Hayward Hydroelectric Project
FERC Project No. 2417

Trego Hydroelectric Project
FERC Project No. 2711

Draft License Application

Appendix E-1
Documentation of Consultation

Prepared for

Northern States Power Company
a Wisconsin Corporation

Prepared by

Mead & Hunt

meadhunt.com

June 2023

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LIST OF ABBREVIATIONS AND TERMS

Applicant.....Northern States Power Company, a Wisconsin Corporation
ATIS .....Aquatic and Terrestrial Invasive Species
Bad River Tribe .....Bad River Band of Lake Superior Chippewa Indians
BIA.....Bureau of Indian Affairs
BLM .....Bureau of Land Management
DLA ..... Draft License Application
EPA .....Environmental Protection Agency
FERC..... Federal Energy Regulatory Commission
FLA..... Final License Application
GLIFWC ..... Great Lakes Indian Fish and Wildlife Commission
JAM .....Joint Agency Meeting
kW ..... kilowatt
Licensee.....Northern States Power Company, a Wisconsin Corporation
NGVD .....National Geodetic Vertical Datum 1929
NPS .....National Park Service
NOAA .....National Oceanic and Atmospheric Administration
NSPW.....Northern States Power Company, a Wisconsin Corporation
PAD ..... Pre-Application Document
Project .....Hayward Hydroelectric Project or Trego Hydroelectric Project
Projects .....Hayward Hydroelectric Project and Trego Hydroelectric Project
PSCW..... Public Service Commission of Wisconsin
RAW .....River Alliance of Wisconsin
TLP..... Traditional Licensing Process
USACE..... United States Army Corps of Engineers
EPA ..... United States Environmental Protection Agency
SHPO .....Wisconsin State Historic Preservation Office
USFWS ..... United States Fish and Wildlife Service
UWSP WCFU.....University of WI Stevens Point WI Cooperative Fisheries Unit
WCMP .....Wisconsin Coastal Management Program
WDNR ..... Wisconsin Department of Natural Resources

1. Listing of Stakeholder/Applicant Contacts

1.1 Listing of Stage 1 Contacts with Stakeholders

Table 1.1-1 includes contacts made between Northern States Power Company, a Wisconsin Corporation (NSPW, Applicant or Licensee) and the stakeholders, beginning with NSPW's development and submittal of the Preliminary Application Document (PAD) and continuing through to the stakeholders written study requests.

Contacts were made through meetings and written correspondence, including email. The following table presents a summary of the various contacts.

Table 1.1-1 Listing of Stage 1 Contacts with Stakeholders for the Hayward and Trego Projects

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Chad Able Red Cliff Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Brian Bisonette Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Stacie Cutbank Oneida Nation of Wisconsin	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Marvin Defoe Red Cliff Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Ned Daniels Forest County Potawatomi	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
David Grignon Menominee Indian Tribe of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Tehassi Hill Oneida Tribe of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Shannon Holsey Stockbridge-Munsee Tribe of Mohican Indians	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Mic Isham Lac Courte Oreilles Band of Chippewa Indians	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Michael LaRonge Forest County Potawatomi Community of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Edith Leoso Bad River Band of Lake Superior Tribe of Chippewa Indians (Bad River Tribe)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Chris McGeshick Sokaogon Chippewa Community of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Clinton Parish Bay Mills Indian Community of MI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
William Quackenbush Ho-Chunk Nation	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Lewis Taylor St. Croix Chippewa Indians of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Adam Van Zile Sokaogon Chippewa Community Mole Lake Band	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Sherry White Stockbridge Munsee Tribe of Mohican Indians	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Marlin WhiteEagle Ho-Chunk Nation of WI	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Michael Wiggins Bad River Band	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Joseph Wildcat, Sr. Lac Du Flambeau Band of Lake Superior Chippewa Indians	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Melinda Young Lac du Flambeau Band of Lake Superior Chippewa Indians	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Public Service Commission of Wisconsin (PSCW)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Wisconsin Cooperative Fisheries Research Unit University of WI Stevens Point (UWSP-WCFU)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Kathleen Angel Wisconsin Coastal Management Program (WCMP)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Cheryl Laatsch Wisconsin Department of Natural Resources (WDNR)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Jeffery Schierer WDNR	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Watershed Management WDNR	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Wisconsin Office of Attorney General	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Wisconsin Office of the Governor	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Tyler Howe State Historic Preservation Office (SHPO)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Nannette Bischoff US Army Corps of Engineers (USACE)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Kimberly Bose Federal Energy Regulatory Commission (FERC)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Tokey Boswell National Park Service (NPS)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Michael Connor US Dept. of Interior-Comm. US Bureau of Reclamation	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Glenn Grothman US Representative District 6	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Timothy Lapointe US Bureau of Indian Affairs (BIA)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Mary Manydeeds BIA	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Angela Tornes NPS	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Tom Tiffany US Representative District 7	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Jen Tyler US Environmental Protection Agency (EPA)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Green Bay Field Office US Fish and Wildlife Service	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Nick Utrup US Fish and Wildlife Service	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
William Allard Town of Trego	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
City Manager City of LaCrosse	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Thomas Hoff Sawyer County	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Wes Huffer Town of Trego	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Marathon County	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Lolita Olson Washburn County	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Dale Peters City of Eau Claire	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Lisa Poppe City of Hayward	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Town of Trego	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Ronald Pete Town of Superior	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Mike Arrowwood Walleyes for Tomorrow	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
James Fossum River Alliance of Wisconsin (RAW)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Thomas Frost Trego Lake District (TLD)	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Northwest Regional Planning Commission	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Scott Crotty Xcel Energy	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Matthew Miller Xcel Energy	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
James Zyduck Xcel Energy	Darrin Johnson Mead & Hunt	PAD Questionnaire	Letter	7/22/2020
Darrin Johnson Mead & Hunt	Carolyn Henry Wisconsin Office of the Attorney General	Response to Questionnaire	Email	8/4/2020
Darrin Johnson Mead & Hunt	Bridget Quist Mille Lacs Band of Ojibwe	Response to Questionnaire	Email	8/5/2020
Darrin Johnson Mead & Hunt	Charlie Peterson TLD	Response to Questionnaire	Email	8/6/2020
Darrin Johnson Mead & Hunt	Town of Trego	Response to Questionnaire	Email	8/20/2020
Barb Hinkfuss Town of Trego	Darrin Johnson Mead & Hunt	Response to Questionnaire	Email	8/21/2020
Darrin Johnson Mead & Hunt	Barb Hinkfuss Town of Trego	Response to Questionnaire	Email	9/7/2020
Cheryl Laatsch WDNR	Darrin Johnson Mead & Hunt	Request for info on Projects	Email	7/17/2020
Darrin Johnson Mead & Hunt	Macaulay Haller WDNR	Background info for Projects	Email	7/20/2020
Darrin Johnson Mead & Hunt	Macaulay Haller WDNR	Response to Questionnaire	Email	7/29/2020
Darrin Johnson Mead & Hunt	McCauley Haller WDNR	Response to Questionnaire	Email	8/10/2020
Darrin Johnson Mead & Hunt	McCauley Haller WDNR	Response to Questionnaire	Email	8/17/2020
Chad Able Red Cliff Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Jamie Arsenault White Earth Band of the Minnesota Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Melanie Benjamin Mille Lacs Band of Ojibwe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Brian Bisonette Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Michael Blackwolf Fort Belknap Indian Community	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Amy Burnette Leech Lake Band of Minnesota	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Alden Connor Keweenaw Bay Indian Community	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Stacie Cutbank Oneida Nation of Wisconsin	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Ned Daniels, Jr. Forest County Potawatomi Community of Wisconsin	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Marvin Defoe Red Cliff Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Norman Des Champe Grand Portage Band of the MN Chippewa Tribe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Joan Delabreau Menominee Indian Tribe of Wisconsin	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Beth Drost Grand Portage Band of the MN Chippewa Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Kevin Dupuis, Sr. Fond du Lac Band of the Minnesota Chippewa Tribe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Michael Fairbanks White Earth Band of the Minnesota Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Gary Frazer Minnesota Chippewa Tribe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
David Grignon Menominee Indian Tribe of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Tehassi Hill Oneida Tribe of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Shannon Holsey Stockbridge-Munsee Tribe of Mohican Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Jill Hoppe Fond du Lac Band of the Lake Superior Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Diane Hunter Miami Tribe of Oklahoma	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020

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Farron Jackson Leech Lake Band of Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Douglas Lankford Miami Tribe of Oklahoma	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Michael LaRonge Forest County Potawatomi Community of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Edith Leoso Bad River Tribe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Wanda McFaggen St. Croix Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Chris McGeschick Sokaogon Chippewa Community of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Daisy McGeschick Lac Vieux Desert Band of Lake Superior Indians of MI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Clinton Parish Bay Mills Indian Community of MI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Rick Peterson Red Cliff Band of Lake Superior Chippewa	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
William Quackenbush Ho-Chunk Nation	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Jared Swader Grand Portage Band of Chippewa Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Warren Swartz, Sr. Keweenaw Bay Indian Community	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Louis Taylor, Sr. Lac Courte Oreilles Band of Chippewa Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Lewis Taylor St. Croix Chippewa Indians of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Adam Van Zile Sokaogon Chippewa Community Mole Lake Band	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Natalie Weyaus Mille Lacs Band of Ojibwe	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Sherry White Stockbridge Munsee Tribe of Mohican Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Marlin WhiteEagle Ho-Chunk Nation of WI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Michael Wiggins Bad River Band	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020

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Joseph Wildcat, Sr. Lac Du Flambeau Band of Lake Superior Chippewa Indians	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
James Williams Lac Vieux Desert Band of Lake Superior Chippewa Indians of MI	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Melinda Young Lac du Flambeau	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Public Service Commission of Wisconsin (PSCW)	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
UWSP-WCFU	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Kathleen Angel WCMP	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Cheryl Laatsch WDNR	Shawn Puzen Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Wisconsin Office of the Governor	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Tyler Howe SHPO	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Nannette Bischoff USACE	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Kimberly Bose FERC	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Tokey Boswell NPS	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Michael Connor US Dept. of Interior-Comm. US Bureau of Reclamation	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Glenn Grothman US Representative District 6	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Timothy Lapointe BIA	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Mary Manydeeds BIA	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Angela Tornes NPS	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Tom Tiffany US Representative District 7	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Jen Tyler EPA	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
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Nick Utrup US Fish and Wildlife Service	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
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City Manager City of LaCrosse	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Barb Hinkfuss Town of Trego	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
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Lolita Olson Washburn County	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
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Lisa Poppe City of Hayward	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Town of Trego	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Town of Superior	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Brian Vosberg Town of Trego	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Mike Arrowwood Walleyes for Tomorrow	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
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Charlie Peterson TLD	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Scott Crotty Xcel Energy	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Matthew Miller Xcel Energy	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
James Zyduck Xcel Energy	Darrin Johnson Mead & Hunt	NOI, PAD, & TLP Request	Letter	11/27/2020
Edith Leoso Bad River Tribe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Mike Wiggins Bad River Tribe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Brian Newland Bay Mills Indian Community of MI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021

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Kevin Dupuis, Sr. Fond Du Lac Band of Lake Superior Chippewa	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Jill Hoppe Fond Du Lac Band of Lake Superior Chippewa	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
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Michael LaRonge Forest County Potawatomi Community of WI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Andrew Werk, Jr. Fort Belknap Indian Community	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Michael Blackwolf Fort Belknap Indian Community	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Robert Deschampe Grand Portage Band of Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Mary Ann Gagnon Grand Portage Band of Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Marlin WhiteEagle Ho-Chunk Nation of WI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
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Alden Connor Keweenaw Bay Indian Community of MI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Warren Swartz, Sr. Keweenaw Bay Indian Community of MI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Louis Taylor, Sr. Lac Courte Oreilles Band of Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Brian Bissonette Lac Courte Oreilles Band of Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
John Johnson Lac Du Flambeau Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Melinda Young Lac Du Flambeay Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Daisy McGeshick Lac Vieux Desert Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
James Williams, Jr. Lac Vieux Desert Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Amy Burnette Leech Lake Band of Ojibwe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Farron Jackson, Sr. Leech Lake Band of Ojibwe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Joan Delabreau Menominee Tribe of WI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
David Grignon Menominee Indian Tribe of WI	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Diane Hunter Miami Tribe of Oklahoma	James Zyduck Xcel Energy	Jam Notification	Letter	2/22/2021
Douglas Lankford Miami Tribe of Oklahoma	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Melanie Benjamin Mille Lacs Band of Ojibwe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Natalie Weyaus Mille Lacs Band of Ojibwe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Gary Frazer Minnesota Chippewa Tribe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
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Marvin Defoe Red Cliff Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Rick Peterson Red Cliff Band of Lake Superior Chippewa	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Chris McGeshick Sokaogon Chippewa Community Mole Lake Band	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Adam Van Zile Sokaogon Chippewa Community Mole Lake Band	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Lewis Taylor St. Croix Band of Lake Superior Chippewa	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Wanda McFaggen St. Croix Band of Lake Superior Chippewa	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Shannon Holsey Stockbridge Munsee Tribe of Mohican Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Sherry White Stockbridge Munsee Tribe of Mohican Indians	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Nathan Allison Stockbridge Munsee Community	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Jamie Arsenault White Earth Band of the Minnesota Chippewa Tribe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Michael Fairbanks White Earth Band of the Minnesota Chippewa Tribe	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
PSCW	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
UWSP-WCFU	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Kathleen Angel WCMP	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Tyler Howe SHPO	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Cheryl Laatsch WDNR	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Jeff Schierer WDNR	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Wisconsin Office of the Governor	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Kimberly Bose FERC	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Tammy Poitra BIA	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Nannette Bischoff USACE	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Mary Manydeeds BIA	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Michael Connor Dept of Interior Comm. US Bureau of Reclamation	James Zyduck Xcel Energy	Jam Notification	Letter	2/22/2021
Nick Utrup USFWS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Green Bay Field Office USFWS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Christine Gabriel NPS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Julie Galonska NPS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Angela Tornes NPS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Lisa Yager NPS	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Jen Tyler EPA	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Glenn Grothman US Representative District 6	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Tom Tiffany US Representative-District 7	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Mike Arrowwood Walleyes for Tomorrow	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Brant Kucera City of Ashland	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Deb Lewis Ashland County	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Joan Harn NPS Consultant	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
James Fossum RAW	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Northwest Regional Planning Commission	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Charlie Peterson TLD	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Scott Crotty Xcel Energy	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Matthew Miller Xcel Energy	James Zyduck Xcel Energy	JAM Notification	Letter	2/22/2021
Matthew Miller Xcel Energy	Thomas Frost TLD	JAM RSVP	Letter	2/26/2021
Nick Utrup, USFWS Connie Antonuk, WDNR Cheryl Laatsch, WDNR McCauley Haller, WDNR Tyler Howe, WSHPO Julie Galonska, NPS Joan Harn, NPS Angela Tornes, NPS Charlie Peterson, TLD Thomas Frost, TLD Wes Huffer, Town of Trego Matthew Miller, Xcel Energy Scott Crotty, Xcel Energy James Zyduck, Xcel Energy Brauna Hartzell, Mead & Hunt Shawn Puzen, Mead & Hunt Arianna Schmidt, Mead & Hunt Jen Schuetz, Mead & Hunt	Darrin Johnson Mead & Hunt	Invitation to JAM	Email	3/8/2021
Matt Miller Xcel Energy	Angela Tornes, NPS	Questions for JAM	Email	3/10/2021
Brauna Hartzell, Mead & Hunt Darrin Johnson, Mead & Hunt Shawn Puzen, Mead & Hunt Arianna Schmidt, Mead & Hunt Jen Schuetz, Mead & Hunt Julie Galonska, NPS	-	JAM Meeting	Virtual Meeting	3/11/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Joan Harn, NPS Consultant Angela Tornes, NPS Lisa Yager, NPS Connie Antonuk, WDNR Macauley Haller, WDNR Thomas Frost, TLD Charlie Peterson, TLD Tyler Howe, SHPO Michael Bebeau, Xcel Energy Scott Crotty, Xcel Energy Matthew Miller, Xcel Energy Ricky Reichert, Xcel Energy Randy Volbrecht, Xcel Energy James Zyduck, Xcel Energy				
Kimberly Bose FERC	Scott Crotty Xcel Energy	JAM Proof of Publication	Letter	3/22/2021
Kimberly Bose FERC	James Zyduck	JAM Audio Recording	Letter	4/9/2021
Shawn Puzen, Mead & Hunt Darrin Johnson, Mead & Hunt Scott Crotty, Xcel Energy Matt Miller Xcel Energy	Angela Tornes NPS	Post JAM Correspondence	Email	3/12/2021
Shawn Puzen Mead & Hunt Darrin Johnson, Mead & Hunt Scott Crotty, Mead & Hunt Joan Harn, NPS Angela Tornes, NPS		Post JAM Meeting with NPS	Virtual Meeting	3/19/2021
Angela Tornes NPS	Scott Crotty Xcel Energy	Post meeting email	Email	3/26/2021
Kimberly Bose FERC	Angela Tornes NPS	Letter opposing use of TLP	Letter	12/28/2020
Kimberly Bose FERC	Christine Gabriel NPS	Letter indicating NPS plans to comment on TLP for Trego Project	Letter	2/8/2021
Kimberly Bose FERC	Christine Gabriel NPS	Letter indicating NPS plans to comment on TLP for Hayward Project	Letter	2/8/2021
Kimberly Bose FERC	Richard Clark NPS	Comments on PAD and Study Requests	Letter	4/27/2021
Kimberly Bose FERC	Charlie Peterson TLD	Comments on PAD and Study Requests	Letter	5/6/2021
Kimberly Bose FERC	Cheryl Laatsch WDNR	Comments on PAD and Study Requests	Letter	5/7/2021
Michael Wiggins Bad River Tribe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Edith Leoso Bad River Tribe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Brian Newland Bay Mills Indian Community of Michigan	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Kevin Dupuis, Sr. Fond du Lac Band of Lake Superior Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Jill Hoppe Fond du Lac Band of Lake Superior Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Ned Daniels, Jr. Forest County Potawatomi Community of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Michael LaRonge Forest County Potawatomi Community of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Andrew Werk, Jr. Fort Belknap Indian Community	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Michael Blackwolf Fort Belknap Indian Community	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Robert Deschampe Grand Portage Band of Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Maryann Gagnon Grand Portage Band of the MN Chippewa Tribe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Marlin WhiteEagle Ho Chunk Nation of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
William Quackenbush Ho Chunk Nation of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Alden Connor Keweenaw Bay Indian Community	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Warren Swartz, Sr. Keweenaw Bay Indian Community	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Louis Taylor, Sr. Lac Courte Oreilles Band of Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Brian Bisonette Lac Courte Oreilles Band of Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
John Johnson Lac Du Flambeau Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Melinda Young Lac Du Flambeau Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Daisy McGeshick Lac Vieux Desert Band of Lake Superior Indians of MI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
James Williams Lac Vieux Desert Band of Lake Superior Indians of MI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Amy Burnette Leech Lake Band of Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Farron Jackson, Sr. Leech Lake Band of Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Joan Delabreau Menominee Indian Tribe of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
David Grignon Menominee Indian Tribe of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Douglas Lankford Miami Tribe of Oklahoma	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Diane Hunter Miami Tribe of Oklahoma	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Melanie Benjamin Mille Lacs Band of Ojibwe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Natalie Weyaus Mille Lacs Band of Ojibwe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Gary Frazer Minnesota Chippewa Tribe	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Stacy Cutbank Oneida Tribe of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Tehassi Hill Oneida Tribe of WI	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Chad Able Red Cliff Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Rick Peterson Red Cliff Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Marvin Defoe Red Cliff Band of Lake Superior Chippewa Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Chris McGeshick Sokaogon Chippewa Indian Community Mole Lake Band	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Adam Van Zile Sokaogon Chippewa Community Mole Lake Band	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Lewis Taylor St. Croix Band of Lake Superior Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Wand McFaggen St. Croix Band of the Lake Superior Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Shannon Holsey Stockbridge Munsee Tribe of Mohican Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Sherry White Stockbridge Munsee Tribe of Mohican Indians	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Nathan Allison Stockbridge Munsee Community	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Jamie Arsenault White Earth Band of the Minnesota Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Michael Fairbanks White Earth Band of the Minnesota Chippewa	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
PSCW	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
UWSP-WCFU	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Kathleen Angel WCMP	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Tyler Howe SHPO	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Connie Antonuk WDNR	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Macaulay Haller WDNR	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Cheryl Laatsch WDNR	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Jeffery Schierer WDNR	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Wisconsin Office of the Governor	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Kimberly Bose FERC	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Tammy Poitra BIA	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Nannette Bischoff USACE	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Mary Manydeeds BIA	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Michael C. Connor US Department of Interior Comm. US Bureau Reclamation	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Nick Utrup USFWS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Green Bay Field Office USFWS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Christine Gabriel NPS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Julie Galonska NPS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Angela Tornes NPS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Lisa Yager NPS	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Jen Tyler EPA	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Glenn Grothman US Representative District 6	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Tom Tiffany US Representative District 7	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Dale Peters City of Eau Claire	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
City Manager City of La Crosse	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Marathon County	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Ronald Pete Town of Superior	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Town Chairman Town of Hayward	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Thomas Hoff Sawyer County	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Wes Huffer Town of Trego	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Brian Vosberg Town of Trego	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Barb Hinkfuss Town of Trego	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Lolita Olson Washburn County	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
James Fossum RAW	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Northwest Regional Planning Commission	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Mike Arrowood Walleye for Tomorrow	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Thomas Frost TLD	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Charlie Peterson TLD	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Joan Harn NPS Consultant	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
Scott Crotty Xcel Energy	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Matthew Miller Xcel Energy	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Joan Harn NPS Consultant	James Zyduck Xcel Energy	Site Visit Notification	Letter	5/27/2021
Matt Miller Xcel Energy	Connie Antonuk WDNR	Site Visit RSVP	Email	6/7/2021
Matt Miller Xcel Energy	James Yach WDNR	Site Visit RSVP	Email	6/7/2021
Matt Miller Xcel Energy	Max Wolter WDNR	Site Visit RSVP	Email	6/7/2021
Matt Miller Xcel Energy	Bob Somermayer TLD	Site Visit RSVP	Email	6/13/2021
Matt Miller Xcel Energy	Charlie Peterson TLD	Site Visit RSVP	Email	6/14/2021
Shawn Puzen, Mead & Hunt John McCue, City of Hayward Connie Antonuk, WDNR Cheryl Laatsch, WDNR Zach Lawson, WDNR Max Wolter, WDNR Lee, WDNR Julie Galonska NPS Lisa Yager, NPS Jonathon Moore, NPS Charlie Peterson, TLD Bob Somermeyer, TLD Scott Crotty, Xcel Energy Ryan Tjader, Xcel Energy Matthew Miller, Xcel Energy		On-Site Visit	Meeting	6/17/2021
Jonathon Moore NPS	Shawn Puzen Mead& Hunt	Site Visit Follow-up	Email	6/21/2021
Shawn Puzen Mead & Hunt	Jonathon Moore NPS	Site Visit Follow-up	Email	6/23/2021
Jonathon Moore NPS	Darrin Johnson Mead & Hunt	Site Visit Follow-up	Email	6/23/2021
Kimberly Bose FERC	James Zyduck Xcel Energy	Site Visit Proof of Publication	Letter	6/24/2021

1.2 Listing of Stage 2 Contacts with Stakeholders

Table 1.2-1 presents contacts made between stakeholders and the Applicant, beginning after receipt of the written study requests, through consultation on the Draft License Application (DLA). Contacts were made through meetings and written correspondence. The following table presents a summary of the various contacts.

Table 1.2-1 Listing of Stage 2 Contacts with Stakeholders

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Cheryl Laatsch, WDNR Julie Galonska, NPS Joan Harn, NPS Susan Rosebrough, NPS David Thomson, NPS Angela Tornes, NPS Lisa Yager, NPS Thomas Frost, TLD Charlie Peterson, TLD Nick Utrup, USFWS Scott Crotty, Xcel Energy Matthew Miller, Xcel Energy Shawn Puzen, Mead & Hunt	Darrin Johnson Mead & Hunt	Draft Study Summary	Email	8/2/2021
Darrin Johnson Mead & Hunt	Charlie Peterson TLD	Comments of Draft Study Summary	Letter	8/27/2021
Darrin Johnson Mead & Hunt	Juliet Galonska NPS	Comments on Draft Study Summary	Letter	8/31/2021
Angela Tornes, NPS Cheryl Laatsch, WDNR	Shawn Puzen Mead & Hunt	Recreation Plan Consultation	Email	11/5/2021
Shawn Puzen Mead & Hunt	Theresa Hogan NPS	Comments on Draft Recreation Plan	Letter	12/3/2021
Cheryl Laatsch, WDNR Susan Rosebrough, NPS Angela Tornes, NPS	Shawn Puzen Mead & Hunt	Mussel Study Plan Consultation	Email	2/2/2022
Shawn Puzen Mead & Hunt	Craig Hansen NPS	Comments on Mussel Study Plan	Letter	3/4/2022
Shawn Puzen Mead & Hunt	Cheryl Laatsch	Comments on Mussel Study Plan	Email	1/7/2022
Cheryl Laatsch, WDNR Susan Rosebrough, NPS Lisa Yager, NPS	Shawn Puzen Mead & Hunt	Turtle Study Consultation	Email	2/3/2022
Shawn Puzen Mead & Hunt	Chery Laatsch WDNR	Comments on Turtle Study Plan	Phone Call	2/21/2022
Shawn Puzen Mead & Hunt	Craig Hansen NPS	Comments on Turtle Study Plan	Letter	3/4/2022
Cheryl Laatsch, WDNR Susan Rosebrough, NPS Angela Tornes, NPS Lisa Yager, NPS	Shawn Puzen Mead & Hunt	Water Qualtiy Study Consultation	Email	2/3/2022
Shawn Puzen Mead & Hunt	Craig Hansen NPS	Comments on Water Quality Study Plan	Letter	3/4/2022

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Kimberly Bose, FERC Cheryl Laatsch, WDNR Lisa Yager, NPS Charlie Peterson, TLD	Scott Crotty Xcel Energy	Final Study Plans	Letter	4/21/2022
Cheryl Laatsch WDNR	Shawn Puzen Mead & Hunt	ATIS Incident Reporting	Email	7/11/2022
Shawn Puzen Mead & Hunt	Cheryl Laatsch Mead & Hunt	ATIS Incident Reporting	Email	7/11/2022
Alexander Sell WDNR	Laura Sass GAI Consultants	ATIS Incident Reporting	Email	7/11/2022
Cheryl Laatsch WDNR	Darrin Johnson Mead & Hunt	WQ Standards Consultation	Email	1/27/2023
Darrin Johnson Mead & Hunt	Ashley Berank WDNR	WQ Standards Consultation	Email	1/27/2023
Cheryl Laatsch WDNR	Shawn Puzen Mead & Hunt	Study Report Consultation	Email	3/6/2023
Craig Hansen, NPS Jonathon Moore, NPS Lisa Yager, NPS	Shawn Puzen Mead & Hunt	Study Report Consultation	Email	3//6/2023
Thomas Frost, TLD Charlie Peterson, TLD	Shawn Puzen Mead & Hunt	Study Report Consultation	Email	3/6/2023
Matthew Miller, Xcel Energy Shawn Puzen, Mead & Hunt	Craig Hansen NPS	Study Report Consultation	Letter	4/21/2023
Cheryl Laatsch WDNR	Darrin Johnson Mead & Hunt	Fish Data	Email	3/29/2023
Darrin Johnson Mead & Hunt	Max Wolter WDNR	Fish Data	Email	3/29/2023
Darrin Johnson Mead & Hunt	Craig Roberts WDNR	Fish Data	Email	3/29/2023
Shawn Puzen Mead & Hunt	SHPO	Section 106 Consultation Hayward	Email	1/24/2023
Shawn Puzen Mead & Hunt	SHPO	Section 106 Consultation Trego	Email	2/1/2023
Tyler Howe SHPO	Shawn Puzen Mead & Hunt	Section 106 Consultation Hayward and Trego	Email	3/28/2023
Shawn Puzen, Mead & Hunt Matthew Miller, Xcel Energy	Tyler Howe SHPO	Section 106 Consultation Hayward	Email	3/28/2023
Shawn Puzen, Mead & Hunt Matthew Miller, Xcel Energy	Tyler Howe SHPO	Section 106 Consultation Hayward	Email	3/28/2023
Shawn Puzen, Mead & Hunt Matthew Miller, Xcel Energy	Tyler Howe SHPO	Section 106 Consultation Trego	Email	3/28/2023
Kathleen Angel WCMP	Matthew Miller Xcel Energy	CZMA Coordination	Email	5/24/2023

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Kathleen Angel WCMP	Matthew Miller Xcel Energy	CZMA Coordination Hayward	Letter	5/24/2023
Kathleen Angel WCMP	Matthew Miller Xcel Energy	CZMA Coordination Trego	Letter	5/24/2023
Michael Wiggins Bad River Tribe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Edith Leoso Bad River Tribe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Whitney Gravelle Bay Mills Indian Community of Michigan	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Kevin Dupuis, Sr. Fond du Lac Band of Lake Superior Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jill Hoppe Fond du Lac Band of Lake Superior Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Ned Daniels, Jr. Forest County Potawatomi Community of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Benjamin Rhodd Forest County Potawatomi Community of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jeffrey Stiffarm. Fort Belknap Indian Community	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Michael Blackwolf Fort Belknap Indian Community	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Robert Deschampe Grand Portage Band of Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Maryann Gagnon Grand Portage Band of the MN Chippewa Tribe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Marlin WhiteEagle Ho Chunk Nation of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
William Quackenbush Ho Chunk Nation of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Gary Loonsfoot Keweenaw Bay Indian Community	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Warren Swartz, Sr. Keweenaw Bay Indian Community	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Louis Taylor, Sr. Lac Courte Oreilles Band of Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Brian Bisonette Lac Courte Oreilles Band of Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
John Johnson Lac Du Flambeau Band of Lake Superior Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Melinda Young Lac Du Flambeau Band of Lake Superior Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Alina Shively Lac Vieux Desert Band of Lake Superior Indians of MI	Donald Hartinger Xcel Energy	DLA	Email	6/29/2023
James Williams Lac Vieux Desert Band of Lake Superior Indians of MI	Donald Hartinger Xcel Energy	DLA	Email	6/29/2023
Amy Burnette Leech Lake Band of Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Email	6/29/2023
Farron Jackson, Sr. Leech Lake Band of Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Ron Corn, Sr. Menominee Indian Tribe of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
David Grignon Menominee Indian Tribe of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Douglas Lankford Miami Tribe of Oklahoma	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Diane Hunter Miami Tribe of Oklahoma	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Melanie Benjamin Mille Lacs Band of Ojibwe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Natalie Weyaus Mille Lacs Band of Ojibwe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Gary Frazer Minnesota Chippewa Tribe	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Nicolas Metoxen Oneida Tribe of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Tehassi Hill Oneida Tribe of WI	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Chad Able Red Cliff Band of Lake Superior Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Chairman Red Cliff Band of Lake Superior Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Marvin Defoe Red Cliff Band of Lake Superior Chippewa Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Robert Van Zile, Jr. Sokaogon Chippewa Indian Community Mole Lake Band	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Michael LaRonge Sokaogon Chippewa Community Mole Lake Band	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Lewis Taylor St. Croix Band of Lake Superior Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Wand McFaggen St. Croix Band of the Lake Superior Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Shannon Holsey Stockbridge Munsee Tribe of Mohican Indians	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Sherry White Stockbridge Munsee Tribe of Mohican Indians	Donald Hartinger Xcel Energy	DLA	Email	6/29/2023
Jeffrey Bendremer Stockbridge Munsee Community	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jamie Arsenault White Earth Band of the Minnesota Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Michael Fairbanks White Earth Band of the Minnesota Chippewa	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
PSCW	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
UWSP-WCFU	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Kathleen Angel WCMP	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Tyler Howe SHPO	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Connie Antonuk WDNR	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Cheryl Laatsch WDNR	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jeffery Schierer WDNR	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Wisconsin Office of the Governor	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Kimberly Bose FERC	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Ann McCammon Soltis Great Lakes Indian Fish and Wildlife Commission (GLIFWC)	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Tammy Poitra BIA	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Nannette Bischoff USACE	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Mary Manydeeds BIA	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Michael C. Connor US Department of Interior Comm. US Bureau Reclamation	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Darrin Simpkins USFWS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Green Bay Field Office USFWS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Christine Gabriel NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Craig Hansen NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Alyssa Walker NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Lilian Jonas NPS Consultant	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Susan Rosebrough-Jones NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
David Thomson NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Terri Hogan NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jonathon Moore NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Lisa Yager NPS	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Jen Tyler EPA	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Glenn Grothman US Representative District 6	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Tom Tiffany US Representative District 7	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Dale Peters City of Eau Claire	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
City Manager City of La Crosse	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Marathon County	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023

Person/Agency Contacted	From	Item	Contact Type (Meeting or Letter/Email?)	Date
Ronald Pete Town of Superior	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Town Chairman Town of Hayward	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Thomas Hoff Sawyer County	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Wes Huffer Town of Trego	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Brian Vosberg Town of Trego	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Patti Butterfield Town of Trego	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Lolita Olson Washburn County	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
James Fossum RAW	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Northwest Regional Planning Commission	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Mike Arrowood Walleye for Tomorrow	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Thomas Frost TLD	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Charlie Peterson TLD	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Joan Harn NPS Consultant	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Hayward Project Adjacent Landowners	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Trego Project Adjacent Landowners	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Scott Crotty Xcel Energy	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Matthew Miller Xcel Energy	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Joan Harn NPS Consultant	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Scott Crotty Xcel Energy	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Matthew Miller Xcel Energy	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023
Donald Hartinger Xcel Energy	Donald Hartinger Xcel Energy	DLA	Letter	6/29/2023

1.3 Listing of Stage 3 Contacts with Stakeholders

In the Final License Application (FLA), Table 1.3-1 will provide a list of stakeholders who were sent a letter with a link to an electronic copy of the FLA as submitted to the Federal Energy Regulatory Commission.

Table 1.3-1 Listing of Stage 3 Contacts with Stakeholders

Person/Agency Contacted	From	Item	Contact Type (Meeting, Letter, Email?)	Date
xxx	xxxx	xxxx	xxxx	xxx

2. Consultation Summary

The following sections provide a summary of stakeholders' comments, recommendations, and concerns, and the Applicant's responses, regarding consultation following the submittal of the PAD to the stakeholders and ending in the filing of the FLA. A brief description of each Project is provided below for a basis for subsequent discussions. More detailed descriptions of each Project are included in Exhibit A of this DLA.

Hayward Project Description

The Hayward Project is a hydroelectric project located on the Namekagon River in Sawyer County, Wisconsin, with an authorized capacity of 168 kilowatts (kW). Project facilities include a dam, powerhouse with intake channel, tailrace or tailwater, transmission equipment, appurtenant equipment, 246.9-acre reservoir, surrounding land extending landward to an elevation of 1,187.5 feet National Geodetic Vertical Datum (NGVD), and NSPW-owned lands near the dam necessary for Project operations.

Under the proposed operation, NSPW will continue to operate the Project in a run-of-river mode where discharge measured immediately downstream of the Project tailrace approximates the sum of inflow into the Project reservoir. This mode of operations minimizes the potential for adverse impacts on water quality, aquatic habitat, and other aquatic resources. At all times, NSPW will continue to minimize the fluctuation of the Project reservoir and maintain the elevation between 1,187.0 and 1,187.5 feet NGVD while targeting 1,187.4 feet NGVD. NSPW will not operate the Project between the low and high elevation on a daily basis for peaking purposes.

In addition, NSPW will continue to release a minimum flow of 8 cfs or inflow, whichever is less, into the bypass reach of the Namekagon River for the protection of fish and wildlife resources and water quality.

Just prior to spring runoff, or for emergency operations, the Applicant may deviate from the maximum reservoir elevation, by no more than an increase of 0.5 feet, to remove ice from the spillway for dam safety purposes. The duration of the deviation shall be no longer than necessary, typically less than a few days, to remove the ice and will be considered a planned deviation under the requirements outlined in Section 4.5.3 of Exhibit E.

Trego Project Description

The Trego Project is a hydroelectric project located on the Namekagon River in the Town of Trego in Washburn County, Wisconsin, with an authorized capacity of 1,200 kW. Project facilities include a dam, powerhouse, tailrace or tailwater, transmission equipment, appurtenant equipment, 435.2-acre reservoir, surrounding land extending landward to an elevation of 1,035.2 feet NGVD, and NSPW-owned lands near the dam necessary for Project operations.

Under the proposed operation, NSPW will continue to operate the Project in a run-of-river mode where streamflow as measured immediately downstream of the Project tailrace approximates the sum of inflows into the Project reservoir. This mode of operation minimizes the potential for adverse impacts on water quality, aquatic habitat, and other aquatic resource values. NSPW will also continue to maintain a reservoir target elevation of 1,034.9 feet NGVD, with fluctuations limited to 0.3 feet around the target elevation (i.e., between 1,034.6 feet and 1,035.2 feet NGVD).

Just prior to spring runoff, or for emergency purposes, the Applicant may deviate from the maximum reservoir elevation by no more than 0.5 feet to remove ice from the spillway for dam safety purposes. The duration of the deviation shall be no longer than necessary, typically less than a few days, to remove the ice and will be considered as a planned deviation under the requirements outlined in Section 5.5.3 of Exhibit E.

2.1 Stage 1 Consultation Summary

Stage 1 Consultation Summary includes consultation that began with pre-licensing questionnaires for developing the PAD and ended with written comments and study requests from interested stakeholders. Formal comments and study requests were received from the following organizations/interested parties:

- National Park Service (NPS)
- Trego Lake District (TLD)
- Wisconsin Department of Natural Resources (WDNR)

Stakeholders' comments and study requests are found in Attachment A of this appendix.

2.2 Stage 2 Consultation Summary

The following provides a summary of stakeholders' comments, recommendations, and concerns, as well as NSPW's responses, regarding consultation that began after written study requests were received and ending with the stakeholder comments on the DLA. The summary is arranged by subject matter with the stakeholders' comments followed by Applicant's responses presented on a stakeholder-by-stakeholder basis.

Any additional narratives, letters, or other information provided within this application further delineate the current positions of the respective parties.

2.2.1 Study Summary

Based on the study requests submitted during the first stage of consultation, the Licensee developed a draft study summary to identify study plans to be completed along with the general study protocols.

In the study summary, the Licensee proposed to complete the following:

- Aquatic and Terrestrial Invasive Species (ATIS) Study (including the collection of bathymetric and substrate data)
- Mussel Study
- Phase 1 Archaeological Study of Project Shorelines
- Recreation Study
- Water Quality Monitoring Study
- Wood and Blanding's Turtle Nesting Habitat Study

On August 2, 2022, NSPW provided a draft study summary for comment to those agencies/entities who requested studies. Draft study plans were then developed and sent to the stakeholders for comment. Stakeholder comments were addressed in the final study plans filed with the Commission on April 21, 2022. More detailed information regarding each of the study plans is provided in the following sections.

On August 2, 2021, the Licensee provided a draft study summary for comment to the agencies/entities who requested studies. WDNR provided comments on August 18, 2021. Comments received, and the Licensee's responses, are summarized in the sections below and are included in Section 3.2. A final study summary, including copies of the final study plans that addressed stakeholder comments, was submitted to FERC on April 21, 2022 and is included in Attachment B of this appendix.

2.2.1.1 Aquatic and Terrestrial Invasive Species Study Plan

WDNR requested an aquatic plant and aquatic and terrestrial invasive species survey. On January 13, 2022, NSPW sent a draft ATIS Study to NPS, TLD, and WDNR. The NPS provided comments via letter on February 9, 2022. No comments were received from the TLD or WDNR. The NPS comments, and the Applicant's responses, were addressed in the final ATIS Study Plan filed with the Commission on April 21, 2022 and included in attachment B of this appendix.

2.2.1.2 Mussel Study Plan

The WDNR requested that a mussel study be completed at each Project. On February 2, 2022, NSPW provided a draft copy of the Mussel Study Plan to the NPS and WDNR for comment. NPS provided comments via letter on March 4, 2022. WDNR provided comments via email on February 16, 2016, which were substantially accepted and incorporated into the plan. NPS and WDNR comments, and the Applicant's responses, were addressed in the final Mussel Study Plan filed with the Commission on April 21, 2022 and included in Attachment B of this appendix.

2.2.1.3 Phase 1 Archaeological Survey of Project Shorelines

The Licensee conducted a Phase I Archaeological Survey of each Project's shoreline. Since the procedure to conduct the survey was set forth in the existing Programmatic Agreement, no specific study plan was developed for consultation. The Hayward and Trego Shoreline Survey Reports were filed with the SHPO on January 24 and February 1, 2023, respectively. The SHPO provided a letter for each Project concurring with the recommendations in each report on March 28, 2023. Copies of the SHPO's concurrence letters are included in Attachment B of this appendix.

2.2.1.4 Recreation Use Study Plan

NPS and WDNR both requested that recreation studies be completed at each Project. On November 5, 2021, NSPW provided a draft copy of the Recreation Study Plan to the NPS and WDNR. Comments were provided by NPS via letter on December 4, 2021. The WDNR did not respond with any comments. The NPS comments, and the Applicant's responses, were addressed in the final Recreation Study Plan filed with the Commission on April 21, 2022 and are included in Attachment B of this appendix.

2.2.1.5 Water Quality Study Plan

WDNR requested that water quality studies be completed at each Project. On February 2, 2022, NSPW provided a draft copy of the Water Quality Study Plan to the NPS and WDNR for comment. The NPS provided comments via letter on March 4, 2022. WDNR did not provide any comments. NPS comments, and the Applicant's responses, were addressed in the final Water Quality Study Plan filed with the Commission on April 21, 2022 and are included in Attachment B of this appendix.

2.2.1.6 Wood and Blanding's Turtle Nesting Habitat Study Plan

WDNR requested that wood and Blanding's turtle nesting habitat studies be completed at each Project. On February 3, 2022, NSPW provided a draft copy of the Wood and Blanding's Turtle Study Plan to the NPS and WDNR for comment. The NPS provided comments via letter on March 4, 2022. The WDNR provided comments verbally on February 21, 2022. NPS and WDNR comments, and the Applicant's responses, were addressed in the final Wood and Blanding's Turtle Study Plan filed with the Commission on April 21, 2022 and are included in Attachment B of this appendix.

2.2.2 Study Reports

The studies were completed in 2022 in accordance with the protocol identified in the final study plans. Draft study reports were provided to the stakeholders for comment. The NPS provided comments on the study reports via letter on April 21, 2022. The NPS was the only agency that provided comments. The study reports and corresponding consultation can be found in Attachment B of this appendix. NSPW's responses to NPS comments on the study reports are included in Sections 1.4.2.2.1 to 1.4.2.2.6 of Exhibit E.

2.2.3 Comments on DLA

The Licensee sent a letter with a link to an electronic version of the DLA to all stakeholders on the distribution list. Written comments received on the DLA, and the Applicant's responses, will be addressed in this section in the FLA.

3. Documentation of Consultation

3.1 Stage 1 Consultation

Copies of Stage 1 correspondence between the stakeholders and the Applicant, beginning with the submittal of the PAD Questionnaire and ending with the written study requests, are included in **Attachment A**. The correspondence is presented in chronological order.

3.2 Stage 2 Consultation

Copies of Stage 2 correspondence between stakeholders and the Applicant, beginning with the written study requests, through consultation on the DLA, and ending just before the filing of the FLA, are included in **Attachment B**. The correspondence is presented on a stakeholder-by-stakeholder basis in chorological order.

3.3 Stage 3 Consultation

The Applicant will send a copy of the cover letter for the FLA, which will include a link to the Project's relicensing website, to all relevant resource agencies, tribes, non-governmental organizations, and other potentially interested parties included in the distribution list via certified mail (including owners of any property adjacent to or within the Project boundary). From this website (http://hydrorelicensing.com/), an electronic copy of the public documents of the FLA may be downloaded. Stakeholders that experience difficulty downloading the document(s) may request an electronic version on a USB drive be sent via US Mail.

4. Evidence of Holding Public Meeting

4.1 Newspaper Notice

In accordance with the schedule set by the FERC, the Licensee held a virtual JAM on March 11, 2021 due to COVID-19 Centers for Disease Control and corporate guidelines to avoid public gatherings and discretionary travel at the time. A public notice of the JAM was published in the Sawyer County Record on February 24, 2021 and the Spooner Advocate on February 25, 2021. The FERC and stakeholders were also notified of this meeting via e-filing and U.S. Mail, respectively, on February 22, 2021. A site visit to the Project was held on June 17, 2021. A public notice of the site visit was published on June 2, 2021 in the Sawyer County Record and on June 3, 2001 in the Spooner Advocate. The FERC and stakeholders were also notified of this meeting via e-filing and U.S. Mail, respectively, on May 28, 2021.

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

March 22, 2021

FERC Docket Nos. 2417-065 and 2711-024

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Proof of Publication of Notice of Joint Meeting**
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2411)

Dear Secretary Bose:

Northern States Power Company-Wisconsin (NSPW), d/b/a Xcel Energy, published a notice in newspapers of general circulation in Sawyer County and Washburn County, Wisconsin announcing the March 11, 2021 Joint Meeting for the Hayward Hydroelectric Project (FERC Project No. 2417) and the Trego Hydroelectric Project (FERC Project No. 2711). The notice was published in the Sawyer County Record on February 24, 2021 and the Spooner Advocate on February 25, 2021. Copies of both public notices and Affidavits of Publication are enclosed.

Should you have any questions, please contact Matthew Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Sincerely,

Scott Crotty

Digitally signed by Scott Crotty
Date: 2021.03.22 11:52:03 -05'00'

For:
James Zyduck
Director, Hydro Plants

Enclosures: Affidavits of Publication

cc: Shawn Puzen – Mead & Hunt, Inc. (via e-mail)
Project Files

News

SAWYER COUNTY RECORD
WEDNESDAY, FEBRUARY 24, 2021 | 5A

Fire destroys shed on Round Lake School Road

BY TERRELL BOETTCHER
News Editor

A fire reported at 9:50 a.m. Thursday, Feb. 18, destroyed a shed and its contents at the Ken Johnson residence of 10415 Round Lake School Road, south of Peninsula Road.

The fire was reported by a passerby. The owners were not home. The Town of Hayward Fire Department was paged to the scene jointly with the City of Hayward Fire Department. Upon arrival they found the unoccupied pole shed fully involved with fire and partially collapsed.

Town of Hayward Fire Chief Don Hamblin said three horses that used the barn for shelter were moved safely away from the barn and put in a nearby paddock. About 20% of the barn was occupied with hay storage and was difficult to extinguish, Hamblin added.

Mutual aid was requested from the Bass Lake and LCO fire departments for water. A hydrant near Round Lake School Road was used for a water site. About 23,000 gallons of water were applied to the fire.

A backhoe from the Town of Hayward was also used to safely pull the shed and hay apart for to extinguish the fire. Firefighters were on scene until 12:45 p.m.

Fire units returned again in the evening and the following morning to further extinguish some smoldering hay.

Hamblin said the fire is believed to have been caused by a heater or heat lamp that was in use to prevent a hydrant from freezing in the shed. The shed and contents were a complete loss.

The Town of Hayward Fire Department responded with a rescue truck, the Town of Bass Lake with a tender, and LCO Fire Department with a tender.

Some 18 firefighters were on scene along with LCO Conservation Department, the Sawyer County Sheriff's Department and Sawyer County Ambulance.

PHOTO BY FRANK RUBAL

Fire consumes a storage shed on Round Lake School Road Thursday, Feb. 18.

Kuula acquitted of homicide charges

Woman stood trial in stabbing death of boyfriend

BY MICHELLE JENSEN
The Lake Chronicler

The trial for a Birchwood woman accused in the stabbing death of her boyfriend in August 2019 concluded with the jury finding her not guilty.

Melanie R. Kuula, 40, had been charged in Barron County with the second-degree intentional homicide of Brett Bents. He had died of a single stab wound near his heart, and he suffered blunt-force trauma to his face.

The trial began Feb. 15 and ended with the jury entering deliberations Friday.

Kuula herself appeared on the stand at about 1:30 p.m. Feb. 17, and took the stand again Thursday morning to plead her case about years of Bents' abusive behavior toward her.

The final witness was Melissa Scala, an internationally known domestic violence expert from Minnesota, who testified about public misperceptions of domestic abuse. She did so without knowledge of the specifics of Kuula's case.

In the closing arguments, assistant district attorney John O'Boyle said a key part of the prosecution's case lies with the 911 call. Overheard was Kuula saying, "I don't care if I go to jail."

O'Boyle said Kuula's actions the day of Bents' death didn't make sense; she could easily have retreated and her statements lacked credibility. He said Kuula killed Bents out of anger and hurt feelings.

"This was a stabbing done out of anger, not self-defense," he concluded.

But defense attorney Ryan Joseph Raymond said the case was about self-defense and domestic abuse, just as he had asserted in his opening statement, and he said he believed the prosecution had not met the burden of proving otherwise beyond a reasonable doubt.

Raymond said Kuula feared for her life that day and would not have stabbed Bents at an upward angle if she had been angry — a stab in anger would have come downward. It was one stab wound, low to high, in and out.

"That's not an anger killing," Raymond said.

Furthermore, after years of abuse, Kuula could read the warning signs in Bents' behavior that indicated he was about to become abusive.

Glut 1 fundraiser underway for Hayward boy

Hayward area resident Ethan Neuman is again joining the Glut 1 Foundation's "Love Some1 with Glut1" campaign.

The Glut 1 Deficiency Foundation is the single source of support provided to Glut 1 families. It is run mostly by volunteers who give hours of their time to make sure that children (and adults) and their families, like the Treland-Neuman family, have a place to go.

"We are a rare group, living with a rare disease with only approximately 1,000 people being diagnosed in the world," said Ethan's mom Kris. "The support we receive from the Glut 1 Deficiency Foundation is priceless."

To donate, people can visit fipcause.com/secure/fundraiser/[illegible]

"Please help me meet my goal of raising $10,000 to help the Glut 1 Foundation meet their goal of $100,000," Ethan said. "I appreciate all of the support you have given me. In the past, it means a lot.

Ethan Neuman

» MARIJUANA
FROM PAGE 4A

Agard, who introduced a bill in 2019 to legalize medicinal marijuana and allow Wisconsin residents 21 or older to possess up to two ounces recreationally, said many Republican lawmakers have told her privately they support legalization.

"I have had closed-door conversations over the years with many of my Republican colleagues who do support the legislation but have been told by their leaders that this is not a priority," Agard said. "They'd be excited to vote for it. But at this point, they feel like it's not politically prudent."

In light of longtime pushback from some Republican lawmakers, Agard said the solution is nonpartisan redistricting, which she hopes will result in more accurate representation and eventually, legalization.

"It's unfortunate that the leaders of the Republican Party in the Wisconsin Legislature continue to be prohibitionist and standing in the way of having this conversation," Agard said. "We know that [legalization] will create jobs, revenue, support our farms [and] agricultural heritage, as well as help address racial disparities in Wisconsin."

Republican lawmakers have also criticized Evers' decision to address legalization through the state budget. They argue it should come through a separate bill.

"You're going to have pros and cons. You're going to have people for and people against. And that's not something you want to put in the budget at all," Bernier said. "It needs to be thoroughly vetted."

Evers' proposal claims legal marijuana could generate more than $165 million in 2023, but Bernier says she worries such a claim could set the stage for larger budget proposals reliant on marijuana taxes. She also raised concerns about the cost of regulating recreational marijuana.

"There are a lot of complicated issues with legalizing marijuana other than you're going to authorize it to be grown and sold," Bernier said. "And there's going to be a lot of money made."

During a recent WispPolitics.com forum, Assembly Speaker Robin Vos, R-Rochester, said he supports legalizing medicinal marijuana, but like Bernier, does not want to address the issue through the state budget.

"I'm still trying to find a way that we can do it where people accept the fact that we are not going to legalize recreational marijuana," Vos said. "I don't think we have a need to have more drugs in society."

The Capitol Report is written by editorial staff at WispPolitics.com, a nonpartisan, Madison based news service that specializes in coverage of government and politics, and is distributed for publication by members of the Wisconsin Newspaper Association.

PUBLIC NOTICE

Northern States Power Company – Wisconsin (NSPW), d/b/a Xcel Energy is holding a public meeting to discuss the relicensing process for its Hayward and Trego Hydroelectric Projects located on the Namekagon River in northwest Wisconsin. The Hayward Project is located in the Town of Hayward and City of Hayward in Sawyer County, Wisconsin. The Trego Project is located in the Town of Trego in Washburn County, Wisconsin. The Projects currently operate under separate licenses issued by the Federal Energy Regulatory Commission (FERC).

The meeting will take place on Thursday, March 11, 2021, at 10:00 a.m. Due to current COVID-19 health-related concerns, the Centers for Disease Control (CDC) guidelines recommend that social gatherings and discretionary travel be avoided. In order to abide by CDC guidelines, the meeting will be held via a conference call, rather than face-to-face. A site visit to the Projects will be scheduled in the summer of 2021. A separate notice will be provided prior to the site visit.

Please RSVP by Friday, March 5, 2021 if you plan to participate in the meeting. NSPW will send out meeting information to those that RSVP to include a call-in number, meeting agenda and a copy of the PowerPoint presentation.

The purpose of the meeting is to outline NSPW's plan for relicensing and the continued operation of the hydroelectric projects. In addition, the meeting will provide a forum designed to hear your comments and to ask questions about the process to renew the licenses and the hydroelectric projects themselves.

The agenda for the March 11, 2021, meeting is as follows:

1. Welcome and Introductions
2. Overview of Meeting Logistics and Purpose
3. Overview of FERC Traditional Licensing Process
4. Overview of Hayward Project Features and Operations
5. Overview of Trego Project Features and Operations
6. Overview of Information Provided in Preliminary Application Document
7. Next Steps
8. Comments
9. Site Visit to be Scheduled for Summer of 2021

Information on the Hayward and Trego Hydroelectric Projects is available for public review during normal business hours at the following libraries:

- Sherman and Ruth Weiss Community Library – 10789 State Hwy. 77, Hayward, Wisconsin
- Spooner Memorial Library – 421 High Street, Spooner, Wisconsin

Information is also available on the following websites:

- Hayward Project at http://hydrorelicensing.com/hayward/
- Trego Project at http://hydrorelicensing.com/trego/

If you have any questions regarding the meeting or this notice, or wish to RSVP for the meeting, please contact Mr. Matthew Miller, Hydro License Compliance Consultant at **Matthew.J.Miller@XcelEnergy.com** or by telephone at **715-737-1363.**

Xcel Energy®

Spooner Advocate

WISCONSIN NEWS TRACKER

Feb 25 2021 Page A009 Clip resized 28%

Winter Festival is March 6

SARONA– Hunt Hill Audubon Sanctuary and Lakeland Family Resource Center's Winter Festival fundraiser will take place at Hunt Hill on Saturday, March 6, from 10 a.m. to 2:30 p.m.

Staggered start times will be at 10 a.m., 11 a.m., noon, and 1 p.m. to allow for social distancing.

The Winter Festival fundraiser will include many winter activities that are fun for all ages, including sledding, snow art, and snowshoe races.

Additional activities will be available with the purchase of tickets. Participants can check out the sled dogs, test out the fat tire bikes, bid in the raffle, buy lunch, create their own hot chocolate, build their own s'more, and more.

All activities will take place outdoors with social distancing practices in place.

Registration is required by Friday, March 5, at noon. Registration is by calling 715.635.6543 or completing the online registration form on hunthill.org.

A slight program fee is charged per person or per family.

All proceeds will help support Hunt Hill Audubon Sanctuary and Lakeland Family Resource Center.

Quickly ...

Program: Winter Festival
Date: Saturday, March 6
Time: 10 a.m.–2:30 p.m.
Location: Hunt Hill Audubon Sanctuary, Sarona
Registration: By Friday, March 5 at 12 p.m.
Contact: Sage Gumaer, Program Director
Info: 715.635.6543

Enjoy activities such as sled dogs, sledding, snow art, much more at the Hunt Hill Audubon Sanctuary and Lakeland Family Resource Center's Winter Festival fundraiser on March 6.

(SUBMITTED)

Alisha Webster (left) of Anderson, Hager & Moe presents a $445 check to Rev. Susan Odegard, president of Washburn Christian Outreach. Anderson, Hager & Moe also donated to Spooner Youth Baseball as part of the CPA firm's "Jeans for Charity" program.

Anderson, Hager & Moe donates to Washburn Christian Outreach

SPOONER– Anderson, Hager & Moe, CPAs, recently presented checks to Washburn Christian Outreach and Spooner Youth Baseball.

Since 2010 the staff at Anderson, Hager & Moe have participated in a the "Jeans for Charity" program.

On the last Friday of each month and on special occasions, the staff are allowed to wear blue jeans in return for a $5 donation. Each year the staff at Anderson, Hager & Moe vote to choose the charities that will receive the donations.

'Get Out There': Program lets people experience outdoors

BIRCHWOOD– The Birchwood School District is starting a new program called "Get Out There" gear to help people be able to check-out outdoor gear for 7-days (in the same way you check-out a library book).

The Get Out There program will let people try a sport they might not be interested in without needing to buy all the expensive equipment first.

This will be open to all students and staff of the Birchwood School, with a hope for "community check-outs" in the future.

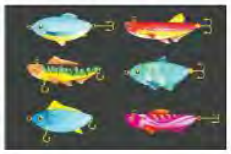
If you would like to donate any gear, here is a list of items that are needed.

Ice Fishing
> Ice rods and reels
> Ice and tip-up line
> Jigs
> Tip-ups
> Treble hooks
> Vexilar or flashes
> Buckets

Open Water Fishing
> Fishing poles
> Fishing reels
> Fishing Line
> Tackle box
> Tackle

Turkey Hunting
> Turkey calls
> Binoculars
> Turkey vest

Other Donations
> Gift card to outdoor stores
> Cash donations



PUBLIC NOTICE

Northern States Power Company – Wisconsin (NSPW), d/b/a Xcel Energy is holding a public meeting to discuss the relicensing process for its Hayward and Trego Hydroelectric Projects located on the Namekagon River in northwest Wisconsin. The Hayward Project is located in the Town of Hayward and City of Hayward in Sawyer County, Wisconsin. The Trego Project is located in the Town of Trego in Washburn County, Wisconsin. The Projects currently operate under separate licenses issued by the Federal Energy Regulatory Commission (FERC).

The meeting will take place on Thursday, March 11, 2021, at 10:00 a.m. Due to current COVID-19 health-related concerns, the Centers for Disease Control (CDC) guidelines recommend that social gatherings and discretionary travel be avoided. In order to abide by CDC guidelines, the meeting will be held via a conference call, rather than face-to-face. A site visit to the Projects will be scheduled in the summer of 2021. A separate notice will be provided prior to the site visit.

Please RSVP by Friday, March 5, 2021 if you plan to participate in the meeting. NSPW will send out meeting information to those that RSVP to include a call-in number, meeting agenda and a copy of the PowerPoint presentation.

The purpose of the meeting is to outline NSPW's plan for relicensing and the continued operation of the hydroelectric projects. In addition, the meeting will provide a forum designed to hear your comments and to ask questions about the process to renew the licenses and the hydroelectric projects themselves.

The agenda for the March 11, 2021, meeting is as follows:
1. Welcome and Introductions
2. Overview of Meeting Logistics and Purpose
3. Overview of FERC Traditional Licensing Process
4. Overview of Hayward Project Features and Operations
5. Overview of Trego Project Features and Operations
6. Overview of Information Provided in Preliminary Application Document
7. Next Steps
8. Comments
9. Site Visit to be Scheduled in Summer of 2021

Information on the Hayward and Trego Hydroelectric Projects is available for public review during normal business hours at the following libraries:
- Sherman and Ruth Weiss Community Library – 10788 State Hwy. 77, Hayward, Wisconsin
- Spooner Memorial Library – 421 High Street, Spooner, Wisconsin

Information is also available on the following websites:
- Hayward Project at http://hydrorelicensing.com/hayward/
- Trego Project at http://hydrorelicensing.com/trego/

If you have any questions regarding the meeting or this notice, or wish to RSVP for the meeting, please contact Mr. Matthew Miller, Hydro License Compliance Consultant at **Matthew.J.Miller@XcelEnergy.com** or by telephone at **715-737-1353**.

Xcel Energy®

ROP AFFIDAVIT

March 19, 2021

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand: **Order #: 21024MX0**

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Hayward Sawyer County Record
15464 County Rd. B
Hayward, Wisconsin 54843
V: 715-635-2181 F: 1-715-635-2186 Email: mcarlson@spooneradvocate.com

WI/Hayward Sawyer County Record (Hayward, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Wed 02/24/21	3.00 X 10.00	**Caption:** Xcel Energy	

Media Dept 3.19.2021

ROP AFFIDAVIT

March 19, 2021

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand: **Order #: 21024MX0**

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Spooner Advocate
251 East Maple St.
Spooner, Wisconsin 54801-0338
V: 715-635-2181 F: 1-715-635-2188 Email: mcarlson@spooneradvocate.com

WI/Spooner Advocate (Spooner, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Thu 02/25/21	3.00 X 10.00	**Caption:** Xcel Energy	

Media Dept 3.19.2021

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

June 24, 2021

FERC Docket Nos. 2417-065 and 2711-024

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Proof of Publication of Notice of Scheduled Site Visit**
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

Northern States Power Company – Wisconsin (licensee), d/b/a Xcel Energy, published a notice in newspapers of general circulation in Sawyer County and Washburn County, Wisconsin announcing the June 17, 2021 site visits to the Hayward (FERC Project No. 2417) and Trego (FERC Project No. 2711) hydroelectric projects. The notice was published in the Sawyer County Record on June 2, 2021 and the Spooner Advocate on June 3, 2021. A copy of each public notice and Affidavit of Publication is enclosed.

Thank you for your time and consideration in this matter. If you have any questions, please contact Matthew Miller at (715) 737-1353 or matthew.j.miller@xcelenergy.com.

Sincerely,

James M Zyduck

Digitally signed by James M Zyduck
Date: 2021.06.28 13:50:47 -05'00'

James M. Zyduck
Director, Hydro Plants

Enclosures: Public Notices and Affidavits of Publication

cc: Shawn Puzen – Mead & Hunt, Inc. (via e-mail)
Project Files

News

SAWYER COUNTY RECORD
WEDNESDAY, JUNE 2, 2021 | 5A

OFF THE SHELF: NEWS OF THE SHERMAN & RUTH WEISS COMMUNITY LIBRARY

BY **KATHY HANSON**
For the Record

Message from Molly Lank-Jones, Director, Sherman & Ruth Weiss Community Library

The Library Board of Trustees is the backbone of any public library. The Trustee Essentials Handbook states that active, enthusiastic trustees govern library operations and promote library development to protect and advance the interests of the broader community. (Wisconsin Department of Public Instruction, Public Library Development Team. Trustee Essentials..., 2016)

At the Sherman & Ruth Weiss Community Library, April marked the end of terms for former Board President Matt Ostrander and former Vice President Delores Peterson. They have been exemplary in advancing the interests of our community and visitors, and in managing me! I hope they remember they only need to take one year off before they can serve on the board again.

May marks the beginning of a new term for Karen Duffy, who has taken on the role of president; Linda Hand, who serves as the City Council representative; and city resident Dave Eckstrom. The remaining roster includes Ann Schleeter, vice president; Bruce Paulson, secretary and county representative; Kathy McCoy, treasurer; Ray Moeller, former longtime board president; and Katie Pritchett, school representative. Several of these trustees served on the library board several years ago. The library staff and I welcome them back and are happy to welcome the new trustees.

Meet the staff: Janet Rowney

Janet Rowney is one of the faces in the library who works the front desk, but she can also be found working on interlibrary loan books, shelving and shopping (searching for titles requested by library patrons and other libraries), helping patrons on the computer, assisting them in finding their items in the stacks, and working curbside with the COVID guidelines.


Rowney

Like many in the Hayward area, she is from Chicago but spent summers in the Hayward area.

Her education is as diverse as any you can imagine: math/science major, theatre major, teaching degree from UW-Superior, student of drama performance with Shakespeare & Company. She has also worked as a server, bartender and hostess.

Perhaps most interesting of all is Janet's passion for working as a deckhand on a tall ship — the S/V Denis Sullivan. She has sailed all five Great Lakes; as far east as Quebec City and as far west as Duluth.

But back to the library. Here is what she told us:

"When I first took the job at the library, I was really naive with my preconceptions of what the job would entail. The processing of books is much more complicated than it appears from the patron's perspective. And you also need to become familiar with the patrons. Plus, there is helping with computer use and printing and faxing and finding materials and research and . . .

Every day I am grateful for the staff. Molly and Ann are supportive bosses and I value each and every staff member and volunteer. My favorite part of the job is the continual challenges. Every day is a fresh experience."

To which we say, "All hands on deck, Janet!"

Maggy's Book Review

"On the House" by John Boehner

I read so much I keep a book diary. Helps me remember what I've read and to make recommendations if anybody asks. I'm going on my fifth diary in the last 10 years or so. They make for a nice gift suggestion to the kids at Christmas, too. Rectangular. Easy to wrap.

So, for the book I'm going to review this time for the library newsletter I'm going straight to my latest book diary and will give it to you straight about John Boehner's "On the House: A Washington Memoir."

Why I read it: It was hyped and promoted a lot; I had hoped for some juicy D.C. dish; I'd always wondered where former Speaker of the House John Boehner disappeared to. I pre-ordered it and counted the days 'til Amazon dropped it off on my front porch.

My review: In a word, disappointing. Too much of the content was boring and permeated with 7th grader cliches. It was surprising, however, to learn that Boehner's big birth family (11 kids!) were lifelong Democrats, though he never explains why he alone made the switch to the Grand Old Party.

Unfortunately, too much of what Boehner gives us is minutiae about his life: his inspirational high school football coach. His Catholic education. His ongoing addiction to Camels. His devotion to red wine. He's even posed on the cover with a cigarette burning in an ashtray and holding a stemmed fishbowl of Cabernet.

He provides some insights into politics and D.C. insiders from his still staunchly Republican point of view, though in the end the GOP turned him out to pasture at age 60. And even with all the tumult going on in his nearly unrecognizable party, he says he voted for Donald Trump in 2020.

That was long after he'd been dumped for the numbers genius, Paul Ryan, who's long gone now, too. Boehner laughingly recounts how Ryan had to have the speaker's office nearly fumigated before moving into it. Too many Camels got smoked in that office for the new speaker, a health nut.

Boehner's lack of spite in a book that could have been over the top with it makes me wonder whether he's leaving an opening for himself, though he claims to be enjoying himself mightily on the golf course these days.

Outdoor Storytime begins June 1 at Weiss Library

The Sherman & Ruth Weiss Community Library is bringing Outdoor Storytime to the library starting June 1, presented on the Children's Patio by Northwest Connection Family Resources.

Sessions will begin at 10:15 a.m. and will run through Aug. 24. Children of all ages are welcome to participate in the interactive, educational activity.

Library officials remind users that inside the building the library's current COVID-19 policy remains in effect. Library patrons and staff must wear a mask and use a hand sanitizer on entering. Children age 3 and older are included in the policy, and the toys and games are temporarily in storage. If people do not have a mask, the library will provide one near the entry at the "sanitation station."

Those who prefer not to mask are free to join Storytime by entering through the Children's Patio gate. During storytime, groups/pods will socially distance around the storyteller, who will be in the center of the patio. Parents and children are free to enter the library to browse either before or after storytime, but masks are required.

1,000 Books program

Participation in Storytime also makes it easier for children to complete 1,000 Books Before Kindergarten, a library challenge to read 1,000 books before the child enters kindergarten. Storytime provides excellent bonding time for children and their caregivers.

Families are invited to join the 1,000 Books challenge at the library. By reading just one book a night, families can reach the 1,000-book goal in three years and provide children with essential early literacy skills.

When children join, they receive a 1,000 Books Before Kindergarten book bag and incentives for every 100 books that are read to the child. When the child completes the program they will receive a book of their choice donated to the program by Arclin of Hayward.

The 1,000 Books program is available to all families with children between the ages of birth and 5 years. Registration is open. For more information, call the library at (715) 634-2161, or visit www.weisscommunitylibrary.com.

Weiss Library resumes 5-day schedule

Effective this week, the Sherman & Ruth Weiss Community Library will be open Monday through Friday for indoor service, but will continue to observe its current COVID-19 policy requiring library patrons and staff to wear a mask and use a hand sanitizer as they enter.

Library hours also have been adjusted to provide more consistent service: Monday, Wednesday, Thursday and Friday from 10 a.m. to 5 p.m., and Tuesday from noon to 7 p.m. The library will continue to offer curbside pickup service on-demand during its open hours.

Library pandemic policies will remain in place at least until the library board meets June 8. People who do not have a mask are provided them near the entry at the "sanitation station."

Pickup will be available during regular hours of operation for those who prefer not to mask or who enjoy the convenience of curbside service. Users must call the library to make an appointment. Curbside pickup now will now be located at the side door facing Highway 77.

Those arriving for pickup should either call the library at (715) 634-2161 from their car or ring the doorbell at the side door. Patrons will be asked to show a library card or I.D. to confirm the order.

The library meeting room will remain unavailable until later in the summer. The Used Book Room will be open Monday through Friday during regular library hours, with purchases made on the honor system (no change will be available).

For more information, visit www.weisscommunitylibrary.com or call the library at (715) 634-2161.

PUBLIC NOTICE

Site Visit for the Relicensing of the Hayward Hydroelectric Project (FERC Project No. 2417) Trego Hydroelectric Project (FERC Project No. 2711)

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, (hereinafter NSPW), hereby notifies resource agencies, Indian tribes and stakeholders, including interested members of the public, that it has scheduled a site visit to the Hayward (FERC Project No. 2417) and Trego (FERC Project No. 2711) Hydroelectric Projects (Projects) as part of the Federal Energy Regulatory Commission's (FERC or Commission) relicensing process. The Hayward and Trego Projects are located on the Namekagon River in the City of Hayward in Sawyer County, Wisconsin and Town of Trego in Washburn County, Wisconsin, respectively.

On Nov. 30, 2020, NSPW filed with the Commission a Pre-Application Document, Notice of Intent, and Request to Use the Traditional Licensing Process (TLP) for the relicensing of both Projects. The Commission, by letter dated Jan. 27, 2021, granted NSPW's request to use the TLP for both Projects.

In accordance with the first stage of consultation requirements under the TLP, NSPW held a Joint Agency Meeting on March 11, 2021. Due to COVID-19 health related concerns, the meeting was held via conference call. No site visit to either Project was conducted at that time in order to abide by Centers for Disease Control and Corporate guidelines to avoid public gatherings and discretionary travel.

NSPW has scheduled a site visit of the Hayward and Trego Projects, in conjunction with a site visit to the White River Hydroelectric Project (FERC Project No. 2444) on Thursday, June 17, 2021. The site visit will begin at 9 a.m. at the White River Project located at 46720 State Hwy 112, Ashland, WI 54806. The group will then proceed to the Hayward Project for a site visit, followed by lunch on your own, and will finish the day with a site visit to the Trego Project.

An accurate number of attendees is necessary to allow NSPW to coordinate the site visit based on the most recent Wisconsin COVID-19 mandate(s) and Corporate guidelines. In addition, based upon the number of attendees, participants may need to be separated into groups, if required by the mandate(s) and guidelines.

All interested parties, including members of the public, who plan to attend the site visit on Thursday, June 17, are asked to RSVP no later than Monday, June 14, to Matt Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Xcel Energy

CANOE MUSEUM

ALLIE HUSTVET

Sleek, well-crafted form merged with function in the canoes displayed at the Wisconsin Canoe Heritage Museum's celebration of Wisconsin Canoe Heritage Day on Saturday, May 29. The day's activities included the annual Canoe & Wooden Boat Show, live music, silent auction, and the re-opening of the museum.

Spooner library: Open, ready to forward in best way it can

BY SPOONER MEMORIAL LIBRARY

As COVID-19 cases continue to drop, and with updated Centers for Disease Control recommendations, the library board, director, and team are beginning their "exit strategy" from COVID practices to move forward.

At their May 26th board meeting, the board discussed at length the Director's recommendations for moving forward.

These stated, "In March 2020, we sought out advice from Washburn County Public Health, Center for Disease Control (CDC), Department of Instruction, and specific library related entities on how to best navigate the COVID-19 pandemic. This has not changed over a year later and continues to guide us in our reopening plan.

"We are aware of CDC's statement allowing vaccinated individuals to gather unmasked. We will not be asking patrons if they are or are not vaccinated, thus we will continue to require 100% mask compliance at this time.

"However, we have a plan in place to start moving towards normalcy. One plan is to adjust our mask requirement when St. Francis de Sales school is out as students use the library almost daily. Beginning June 7, the library will adjust the mask requirement to the following: Monday-Wednesday will require 100% mask compliance in ages 5+ and Thursday-Saturday will not require 100% mask compliance.

"This change allows library patrons who are unable to be vaccinated an opportunity to still safely use the library at the beginning of the week. Once Washburn County reaches a 70% vaccinated rate, the library will no longer require 100% mask compliance as the County has approached herd immunity rates. We may make this change prior to the 70% mark if deemed appropriate by public health.

"The library will continue to host programs outside if possible or with limited seating inside. We will be opening more computer stations. More seating has already opened up. We appreciate your patience and respect as we navigate COVID-19 together."

The board voted unanimously to approve this update to the pandemic policy and will evaluate it once more at the June 22nd board meeting.

Masks will be required by everyone age 5+ on Monday-Wednesday. If a patron cannot or refuses to wear a mask those days, we will provide curbside service while the patron waits outside. (Curbside service is available Monday-Saturday.)

We will continue to have masks and hand sanitizer in our entrance as it is still the recommendation of CDC for people without their vaccinations to wear masks, but masks are not required at the end of the week. Staff will continue to wear masks (to lead by example). All six adult computer stations are open, and two spaced computer stations are open in the children's wing.

We have a mixture of spaced tables and community tables in our sitting areas on both the adult and children's sides. Children's toys will be taken out of storage and set back up on the children's wing with the understanding that we will not be able to clean them all between uses.

Returned items and items in delivery from other libraries will no longer be quarantined after a follow-up study confirming the extremely rare chance of COVID spread amongst library materials.

In the same way that we went into the pandemic with careful thought and consideration for the community, we will continue to do so with our exit strategy. No matter where our patrons stand on issues, such as masks and safety concerns, we hear you. We know we cannot make everyone happy, but we can definitely listen to the voices of the community and to science as we have been.

It is time to move forward in the best way we can. So, yes we are open!

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ROP AFFIDAVIT

June 04, 2021

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand: **Order #: 21061MX0**

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Hayward Sawyer County Record
15464 County Rd. B
Hayward, Wisconsin 54843
V: 715-939-9036 F: 1-715-635-2166 Email: mcarlson@spooneradvocate.com

WI/Hayward Sawyer County Record (Hayward, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Wed 06/02/21	2.00 X 10.00	**Caption:** Xcel Energy **Special Instructions:** Deadline - Mon prior by noon	

Media Dept. 6.4.2021

ROP AFFIDAVIT

June 04, 2021

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand:

Order #: 21061MX0

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Spooner Advocate
251 East Maple St.
Spooner, Wisconsin 54801-0338
V: 715-939-9036 F: 1-715-635-2188 Email: mcarlson@spooneradvocate.com

WI/Spooner Advocate (Spooner, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Thu 06/03/21	2.00 X 10.00	**Caption:** Xcel Energy **Special Instructions:** Deadline - week prior	

Media Dept. 6.4.2021

4.2 Recording of Public Meeting

A recording of the Joint Agency Meeting was e-filed with the FERC on April 9, 2021.

ATTACHMENT A

STAGE 1 CONSULTATION

Hayward and Trego Questionnaire

Hayward Hydroelectric Project

FERC No. 2417: Namekagon River, City of Hayward, Sawyer County, WI
Licensee: Northern States Power Company - Wisconsin (d/b/a Xcel Energy)

Installed Capacity: 168 kilowatt (kW), 1 unit

License Expires: November 30, 2025

Notice of Intent to Relicense Due: November 30, 2020

Project Operation Mode: Run-of-River

Minimum Flow Requirement: 8 cubic feet per second (cfs) or inflow at all times

Reservoir Elevation Requirements:

- Target: 1,187.4 feet NGVD
- Minimum: 1,187.0 feet NGVD
- Maximum: 1,187.5 feet NGVD

Approximate Reservoir Surface Acreage: 247 acres

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Hayward Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

   Name: _____ Title: _____

   Organization: _____

   Address: _____

   _____

   Phone: _____ Email: _____

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Hayward Hydroelectric Project?

   ☐ Yes ☐ No

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

   ☐ Yes ***(Please complete 3a thru 3f)*** ☐ No ***(Proceed to 4)***

   a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

   ☐ Geology and soils
   ☐ Water resources
   ☐ Fish and aquatic resources
   ☐ Wildlife and botanical resources
   ☐ Wetlands, riparian, and littoral habitat
   ☐ Rare, threatened, and endangered species
   ☐ Recreational and land use
   ☐ Aesthetic resources
   ☐ Cultural resources
   ☐ Socio-economic resources
   ☐ Tribal resources
   ☐ Other resource information

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

c. Where or how can NSPW obtain this information?

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: ***(Additional information, if any, may be provided on page 4)***

Representative Contact Information

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? ***(Additional information, if any, may be provided on page 4)***

☐ Yes ***(Please list specific issues below)*** ☐ No

Resource Area	**Specific Issue**

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? ***(Additional information, if any, may be provided on page 4)***

☐ Yes ***(Please list below)*** ☐ No

Potential Studies or Information Needs

4. NSPW is considering using the Traditional Licensing Process for relicensing the Hayward Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

   ☐ Yes ***(Please describe concerns below)*** ☐ No

   Traditional Licensing Process Concerns

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

   Additional comments, questions, or information

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Projects.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

Trego Hydroelectric Project

FERC No. 2711: Namekagon River, Town of Trego, Washburn County, WI
Licensee: Northern States Power Company - Wisconsin (d/b/a Xcel Energy)

Installed Capacity: 1,200 kilowatt (kW)

- Unit 1: 700 kW
- Unit 2: 500 kW

License Expires: November 30, 2025

Notice of Intent to Relicense Due: November 30, 2020

Project Operation Mode: Run-of-River

Reservoir Elevation Requirements:

- Target: 1,034.9 feet NGVD
- Minimum: 1,034.6 feet NGVD
- Maximum: 1,035.2 feet NGVD

Approximate Reservoir Surface Acreage: 470 acres

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Trego Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

   Name: _____ Title: _____

   Organization: _____

   Address: _____

   _____

   Phone: _____ Email: _____

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Trego Hydroelectric Project?

   ☐ Yes ☐ No

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

   ☐ Yes ***(Please complete 3a thru 3f)*** ☐ No ***(Proceed to 4)***

   a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

   ☐ Geology and soils
   ☐ Water resources
   ☐ Fish and aquatic resources
   ☐ Wildlife and botanical resources
   ☐ Wetlands, riparian, and littoral habitat
   ☐ Rare, threatened, and endangered species
   ☐ Recreational and land use
   ☐ Aesthetic resources
   ☐ Cultural resources
   ☐ Socio-economic resources
   ☐ Tribal resources
   ☐ Other resource information

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

c. Where or how can NSPW obtain this information?

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: ***(Additional information, if any, may be provided on page 4)***

Representative Contact Information

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? ***(Additional information, if any, may be provided on page 4)***

☐ Yes ***(Please list specific issues below)*** ☐ No

Resource Area	**Specific Issue**

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? ***(Additional information, if any, may be provided on page 4)***

☐ Yes ***(Please list below)*** ☐ No

Potential Studies or Information Needs

4. NSPW is considering using the use of the Traditional Licensing Process for relicensing the Trego Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

☐ Yes ***(Please describe concerns below)*** ☐ No

Traditional Licensing Process Concerns

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

Additional comments, questions, or information

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

Hayward and Trego Hydroelectric Project Licensing
FERC Project Nos. 2417 and 2711

Indian Tribes

Edith Leoso, THPO
Bad River Band of the Lake Superior
Tribe of the Chippewa
P.O. Box 39
Odanah, WI 54861-0039
THPO@badriver-nsn.gov

Clinton Parish, Chairman
Bay Mills Indian Community of Michigan
12140 W. Lakeshore Dr.
Brimley, MI 49715-9319

Ned Daniels Jr., Chairman
Forest County Potawatomi Community of WI
3051 Sand Lake Rd.
Crandon, WI 54520-9801

Michael LaRonge, THPO
Forest County Potawatomi Community of WI
5320 Wensaut Lane, P.O. Box 340
Crandon, WI 54520
Michael.LaRonge@FCPotawatomi-nsn.gov

Marlin WhiteEagle, President
Ho Chunk Nation of WI
PO Box 667
Black River Falls, WI 54615-0667

William Quackenbush, THPO
Ho Chunk Nation of WI
P.O. Box 667
Black River Falls, WI 54615-0667
Bill.Quackenbush@Ho-Chunk.com

Mic Isham, Chairman
Lac Courte Oreilles Band of Chippewa Indians
13394 W Trepania Rd., Bldg. NO1
Hayward, WI 53843-2186

Brian Bisonette, THPO
Lac Courte Oreilles Band of Chippewa Indians
13394 W Trepania Rd., Bldg. NO1
Hayward, WI 54843
brian.bisonette@lco-nsn.gov

Joseph Wildcat, Sr., President
Lac Du Flambeau Band of Lake Superior
Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538-0067

Melinda Young, THPO
Lac Du Flambeau Band of Lake Superior
Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538
ldfthpo@ldftribe.com

David Grignon, THPO
Menominee Indian Tribe of Wisconsin
W3426 Cty. VV W., P.O. Box 910
Keshena, WI 54135-0910
dgrignon@mitw.org

Stacie Cutbank, THPO
Oneida Tribe of Wisconsin
PO Box 365
Oneida, WI 54155-0365
sdanfor3@oneidanation.org

Tehassi Hill, Chairperson
Oneida Tribe of Wisconsin
PO Box 365
Oneida, WI 54155-0365

Chad Able, Treaty Natural Resource
Red Cliff Band of Lake Superior
Chippewa Indians
88385 Pike Rd., Hwy. 13
Bayfield, WI 54814

Marvin Defoe, THPO
Red Cliff Band of Lake Superior
Chippewa Indians
88385 Pike Rd., Hwy. 13
Bayfield, WI 54814
marvin.defoe@redcliff-nsn.gov

Chris McGeshick, Chairman
Sokaogon Chippewa Community
Mole Lake Band
3051 Sand Lake Rd.
Crandon, WI 54520-9801

Adam Van Zile, THPO
Sokaogon Chippewa Community
Mole Lake Band
3051 Sand Lake Rd.
Crandon, WI 54520-9801
adam.VanZile@SCC-nsn.gov

Lewis Taylor, President
St. Croix Band of Lake Superior Chippewa
24663 Angeline Ave
Webster, WI 54893-9246

Shannon Holsey, President
Stockbridge Munsee Tribe of Mohican Indians
N8476 Mo He Con Nuck Rd
Bowler, WI 54416

Sherry White, THPO
Stockbridge Munsee Tribe of Mohican Indians
PO Box 70
Bowler, WI 54416-0070
sherry.white@mohican-nsn.org

Federal

Kimberly Bose, Secretary
FERC Office of General Counsel
888 First St. NE
Washington, DC 20426

Kimberly Bose, Secretary
FERC Office of Energy Projects
888 First St. NE
Washington, DC 20426

Timothy Lapointe, Regional Director
U.S. Bureau of Indian Affairs
Midwest Regional Office
5600 West American Blvd., Suite 500
Bloomington, MN 55437
timothy.lapointe@bia.gov

Nannette Bischoff, FERC Coordinator
St. Paul District
U.S. Department of the Army
Corps of Engineers
180 5th St. E., Suite 700
St. Paul, MN 55101-1638
nannette.m.bischoff@usace.army.mil

Mary Manydeeds, Environmental Specialist
U.S. Department of the Interior
Bureau of Indian Affairs
Norman Pointe II Building
5600 American Boulevard W, Suite 500
Bloomington, MN 55437-1458
Mary.Manydeeds@BIA.gov

Michael C. Connor
U.S. Department of the Interior
Comm. U.S. Bureau Reclamation
1849 C Street NW
Washington, DC 20240-0001

Nick Utrup, Fisheries Biologist
U.S. Department of the Interior
Fish & Wildlife Service
4101 American Boulevard E.
Bloomington, MN 55425-1665
Nick_Utrup@fws.gov

Field Supervisor
U.S. Department of the Interior
Fish & Wildlife Service
Green Bay Field Office
2661 Scott Tower Dr.
New Franken, WI 54229-9565
greenbay@fws.gov

Tokey Boswell, Regional Environmental Coordinator
U.S. Department of the Interior
National Park Service
601 Riverfront Dr.
Omaha, NE 68102-4226
tokey_boswell@nps.gov

Angela Tornes, Midwest Hydropower Coordinator
U.S. Department of the Interior
National Park Service
626 E. Wisconsin Ave., Suite 100
Milwaukee, WI 53202
angela_tornes@nps.gov

Jen Tyler
Mail Code: E-19J
U.S. Environmental Protection Agency
NEPA Implementation Section, Region V
77 W. Jackson Boulevard, AR-18J
Chicago, IL 60604-3507
Tyler.jennifer@epa.gov
312-886-6394

Tom Tiffany, U.S. Representative
U.S. Representative from Wisconsin District 7
1714 Longworth House Office Building
Washington, DC 20515

Glen Grothman, U.S. Representative
U.S. Representative from Wisconsin District 6
Washington, DC 20515

State

Public Service Commission of Wisconsin
P.O. Box 7894
Madison, WI 53707-7854

Wisconsin Cooperative Fishery Research Unit
U.W. Stevens Point
Stevens Point, WI 54481

Kathleen Angel, Wisconsin Coastal Management Program
Wisconsin Department of Administration
101 E. Wilson St., 10th Floor
Madison, WI 53703
kathleen.angel@wisconsin.gov

Cheryl Laatsch, FERC Coordinator
Wisconsin Department of Natural Resources
N7725 Hwy 28
Horicon, WI 53022-1060
cheryl.laatsch@wisconsin.gov

Jefftry Schierer, Watershed Management
Wisconsin Department of Natural Resources
875 S. Fourth Ave
Park Falls, WI 54552

Watershed Management-WT/4
Wisconsin Department of Natural Resources
PO Box 7921
Madison, WI 53707-7921

Wisconsin Office of Attorney General
114 East, State Capital
Madison, WI 53702-0001

Wisconsin Office of the Governor
P.O. Box 7863
Madison, WI 53702-0001

Tyler Howe, Preservation Office
Wisconsin State Historical Society
816 State St.
Madison, WI 53706
tyler.howe@wisconsinhistory.org

Local

Dale Peters, City Manager
City of Eau Claire
203 S Farwell St., PO Box 5148
Eau Claire, WI 54702-5148

Lisa Poppe, Clerk/Treasurer
City of Hayward
P.O. Box 969
Hayward, WI 54843

City Manager
City of Lacrosse
601 Main St. W.
Ashland, WI 54806

Marathon County
500 Forest Street
Wausau, WI 54403-5554

Ronald Pete, Town Chairman
Town of Superior
4917 South State Road 35
Superior, WI 54880
townofsuperior@ceturytel.net
715-339-8385

William Allard, Town Chairman
Town of Trego
W5690 Trego River Street
Trego, WI 54888
clerk@townoftrego.com
715-635-3120

Other

James Fossum
River Alliance of Wisconsin
199 Janet Marie Ln.
Winona, MN 55987
jfbio@yahoo.com

Thomas Frost, Chairman
Trego Lake District
N7558 Wood Drive
Trego, WI 54888
thomas.h.frost@gmail.com
(715) 416-0106

Northwest Regional Planning Commission
1400 S. River St.
Spooner, WI 54801-8692

Mike Arrowood, Chairman
Walleye for Tomorrow
2240 Auburn St.
Fond du Lac, WI 54935

Hydro

Scott Crotty
Sr. Operations Manager
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1414 W. Hamilton, P.O. Box 8
Eau Claire, WI 54702-0008
scott.a.crotty@xcelenergy.com

Matt Miller
Hydro License Compliance Consultant
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1414 W. Hamilton, P.O. Box 8
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matthew.j.miller@xcelenergy.com

James Zyduck
Director, Hydro Plants
Xcel Energy
1414 W. Hamilton, P.O. Box 8
Eau Claire, WI 54702-0008
james.zyduck@xcelenergy.com

Hayward and Trego Questionnaire

Stakeholder Responses

Office of Attorney General Comment

Darrin Johnson

From: Henry, Carolyn J. <henrycj@doj.state.wi.us>
Sent: Tuesday, August 4, 2020 10:49 AM
To: Darrin Johnson
Subject: Remove from mailing list
Attachments: 2020_07_29_07_51_13.pdf

Hi Darrin,
Please remove us from your mailing list.

Here is the address to remove:

Wisconsin Office of Attorney General
114 East State Capitol
Madison, WI 53702-0001

Thank you, Carly

Carly Henry
Legal Associate
Wisconsin Department of Justice
Division of Legal Services - Public Protection Unit
17 West Main Street
Madison, WI 53707
608-279-0239 (tel)
608-294-2907 (fax)
henrycj@doj.state.wi.us

Mille Lacs Band of Ojibwe Comment

MILLE LACS BAND OF OJIBWE
DEPARTMENT OF NATURAL RESOURCES

Mead & Hunt

2440 Deming Way

Middleton Wisconsin53562

FERC No, 2711, Namekagon River Town of Trego, Washburn County, WI

Licensee: Norther States Power company-Wisconsin (d/b/a Xcel Energy)

Dear Sir:

Thank you for the opportunity to review the referenced project. We look forward to reviewing in Section 106 pursuant to the responsibilities given the Tribal Historic Preservation Officer (THPO) by the National Historic Preservation Act of 1966, as amended in 1992 and the Procedures of the Advisory Council on Historic Preservation (36CFR800).

I have reviewed the documentation: after careful consideration of our records, I have determined that the Mille Lacs Band of Ojibwe THPO does want to consult on the above states project.

Should you have any questions please contact Terry Kemper or Bridgett Quist at the THPO Department Mille Lacs Band of Ojibwe 43408 Oodena Drive Onamia MN 56359 office 320-532-7439 cell 320-362-1393

Real Estate Director

Bridgett Quist

Bridgett Quist TK

Trego Lake District Comment

Darrin Johnson

From: Charles Petersen <cjpetersen@msn.com>
Sent: Thursday, August 6, 2020 7:30 PM
To: Darrin Johnson
Subject: Trego and Hayward Dam FERC Projects

Mr. Johnson,

Can you please email to me an electronic version of the "Licensing Preliminary Application Document Information Questionnaire?" Please send the document to cjpetersen@msn.com.

I'm on the Trego Lake District Board and would like to use the electronic version to respond for the District rather than the hand written option. The Trego Lake District is very interested in providing input on this relicensing process.

Please feel free to contact me if you have any questions or concerns.

Thank you for your interest in Trego Lake.

Charlie Petersen
Trego Lake District Chair
cjpetersen@msn.com
612-803-8765

Trego Lake District Comment

Hayward Hydroelectric Project

FERC No. 2417: Namekagon River, City of Hayward, Sawyer County, WI
Licensee: Northern States Power Company - Wisconsin (d/b/a Xcel Energy)

Installed Capacity: 168 kilowatt (kW), 1 unit

License Expires: November 30, 2025

Notice of Intent to Relicense Due: November 30, 2020

Project Operation Mode: Run-of-River

Minimum Flow Requirement: 8 cubic feet per second (cfs) or inflow at all times

Reservoir Elevation Requirements:

- Target: 1,187.4 feet NGVD
- Minimum: 1,187.0 feet NGVD
- Maximum: 1,187.5 feet NGVD

Approximate Reservoir Surface Acreage: 247 acres

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Hayward Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

Name: ***Charlie Petersen*** ***Text*** Title: ***Board Member***

Organization: ***Trego Lake District (TLD)***

Address: ***5504 12th Ave South***

Minneapolis, MN 55417

Phone: ***612-803-8765*** Email: ***cjpetersen@msn.com***

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Hayward Hydroelectric Project?

☒ Yes ☐ No

x

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

☒ Yes ***(Please complete 3a thru 3f)*** ☐ No ***(Proceed to 4)***

xx

a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

- ☐ Geology and soils
- ☒ Water resources
- ☒ Fish and aquatic resources
- ☐ Wildlife and botanical resources
- ☐ Wetlands, riparian, and littoral habitat
- ☐ Rare, threatened, and endangered species
- ☒ Recreational and land use
- ☐ Aesthetic resources
- ☐ Cultural resources
- ☒ Socio-economic resources
- ☐ Tribal resources
- ☒ Other resource information

xx

xx

xx

xx

xx

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

- hybrid water milfoil in Trego Lake - DNR identified the source as "coming down from Hayward Lake

- 35 plus years of sedimentation build up from sand coming down Namekagon River

- reduction in DNR acreage of Trego Lake because of sedimentation; potential decrease in land values for certain property

c. Where or how can NSPW obtain this information?

Contact Trego Lake District for information on hybrid water milfoil and sedimentation history. Check historcal information on Trego Lake from DNR website.

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: ***(Additional information, if any, may be provided on page 4)***

Representative Contact Information

Name: ***Charlie Petersen*** Title: ***Trego Lake District Board Member (2020)***

Address: ***5504 12th Ave South***

Minneapolis, MN 55417

Phone: ***612-803-8765*** Email: ***cjpetersen@msn.com***

Name: ***Tom Frost*** Title: ***Trego Lake District Board Member (2020)***

Address: ***N7558 Wood Dr***

Trego, WI 54888

Phone: ***715-733-1870*** Email: ***thomas.h.frost@gmail.com***

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list specific issues below)*** ☐ No

Resource Area	Specific Issue
Aquatic invasive species	***Hybrid water milfoil coming down from Lake Hayward***
Sedimentation	***Sedimentation coming down Namekagon River has created impassable boating channels in certain areas of Trego Lake***

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list below)*** ☐ No

Potential Studies or Information Needs

Same as in 3 B & C above

4. NSPW is considering using the Traditional Licensing Process for relicensing the Hayward Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

☐ Yes ***(Please describe concerns below)*** ☐ No

Traditional Licensing Process Concerns

The TLD is unfamiliar with the TLP therefore not able to comment.

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

Additional comments, questions, or information

Please feel free to contact the TLD Board members identified above for any addition question or information.

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Projects.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

Trego Lake District Comment

Trego Hydroelectric Project

FERC No. 2711: Namekagon River, Town of Trego, Washburn County, WI
Licensee: Northern States Power Company - Wisconsin (d/b/a Xcel Energy)

Installed Capacity: 1,200 kilowatt (kW)

- Unit 1: 700 kW
- Unit 2: 500 kW

License Expires: November 30, 2025

Notice of Intent to Relicense Due: November 30, 2020

Project Operation Mode: Run-of-River

Reservoir Elevation Requirements:

- Target: 1,034.9 feet NGVD
- Minimum: 1,034.6 feet NGVD
- Maximum: 1,035.2 feet NGVD

Approximate Reservoir Surface Acreage: 470 acres

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Trego Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

Name: ***Charlie Petersen*** Title: ***TLD Board Member***

Organization: ***Trego Lake District***

Address: ***5504 12th Ave South***

Minneapolis, MN 55417

Phone: ***612-803-8765*** Email: ***cjpetersen@msn.com***

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Trego Hydroelectric Project?

☒ Yes ☐ No

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

☒ Yes ***(Please complete 3a thru 3f)*** ☐ No ***(Proceed to 4)***

a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

- ☒ Geology and soils
- ☒ Water resources
- ☒ Fish and aquatic resources
- ☒ Wildlife and botanical resources
- ☒ Wetlands, riparian, and littoral habitat
- ☒ Rare, threatened, and endangered species
- ☒ Recreational and land use
- ☒ Aesthetic resources
- ☒ Cultural resources
- ☒ Socio-economic resources
- ☒ Tribal resources
- ☒ Other resource information

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

Archives of Trego Lake District

Archives of Wisconsin DNR

Documents from licensure of Trego Lake Dam

Personal observations from Trego Lake residents and other interested parties

c. Where or how can NSPW obtain this information?

Contact Trego Lake District (see contact information below)

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: ***(Additional information, if any, may be provided on page 4)***

Representative Contact Information

Name: ***Charlie Petersen*** Title: ***TLD Board Member***

Address: ***5504 12th Ave South***

Minneapolis, MN 55417

Phone: ***612-803-8765*** Email: ***cjpetersen@msn.com***

Name: ***Tom Frost*** Title: ***TLD Board Member***

Address: ***N7558 Wood Dr.***

Trego, WI 54888

Phone: ***715-733-1870*** Email: ***thomas.h.frost@gmail.com***

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list specific issues below)*** ☐ No

Resource Area	Specific Issue
Aquatic vegitation	*- Weeds affecting navigation and recreational use*
Fishing	*- Reduction in sport fishing*
Aquatic invasive species	*- Hybrid water milfoil and curly leaf pondweed in Trego Lake*
Sedimentation	*- Sedimentation coming into Trego Lake from the Namekagon River and Potato Creek have created shallow area that facilitate aquatic plant growth and impassable boating channels in certain areas of Trego Lake*
	- Reduction in DNR acreage of Trego Lake because of sedimentation; potential decrease in land values for certain property
Recreation	*- Sedimentation and aquatic plants create the loss of recreation areas and/or access to recreation area*

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list below)*** ☐ No

Potential Studies or Information Needs

Contact TLD for current and historical documents

4. NSPW is considering using the use of the Traditional Licensing Process for relicensing the Trego Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

☐ Yes ***(Please describe concerns below)*** ☐ No

Traditional Licensing Process Concerns

The TLD is unfamiliar with the TLP therefore not able to comment.

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

Additional comments, questions, or information

TLD is vitally interest in the protection and rehabilitation of the Trego Lake resource. We were intimately involved in the last licensing process and expect to continue to be involved with dam licensing into the future.

Please feel free to contact the TLD Board members identified above for any addition question or information.

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

Town of Trego Comment

Darrin Johnson

From: clerk@townoftregowi.com
Sent: Thursday, August 20, 2020 2:30 PM
To: Darrin Johnson
Subject: Trego Hydroelectric Project - FERC Project No. 2711

Please be advised of the Trego Town Board's intent to offer comment for the 'Licensing Preliminary Application Document Information Questionnaire' for the Trego Hydroelectric Project. The questionnaire was just recently received by me and presented to the town board at a meeting held on Tuesday, August 18. The envelope was address to William Allard, Chairman (William Allard is a Supervisor) and addressed to W5690 Trego River Street, Trego, WI 54888. This address is the physical location of the town hall, however there is no mail receptacle there. Luckily, with much delay, the envelope showed up in my mailbox (W6097 River Rd, Trego, WI) which is the mailing address for correspondence to the town, as I am the clerk. I am in the process of compiling information/comment as received and will be forwarding within a day or two. Please acknowledge receipt of this email.
Thank you. Barb Hinkfuss, Clerk
Town of Trego
W6097 River Rd
Trego WI 54888
clerk@townoftregowi.com

Town of Trego Comment

Darrin Johnson

From: Darrin Johnson
Sent: Friday, August 21, 2020 8:15 AM
To: clerk@townoftregowi.com
Subject: RE: Trego Hydroelectric Project - FERC Project No. 2711

Categories: Filed by Newforma

Barb,

Sorry for the mix-up on the mailing address. We look forward to your response.

Who should we list as the official Town contact for the relicensing? We will be sending out other documents to stakeholders throughout the relicensing process. I will update the stakeholder list with the official Town contact and correct the mailing address of W6097 River Rd, Trego WI 54888.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

From: clerk@townoftregowi.com <clerk@townoftregowi.com>
Sent: Thursday, August 20, 2020 2:30 PM
To: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: Trego Hydroelectric Project - FERC Project No. 2711

Please be advised of the Trego Town Board's intent to offer comment for the 'Licensing Preliminary Application Document Information Questionnaire' for the Trego Hydroelectric Project. The questionnaire was just recently received by me and presented to the town board at a meeting held on Tuesday, August 18. The envelope was address to William Allard, Chairman (William Allard is a Supervisor) and addressed to W5690 Trego River Street, Trego, WI 54888. This address is the physical location of the town hall, however there is no mail receptacle there. Luckily, with much delay, the envelope showed up in my mailbox (W6097 River Rd, Trego, WI) which is the mailing address for correspondence to the town, as I am the clerk. I am in the process of compiling information/comment as received and will be forwarding within a day or two. Please acknowledge receipt of this email.
Thank you. Barb Hinkfuss, Clerk
Town of Trego
W6097 River Rd
Trego WI 54888
clerk@townoftregowi.com

Town of Trego Comment

Darrin Johnson

From: clerk@townoftregowi.com
Sent: Monday, September 7, 2020 8:02 AM
To: Darrin Johnson
Subject: RE: Trego Hydroelectric Project - FERC Project No. 2711

Darrin
Town Offcials:

Wes Huffer, Chairman
N8521 Hwy 53
Trego WI 54888
715-635-3138
wchuffer@gmail.com

William Allard, Supervisor
N7069 Oak Hill Rd
Trego WI 54888
715-635-3120
billallard54@yahoo.com

Brian Vosberg, Supervisor
N7523 Lakeside Rd
Trego WI 54888
715-635-3112
bjvosberg@yahoo.com

Barb Hinkfuss, Clerk
W6097 River Rd
Trego WI 54888
clerk@townoftregowi.com

-----Original Message-----
From: "Darrin Johnson" <Darrin.Johnson@meadhunt.com>
Sent: Friday, August 21, 2020 9:14am
To: "clerk@townoftregowi.com" <clerk@townoftregowi.com>
Subject: RE: Trego Hydroelectric Project - FERC Project No. 2711

Barb,

Sorry for the mix-up on the mailing address. We look forward to your response.

Who should we list as the official Town contact for the relicensing? We will be sending out other documents to stakeholders throughout the relicensing process. I will update the stakeholder list with the official Town contact and correct the mailing address of W6097 River Rd, Trego WI 54888.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Town of Trego Comment

From: clerk@townoftregowi.com <clerk@townoftregowi.com>
Sent: Thursday, August 20, 2020 2:30 PM
To: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: Trego Hydroelectric Project - FERC Project No. 2711

Please be advised of the Trego Town Board's intent to offer comment for the 'Licensing Preliminary Application Document Information Questionnaire' for the Trego Hydroelectric Project. The questionnaire was just recently received by me and presented to the town board at a meeting held on Tuesday, August 18. The envelope was address to William Allard, Chairman (William Allard is a Supervisor) and addressed to W5690 Trego River Street, Trego, WI 54888. This address is the physical location of the town hall, however there is no mail receptacle there. Luckily, with much delay, the envelope showed up in my mailbox (W6097 River Rd, Trego, WI) which is the mailing address for correspondence to the town, as I am the clerk. I am in the process of compiling information/comment as received and will be forwarding within a day or two. Please acknowledge receipt of this email.
Thank you. Barb Hinkfuss, Clerk
Town of Trego
W6097 River Rd
Trego WI 54888
clerk@townoftregowi.com

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Hayward Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

Name: Wes Hupfer Title: CHAIRMAN

Organization: TOWN OF TREGO

Address: N8531 Hwy 53
TREGO WI 54888

Phone: 7156353138 Email: clerk@townoftrego wi.com

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Hayward Hydroelectric Project?

☑ Yes ☐ No

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

☑ Yes *(Please complete 3a thru 3f)* ☐ No *(Proceed to 4)*

a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

- ☐ Geology and soils
- ☑ Water resources
- ☑ Fish and aquatic resources
- ☐ Wildlife and botanical resources
- ☐ Wetlands, riparian, and littoral habitat
- ☐ Rare, threatened, and endangered species
- ☑ Recreational and land use
- ☐ Aesthetic resources
- ☐ Cultural resources
- ☐ Socio-economic resources
- ☐ Tribal resources
- ☐ Other resource information

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

Aquatic Invasive Species

Sedimentation

c. Where or how can NSPW obtain this information?

WDNR – dnr.wi.gov

NPS – nps.gov

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: *(Additional information, if any, may be provided on page 4)*

Representative Contact Information ΔAmo M #1.

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? *(Additional information, if any, may be provided on page 4)*

☑ Yes *(Please list specific issues below)* ☐ No

Resource Area	Specific Issue
A.I.S.	Hybrid Eurasian / Northern Water-Milfoil

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? *(Additional information, if any, may be provided on page 4)*

☐ Yes *(Please list below)* ☐ No

Potential Studies or Information Needs

4. NSPW is considering using the Traditional Licensing Process for relicensing the Hayward Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

☐ Yes *(Please describe concerns below)* ☐ No

Traditional Licensing Process Concerns

Would Need to KNOW more About TLP IN Order to Respond.

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

Additional comments, questions, or information

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Projects.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

Northern States Power Company-Wisconsin ("NSPW") d/b/a Xcel Energy, has retained Mead & Hunt, Inc. ("Mead & Hunt") to assist with the federal relicensing process for the Trego Hydroelectric Project ("Project") located on the Namekagon River in northwestern Wisconsin. Under Federal Energy Regulatory Commission ("FERC") regulations, NSPW is preparing a Preliminary Application Document ("PAD") that provides the FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project to help identify issues and related information needs, develop study requests and study plans, and prepare documents analyzing impacts. The PAD Information Questionnaire will be used to help identify sources of existing, relevant, and reasonably available information that is not in NSPW's possession.

1. Information about person completing this questionnaire:

Name: Wes Huffer Title: Chairman

Organization: Town of Trego

Address: N8521 Hwy 53
Trego WI 54888

Phone: 715-635-3138 Email: clerk@townoftregowi.com

2. Do you or your organization plan to participate in the 3 to 5 year-long licensing proceeding for the Trego Hydroelectric Project?

☑ Yes ☐ No

3. Do you or your organization know of existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project?

☑ Yes ***(Please complete 3a thru 3f)*** ☐ No ***(Proceed to 4)***

a. If yes, check box(es) to indicate the specific resource area(s) that the information relates to:

- ☑ Geology and soils
- ☑ Water resources
- ☑ Fish and aquatic resources
- ☐ Wildlife and botanical resources
- ☐ Wetlands, riparian, and littoral habitat
- ☐ Rare, threatened, and endangered species
- ☑ Recreational and land use
- ☑ Aesthetic resources
- ☐ Cultural resources
- ☐ Socio-economic resources
- ☑ Tribal resources
- ☐ Other resource information

Questions 3b – 3f are continued on the following pages

b. Briefly describe the information or list available documents:
(Additional information, if any, may be provided on page 4)

WI Dept of Natural Resources

National Park Service

Trego Lake District

Washburn Co Land & Water Conservation

Town of Trego

c. Where or how can NSPW obtain this information?

WDNR: dnr.wi.gov

NPS: nps.gov

TLD: tregolakedistrict.com

Washburn Co: landwtr@co.washburn.wi.us

Town of Trego: clerk@townoftregowi.com

d. Please indicate whether there is a specific representative you wish to designate for potential follow-up contact by NSPW or its representative for the resource area(s) checked in 3a: *(Additional information, if any, may be provided on page 4)*

Representative Contact Information Same As #1.

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Name: _____ Title: _____

Address: _____

_____

Phone: _____ Email: _____

Questions 3e – 3f are continued on the following page

e. Are you aware of any particular issues pertaining to the specific resource area(s) identified in 3a? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list specific issues below)*** ☐ No

Resource Area	**Specific Issue**
Aquatic Invasive Species:	Curly-Leaf Pondweed
	-Eurasian Water-Milfoil
Sedimentation:	monetary contribution to TLD for Dredging
Aquatic Vegetation:	Boat landing is un-usable
Flooding:	town road closure – campground
	-closure – loss of revenue to municipality
	damage to roads/washouts
	-damage to residences/personal property

f. Based on the issues identified in 3e, are you aware of any potential studies or information needs associated with the identified issues? ***(Additional information, if any, may be provided on page 4)***

☒ Yes ***(Please list below)*** ☐ No

Potential Studies or Information Needs

4. NSPW is considering using the use of the Traditional Licensing Process for relicensing the Trego Project. Do you have concerns with the use of the TLP? If so, please specify your concerns.

☐ Yes *(Please describe concerns below)* ☐ No

Traditional Licensing Process Concerns

Would Need to Know More About TLP IN Order to Respond.

5. NSPW is interested in any additional comments, questions, or information you may have regarding the licensing of the Project. If the additional comments, questions, or information you provide below pertain to a particular question, please indicate the applicable question (such as 3b, 3d, 3e, 3f).

Additional comments, questions, or information

Please return this completed questionnaire to Mead & Hunt using the enclosed self-addressed, stamped envelope **within 30 days of receipt** to allow for follow-up by NSPW or its representative.

Not responding within 30 days will indicate you are not aware of any existing, relevant, and reasonably available information that describes the existing environment or known potential impacts of the Project.

Comments and/or questions may also be sent via email to: Darrin.Johnson@meadhunt.com

WDNR Comments

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Monday, July 20, 2020 2:05 PM
To: Darrin Johnson
Cc: Laatsch, Cheryl - DNR
Subject: RE: Hayward and Trego Hydro Project SWIMS information
Attachments: Hayward P-2417 SWIMS Pull 2020.xlsx; Trego P-2711SWIMS Pull 2020.xlsx

Hi Darrin,

I've attached a SWIMS data pull from the past 10 years. Please let me know if you need additional information provided with these datasets.

Cheryl and I will be working with program staff to compile additional data for the PAD.

Thank you,

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Macaulay Haller
Water Resources Management Specialist- Senior
Water Regulations and Zoning Specialist- Senior
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

dnr.wi.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Friday, July 17, 2020 2:15 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Subject: RE: Hayward and Trego Hydro Project SWIMS information

Thanks Cheryl.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Friday, July 17, 2020 2:13 PM

WDNR Comments

To: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Subject: RE: Hayward and Trego Hydro Project SWIMS information

I also found out the fish data base may not be accurate. Ill work with Macaulay to get the process started. WE will also check on mussel data and such.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Friday, July 17, 2020 2:02 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Subject: RE: Hayward and Trego Hydro Project SWIMS information

Cheryl,

Yes we are beginning the PAD for the two projects now. The questionnaire has been finalized and will be mailed out early next week. I will send you an electronic version when it goes out. I typically pull fish data from the WDNR Fish Mapper Application, but that is currently being upgraded and is not accessible. I was able to find quite a bit of water quality monitoring information accessible via SWDV and the DNR Lakes Pages.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Friday, July 17, 2020 1:47 PM
To: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: RE: Hayward and Trego Hydro Project SWIMS information

Hi Darrin – are we starting the existing data collection for these projects?

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch

WDNR Comments

Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Friday, July 17, 2020 1:34 PM
To: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: Hayward and Trego Hydro Project SWIMS information

Good Afternoon,

Mead & Hunt, Inc. is assisting Xcel Energy with relicensing of the Hayward (FERC No.2417) and Trego (FERC No. 2711) Hydroelectric Projects. I am inquiring to see if we could obtain SWIMS information (similar to what we received for the White River Project) that is available for the two projects to assist us in developing the Preliminary Application Document. Just let me know if you have any questions. Thank you.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

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WDNR Comments

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Wednesday, July 29, 2020 2:40 PM
To: Darrin Johnson
Cc: Shawn Puzen; Laatsch, Cheryl - DNR
Subject: WDNR Hayward Data Submission - Fisheries (Part 1 of 2)
Attachments: WDNR Fisheries Data for Xcel_Hayward P-2417_ Part 1 of 2.zip

Hi Darrin,

Please find attached part 1 of 2 Hayward Hydro Project data and reports from WDNR's fisheries biologist. Attachments include reports, fisheries survey data (recent and historical), fish stocking/spawning data, and fish habitat information.

I will continue to send data and information as it comes in from our program staff.

Thank you,

Macaulay Haller
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Wednesday, July 22, 2020 1:56 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: Hayward and Trego Questionnaire

Cheryl,

Per our discussion last week, I am sending electronic copies of the Hayward and Trego Hydroelectric Project Questionnaires and Factsheets. They were sent out in the mail today. Feel free to contact me if you have any questions.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500

Sampling Objective	Number and Locations of Stations (Habitat)	
Walleye Recruitment Survey		Source
	Miles Actually Shocked = 5.7	LM
Period Fished (Dates)	Acres = 247	LM
10/03/01	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time	
2.8	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-NR
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	54	5.5-5.9	5.0 - 7.9	19.29 / hour 9.47 / mile
Sems Index NA YOY / acre				
Walleye (Age 1+)	12	9.0-9.4	8.5 - 10.4	4.29 / hour 2.11 / mile
Walleye (Other)	17	None	11.5 - 27.0	6.07 / hour 2.98 / mile
Smallmouth Bass	0		-	0.00 / hour 0.00 / mile
Largemouth Bass	24	None	2.0 - 19.4	8.57 / hour 4.21 / mile
Muskellunge	6	None	6.0 - 38.4	2.14 / hour 1.05 / mile
Northern Pike	37	None	6.0 - 28.9	13.21 / hour 6.49 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
YOY Bluegill	Present		Black Crappie	Present	
Bluegill	Common		White Sucker	Common	
YOY Yellow Perch	Present		Redhorse spp.	Common	
Yellow Perch	Common		Common Shiner	Present	
Pumpkinseed	Present		Black Bullhead	Present	
YOY Black Crappie	Present		Chestnut Lamprey	Present	

1) Tank Mortality: None 2) Weather: Clear, Cold 3) Reliabilty: High

4) Stocking: 2,470 Walleye, 6.0 inches, 09/26/01, DNR

5) Comments:

Rev. 10-70

Signed (Compiler)	Scott D. Plaster	Date	12/10/01

WDNR Comments

of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

ayward MWB Code: 2725500 Date: 10/03/01 County: Sawyer Collector(s): Pratt, Warwick, Drabek

t Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 57°F Station: Portion of Shoreline

verse Conditions: None Gear Type: Boomshocker Distance Shocked: 5.7 miles

Volts: 150 Amps: 5.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:20 Shocking End Time: 23:10 Generator Start Hour: 424.6 Generator End Hour: 427.4

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9	1	
3.0-3.4			17.0-17.4	2	
3.5-3.9			17.5-17.9	1	
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4	19		19.0-19.4		
5.5-5.9	22		19.5-19.9		
6.0-6.4	11		20.0-20.4		
6.5-6.9			20.5-20.9		
7.0-7.4	1		21.0-21.4		
7.5-7.9	1		21.5-21.9		
8.0-8.4			22.0-22.4		
8.5-8.9	1		22.5-22.9		
9.0-9.4	6		23.0-23.4		
9.5-9.9	3		23.5-23.9		
10.0-10.4	2		24.0-24.4		
10.5-10.9			24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9	2		25.5-25.9		
12.0-12.4	1		26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4			27.0-27.4	1	
13.5-13.9	5		27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9	1		28.5-28.9		
15.0-15.4	2		29.0-29.4		
15.5-15.9			29.5-29.9		
16.0-16.4	1		30.0 +		
Totals:	83				

WALLEYE

WDNR Comments

f Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

yward MWB Code: 2725500 Date: 10/03/01 County: Sawyer Collector(s): Pratt, Warwick, Drabek

Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 57°F Station: Portion of Shoreline

erse Conditions: None Gear Type: Boomshocker Distance Shocked: 5.7 miles

olts: 150 Amps: 5.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:20 Shocking End Time: 23:10 Generator Start Hour: 424.6 Generator End Hour: 427.4

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

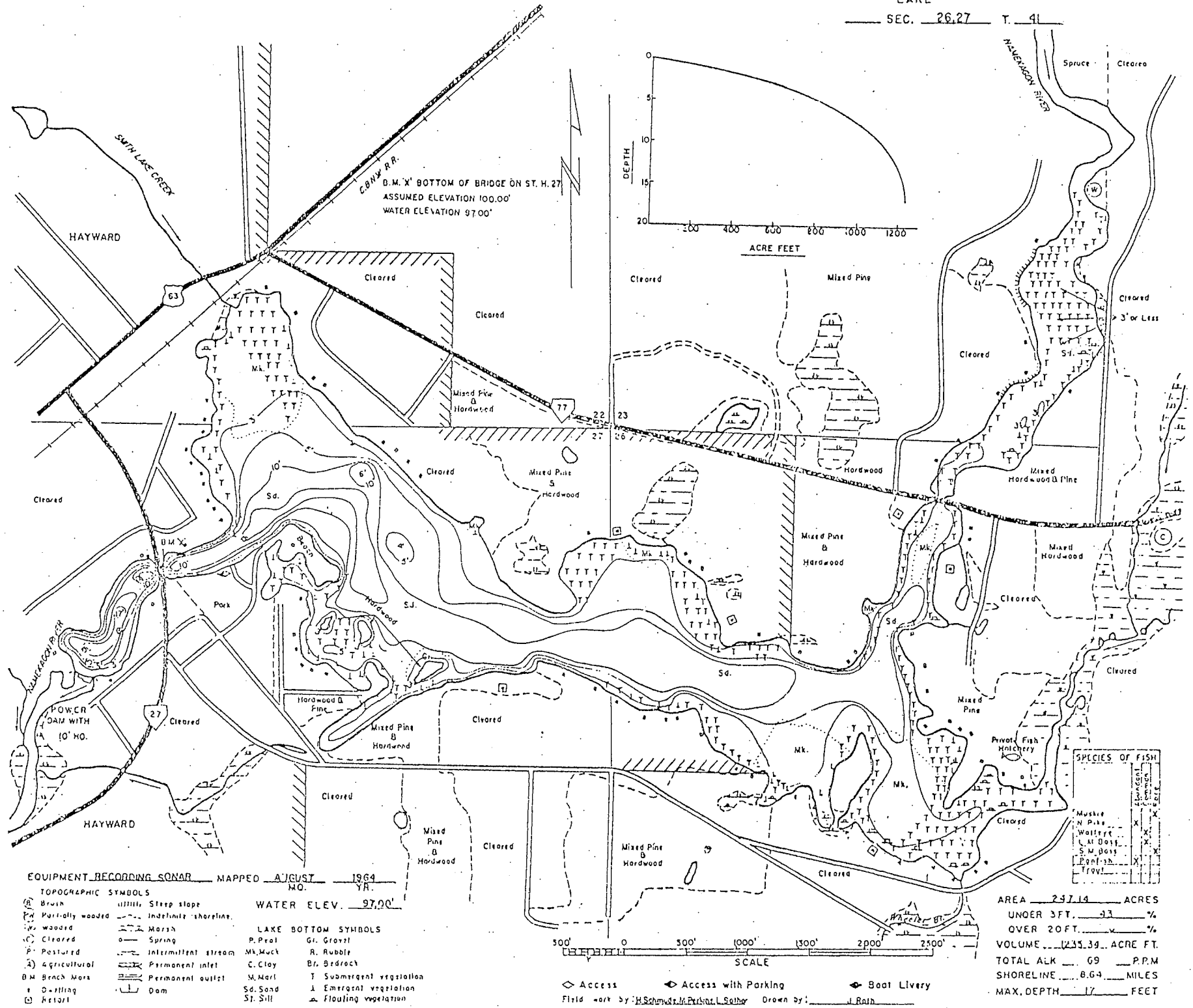
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4					1				25.5-25.9	2			
2.5-2.9									26.0-26.4				
3.0-3.4					1				26.5-26.9	2			
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9	1			
4.5-4.9					1				28.0-28.4				
5.0-5.4									28.5-28.9	1		1	
5.5-5.9									29.0-29.4				
6.0-6.4	2		1						29.5-29.9				
6.5-6.9					1				30.0-30.4				
7.0-7.4									30.5-30.9				
7.5-7.9	1								31.0-31.4				
8.0-8.4	7								31.5-31.9				
8.5-8.9	2				1				32.0-32.4				
9.0-9.4	3								32.5-32.9				
9.5-9.9									33.0-33.4				
10.0-10.4	1				2				33.5-33.9				
10.5-10.9	1				2				34.0-34.4				
11.0-11.4	1				1				34.5-34.9				
11.5-11.9	1				2				35.0-35.4				
12.0-12.4					1				35.5-35.9				
12.5-12.9	1				1				36.0-36.4				
13.0-13.4	2				1				36.5-36.9				
13.5-13.9	1				1				37.0-37.4				
14.0-14.4	1								37.5-37.9				
14.5-14.9	1				1				38.0-38.4			1	
15.0-15.4	1				1				38.5-38.9				
15.5-15.9									39.0-39.4				
16.0-16.4					1				39.5-39.9				
16.5-16.9	1		1		2				40.0-40.4				
17.0-17.4			1						40.5-40.9				
17.5-17.9			1						41.0-41.4				
18.0-18.4					1				41.5-41.9				
18.5-18.9					1				42.0-42.4				
19.0-19.4					1				42.5-42.9				
19.5-19.9	1								43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4				
21.0-21.4	1								44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9	1								46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	37	0	6	0	24	0	0	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

LAKE

SEC. 26,27 T. 41



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964
MO. YR.

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (P) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schnuder, M. Perlick, L. Sather Drawn by: J. Rain

AREA 237.14 ACRES
UNDER 3 FT. 43 %
OVER 20 FT. — %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

A-51

WDNR Comments

WDNR Comments

5'0611
125500

SUMMARY FISHING RECORD
Form 3600-63

1-18-05

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500
Sampling Objective	**Number and Locations of Stations (Habitat)**	
Walleye Recruitment Survey		Source
Period Fished (Dates)	Miles Actually Shocked = 6.2	LM
10/14/02 non-stocked year	Acres = 247	LM
	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time	
2.4	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code: C-NR
Dip Netter(s): 2	Dip Netter(s):	

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	8	None	6.0 - 8.4	3.33 / hour	1.29 / mile
Sems Index NA YOY / acre					non-stocked
Walleye (Age 1+)	9	10.0-10.4	9.0 - 10.9	3.75 / hour	1.45 / mile
Walleye (Other)	9	None	11.5 - 22.4	3.75 / hour	1.45 / mile
Smallmouth Bass				/ hour	/ mile
Largemouth Bass	16	15.5-15.9	2.0 - 19.4	6.67 / hour	2.58 / mile
Muskellunge	7	None	8.5 - 48.9	2.92 / hour	1.13 / mile
Northern Pike	59	6.0-6.4	5.0 - 29.9	24.58 / hour	9.52 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Bluegill	45	3.3-8.3	White Sucker	Common	
Black Crappie	19	5.3-10.9	Redhorse spp.	Present	
Yellow Perch	15	4.8-10.7	Black Bullhead	Present	
Rock Bass	Present		Johnny Darter	Present	
Pumpkinseed	10	3.8-6.4	Central Mudminnow	Present	

) Tank Mortality: None 2) Weather: Cold, Windy 3) Reliabilty: Medium

) Stocking: 247 Muskellunge, 11.4 inches, 09/17/02, DNR

Comments:

ev. 10-70

Signed (Compiler)	Scott D. Plaster	Date	12/06/02

WDNR Comments

.nent of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

.ake: Hayward MWB Code: 2725500 Date: 10/14/02 County: Sawyer Collector(s): Pratt, Warwick, Drabek

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 46°F Station: Portion of Shoreline

Adverse Conditions: Cold, Wind/waves, Dark stained water Gear Type: Boomshocker Distance Shocked: 6.2 miles

Volts: 200 Amps: 3.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:00 Shocking End Time: 22:30 Generator Start Hour: 476.6 Generator End Hour: 479.0

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: 4 feet

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4		
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9	1	
5.0-5.4			19.0-19.4	1	
5.5-5.9			19.5-19.9		
6.0-6.4	1		20.0-20.4		
6.5-6.9	1		20.5-20.9		
7.0-7.4	2		21.0-21.4		
7.5-7.9	2		21.5-21.9		
8.0-8.4	2		22.0-22.4	1	
8.5-8.9			22.5-22.9		
9.0-9.4	2		23.0-23.4		
9.5-9.9	2		23.5-23.9		
10.0-10.4	4		24.0-24.4		
10.5-10.9	1		24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9	1		25.5-25.9		
12.0-12.4	2		26.0-26.4		
12.5-12.9	1		26.5-26.9		
13.0-13.4	1		27.0-27.4		
13.5-13.9			27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9			28.5-28.9		
15.0-15.4			29.0-29.4		
15.5-15.9			29.5-29.9		
16.0-16.4	1		30.0 +		
Totals:	26				

WALLEYE

WDNR Comments | Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186

8-95

ce: Hayward MWB Code: 2725500 Date: 10/14/02 County: Sawyer Collector(s): Pratt, Warwick, Drabek

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 46°F Station: Portion of Shoreline

Adverse Conditions: Cold, Wind/waves, Dark stained water Gear Type: Boomshocker Distance Shocked: 6.2 miles

Volts: 200 Amps: 3.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:00 Shocking End Time: 22:30 Generator Start Hour: 476.6 Generator End Hour: 479.0

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: 4 feet

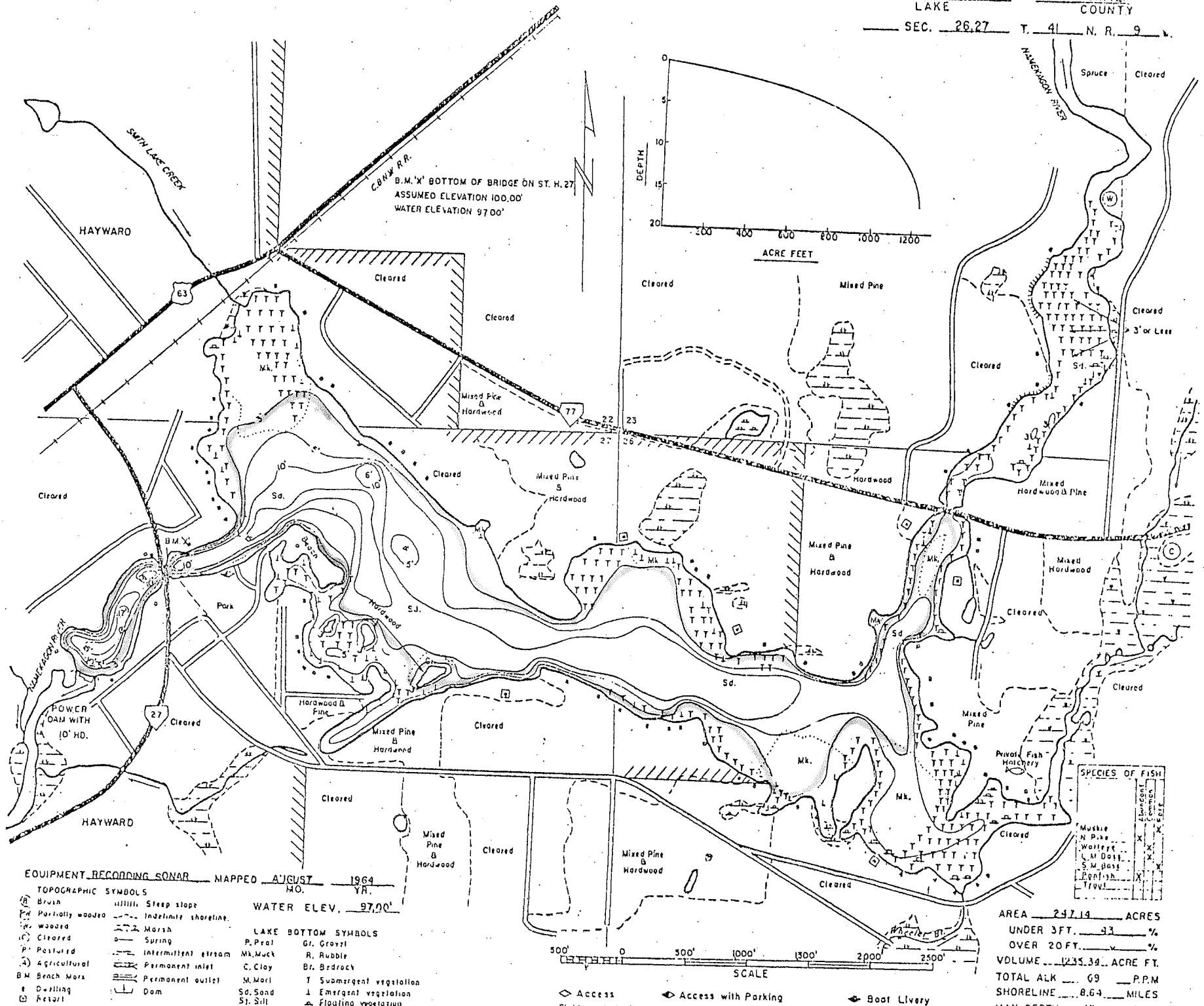
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4					1				25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4					1				26.5-26.9	1			
3.5-3.9									27.0-27.4	1			
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4	1								28.5-28.9				
5.5-5.9	1								29.0-29.4				
6.0-6.4	6								29.5-29.9	1			
6.5-6.9	4								30.0-30.4				
7.0-7.4	2								30.5-30.9				
7.5-7.9	2								31.0-31.4				
8.0-8.4	1								31.5-31.9				
8.5-8.9			1						32.0-32.4				
9.0-9.4	4								32.5-32.9				
9.5-9.9	2				1				33.0-33.4				
10.0-10.4	2				1				33.5-33.9				
10.5-10.9	5								34.0-34.4				
11.0-11.4	3		2		1				34.5-34.9				
11.5-11.9	2		1						35.0-35.4				
12.0-12.4	3		1						35.5-35.9				
12.5-12.9									36.0-36.4				
13.0-13.4	1								36.5-36.9				
13.5-13.9	1								37.0-37.4				
14.0-14.4									37.5-37.9				
14.5-14.9					2				38.0-38.4				
15.0-15.4	2				2				38.5-38.9				
15.5-15.9	1				3				39.0-39.4				
16.0-16.4					1				39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4	3				1				40.5-40.9				
17.5-17.9			1		1				41.0-41.4				
18.0-18.4	1								41.5-41.9				
18.5-18.9	1								42.0-42.4				
19.0-19.4					1				42.5-42.9				
19.5-19.9	2								43.0-43.4				
20.0-20.4	1								43.5-43.9				
20.5-20.9	1								44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9	1								45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4	2								47.0-47.9				
23.5-23.9									48.0-48.9			1	
24.0-24.4									49.0-49.9				
Totals:	59	0	7	0	16	0	0	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



SPECIES OF FISH

	Abundant	Common	Scarce
Muskie			
N. Pike			
Walleye			
L.M. Bass			
S.M. Bass			
Panfish			
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST (MO.) 1964 (YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- Brush
- Partially wooded
- Wooded
- Cleared
- Pastured
- Agricultural
- BM Beach Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

P. Peat	Gr. Gravel
Mk. Muck	R. Rubble
C. Clay	Br. Bedrock
M. Marl	T Submergent vegetation
Sd. Sand	⊥ Emergent vegetation
Sl. Silt	Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmidt, M. Pennot, L. Gothy Drawn by: J. Roth

AREA 247.14 ACRES
UNDER 3 FT. 93 %
OVER 20 FT. — %
VOLUME 1235.39 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

A-55

WDNR Comments

Sheet

WDNR Comments

DNR 125500
survey 51426
WBIC 484970

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET

GAMEFISH

Wisconsin Department of Natural Resources

Waterbody Name: Hayward
MWB Code/WBIC: 2725500
Waterbody Type: Imp
County: Sawyer
Date (MM/DD/YY): Oct. 04, 2002
Station:
Start Time:
End Time:
Collectors: Pratt

Target Fish: Juvenile Walleye
Mark(s) Given:
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather:
Adverse Conditions:
Water Temperature: 57
Water Conductivity:
Water Level: [HI] [NORM] [LOW]
Water Clarity: 7.5

Generator Start Time: 424.6
Generator End Time: 427.4
Volts: 150
Amps: 5
Pulse Rate:
Duty Cycle:
Current Type: AC
Distance Shocked: 6.5
Entire Shoreline Shocked: Y
Number of Dippers: 2
Dipnet Mesh Size: 3/8" bar

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clippped
<1.5							None	
1.5-1.9								
2.0-2.4					1			
2.5-2.9								
3.0-3.4					1			
3.5-3.9								
4.0-4.4								
4.5-4.9					1			
5.0-5.4					1			
5.5-5.9			1 Hyb					
6.0-6.4	2							
6.5-6.9					1			
7.0-7.4								
7.5-7.9	1							
8.0-8.4	7							
8.5-8.9	2							
9.0-9.4	3							
9.5-9.9								
10.0-10.4	1				2			
10.5-10.9	1				2			
11.0-11.4	1				1			
11.5-11.9	1				2			
12.0-12.4					1			
12.5-12.9	1				1			
13.0-13.4	2				1			
13.5-13.9	1				1			
14.0-14.4	1							
14.5-14.9	1				1			
15.0-15.4	1				1			
15.5-15.9								
16.0-16.4								
16.5-16.9	1		1					
17.0-17.4			1					
17.5-17.9			1					
18.0-18.4								
18.5-18.9								
19.0-19.4								
19.5-19.9	1							
20.0-20.4								
20.5-20.9								
21.0-21.4	1							
21.5-21.9								
22.0-22.4	1							
22.5-22.9	1							
23.0-23.4								
23.5-23.9								
24.0-24.4								
TOTALS	37				15			

	Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped
24.5-24.9				
25.0-25.4				
25.5-25.9	2			
26.0-26.4				
26.5-26.9	2			
27.0-27.4				
27.5-27.9	1			
28.0-28.4				
28.5-28.9	1		1	
29.0-29.4				
29.5-29.9				
30.0-30.4				
30.5-30.9				
31.0-31.4				
31.5-31.9				
32.0-32.4				
32.5-32.9				
33.0-33.4				
33.5-33.9				
34.0-34.4				
34.5-34.9				
35.0-35.4				
35.5-35.9				
36.0-36.4				
36.5-36.9				
37.0-37.4				
37.5-37.9				
38.0-38.4			1	
38.5-38.9				
39.0-39.4				
39.5-39.9				
40.0-40.4				
40.5-40.9				
41.0-41.4				
41.5-41.9				
42.0-42.4				
42.5-42.9				
43.0-43.4				
43.5-43.9				
44.0-44.4				
44.5-44.9				
45.0-45.4				
45.5-45.9				
46.0-46.9				
47.0-47.9				
48.0-48.9				
49.0-49.9				
50.0+	37 NP		6 Mu	

WDNR Comments

Department of Natural Resources

NETTING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-188 4-92

2725500

Lake Hayward MWB Code: A Date: 03 / 31 / 2000 County: Sawyer Collector: Brett/Tworb.

Target Fish: WE Survey Type: WE PE Mark Given: ALP Play H_2O Temp: 42 Time 10 : 30 AM

Adverse Conditions: Stormy, current / lack access Station: Above STH '77'

Net Type: Fyke Length/Frame: 4' Bar Mesh: 1/2"

Color: 3Bl / 1Wh. Mesh Type: W-Knotted Net Nights: 1
Bl-Woven

Two nets moved upstream, north of Ulmers in fast water.

Inches	Walleye Male	F	Unkwn						
4.4 - 4.4									
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9									
7.0 - 7.9									
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4							Play Pen (L)		
9.5 - 9.9							0144	16.4	Unkwn
10.0-10.4			1				0148	14.3	Male
10.5-10.9							0147	15.6	Unknwn
11.0-11.4									
11.5-11.9									
12.0-12.4									
12.5-12.9									
13.0-13.4									
13.5-13.9									
14.0-14.4	1						RB	5.8	
14.5-14.9							NP	17.5	
15.0-15.4									
15.5-15.9			1						
16.0-16.4			1				2 Dityscis water beetle		
16.5-16.9							1 Mud puppy		
17.0-17.4							1 Green frog tadpole		
17.5-17.9									
18.0-18.4									
18.5-18.9									
19.0-19.4									
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4		0	3						
29.5-29.9	1								

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WDNR Comments

survey 51712
site 122431

SUMMARY FISHING RECORD

FORM 3600-63 REVISED 1-94

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS	MWB CODE
Sawyer	Lake Hayward	2725500
SAMPLING OBJECTIVE	**DATES FISHED**	**WATER TEMP.**
Spring Adult Panfish	June 09-15, 2003	63-70

GEAR

Pratt, Warwick,D

BOOMSHOCKER	PANFISH		NO. DIPPERS		NIGHT		AC	
HOURS	GAMEFISH		NO. MILES		VOLTS		AMPS	
FYKE NET	PANFISH	~~8~~ 18			Days- 6			
LIFTS	GAMEFISH	18	LEAD LEN:	50	FRAME:	4	MESH	1/2"
GILL NET	(NO. LIFTS)	~~18~~	NO. NETS: LENGTH:		DEPTH:		MESH:	
SEINE	(NO. PULLS)		LENGTH:		DEPTH:		MESH:	
ANGLING	(TOT. HRS.)		NO. ANGLERS:		TIME OF DAY:			

OTHER These comments go to the summary sheet under OTHER.

FISHING RESULTS

GAMEFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
Walleye	2		-	**0.1** per net
Musky			-	per net
Northern Pike	8		-	**0.4** per net
Largemouth Bass	5		-	**0.3** per net
Smallmouth Bass			-	per net
White Sucker	4		-	**1.3** per net
			-	#####
			-	##### #DIV/0!
			-	#DIV/0!

PANFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
Bluegill	731		-	~~244~~ per net
Pumpkinseed	711		-	~~237~~ per net
Black Crappie	12		-	~~4~~ per net
Yellow Perch	20		-	~~7~~ per net
Rock Bass	2		-	**0** per net
Black Bullhead	7		-	**0** per net
Brown Bullhead	8			
			-	

Observations: For panfish field-transfer to Shues Pond and NFWFHOF. Disease Certification by Eric Sawnson DVM. Supplemental a

Compiled By:	Date
~~Skip Sommerfeldt~~ E. Pratt	~~9/25/02~~ 6/26/03

WDNR Comments

State of Wisconsin
Department of Natural Resources

Water Temp: 63-70

Gamefish Length Frequency

Form 3600-65 Rev.7-93

County	Water	Date	Gear: 3 fyke nets
Sawyer	Lake Hayward	06/09-15/2003	Sets: 18 Pratt, Waterblee/Risch

Size Range Inches	Walleye	N Pike	Musky	LMB	SMB	W. Sucker		Size Range Inches	N Pike	Musky
<3.0								27.0 - 27.4		
3.0 - 3.4								27.5 - 27.9		
3.5 - 3.9								28.0 - 28.4		
4.0 - 4.4				1				28.5 - 28.9		
4.5 - 4.9				1				29.0 - 29.4		
5.0 - 5.4								29.5 - 29.9		
5.5 - 5.9								30.0 - 30.4		
6.0 - 6.4								30.5 - 30.9		
6.5 - 6.9								31.0 - 31.4		
7.0 - 7.4		1		1				31.5 - 31.9		
7.5 - 7.9		2						32.0 - 32.4		
8.0 - 8.4		1						32.5 - 32.9		
8.5 - 8.9								33.0 - 33.4		
9.0 - 9.4								33.5 - 33.9		
9.5 - 9.9								34.0 - 34.4		
10.0 - 10.4								34.5 - 34.9		
10.5 - 10.9								35.0 - 35.4		
11.0 - 11.4								35.5 - 35.9		
11.5 - 11.9								36.0 - 36.4		
12.0 - 12.4								36.5 - 36.9		
12.5 - 12.9								37.0 - 37.4		
13.0 - 13.4		1						37.5 - 37.9		
13.5 - 13.9		1						38.0 - 38.4		
14.0 - 14.4								38.5 - 38.9		
14.5 - 14.9								39.0 - 39.4		
15.0 - 15.4								39.5 - 39.9		
15.5 - 15.9								40.0 - 40.9		
16.0 - 16.4				1				41.0 - 41.9		
16.5 - 16.9								42.0 - 42.9		
17.0 - 17.4	1							43.0 - 43.9		
17.5 - 17.9								44.0 - 44.9		
18.0 - 18.4								45.0 - 45.9		
18.5 - 18.9						1		46.0 - 46.9		
19.0 - 19.4								47.0 - 47.9		
19.5 - 19.9								48.0 - 48.9		
20.0 - 20.4								49.0 - 49.9		
20.5 - 20.9								50.0 - 50.9		
21.0 - 21.4								51.0 - 51.9		
21.5 - 21.9								52.0 - 52.9		
22.0 - 22.4								53.0 - 53.9		
22.5 - 22.9								54.0 - 54.9		
23.0 - 23.4	1							55.0 - 55.9		
23.5 - 23.9								56.0 - 56.9		
24.0 - 24.4								57.0 - 57.9		
24.5 - 24.9								58.0 - 58.9		
25.0 - 25.4								59.0 - 59.9		
25.5 - 25.9		1						60.0+		
26.0 - 26.4										
26.5 - 26.9										
TOTALS	**2**			**4**	**0**	**1**	**0**	**TOTALS**	**7**	**0**

OBSERVATIONS: Walleye PSD15 = 100% (10" stock size) LMB PSD12 = 50% (6" stock size)

These comments go to the summary sheet under OTHER.
These go to the observation section - second line.

WDNR Comments

...rtment of Natural Resources

Panfish Length Frequency

Form 3600-64 Rev. 1-00

...unty	Water	Date	Gear	Sets
Sawyer	Lake Hayward	06/09-15/2003	Fyke nets	18

Size Range Inches	Species					Size Range Inches	Species				
	Bluegill	B Crap.	Y Perch	Pksd	R Bass		Blg	BC	YP	Pkd	RB
Count	634			511		**7.0**	10			4	
1.0 - 1.4						7.1					
1.5 - 2.0						7.2					
2.1						7.3					
2.2						7.4					
2.3						7.5	4		2	1	1
2.4						7.6					
2.5	8			7		7.7					
2.6						7.8					
2.7						7.9					
2.8						**8.0**	2				
2.9						8.1					
3.0	4			3		8.2					
3.1						8.3					
3.2						8.4					
3.3						8.5	1				
3.4						8.6					
3.5	2			6		8.7					
3.6						8.8					
3.7						8.9					
3.8						**9.0**	1	9	2		
3.9						9.1					
4.0	7		5	7		9.2					
4.1						9.3					
4.2						9.4					
4.3						9.5		2			
4.4						9.6					
4.5	1		3	20		9.7					
4.6						9.8					
4.7						9.9					
4.8						**10.0**		1	1		
4.9						10.2					
5.0	4			31		10.4					
5.1						10.6			1		
5.2						10.8					
5.3						**11.0**					
5.4						11.2					
5.5	10		5	48	1	11.4					
5.6						11.6					
5.7						11.8					
5.8						**12.0**					
5.9						12.2					
6.0	26		1	54		12.4					
6.1						12.6					
6.2						12.8					
6.3						**13.0**					
6.4						13.2					
6.5	17			19		13.4					
6.6						13.6					
6.7						13.8					
6.8						**14.+**					
6.9						TOTAL	**731**	**12**	**20**	**711**	**2**

Notes:

Bluegill PSD6 = 69% Bluegill RSD7 = 20%

B. Crappie PSD8 = 100% B. Crappie RSD10 = 8%

Also 7 black bullheads 8-10.5"

WDNR Comments

1-18-05 122431 52166 survey 0

SUMMARY FISHING RECORD

FORM 3600-63 REVISED 1-94

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS	MWB CODE
Sawyer	Lake Hayward- ST2 North	2725500
SAMPLING OBJECTIVE	DATES FISHED	WATER TEMP.
	October 1, 2003	50

GEAR

BOOMSHOCKER	PANFISH	0.2	NO. DIPPERS	1	NIGHT	X	AC	X
HOURS	GAMEFISH	0.8	NO. MILES	2.00	VOLTS	150	AMPS	1
FYKE NET	PANFISH							
LIFTS	GAMEFISH		LEAD LEN:		FRAME:		MESH:	
GILL NET	(NO. LIFTS)		LENGTH:		DEPTH:		MESH:	
SEINE	(NO. PULLS)		LENGTH:		DEPTH:		MESH:	
ANGLING	(TOT. HRS.)		NO. ANGLERS:		TIME OF DAY:			

OTHER

FISHING RESULTS

GAMEFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
Walleye	4		-	2.0
Musky	3		-	1.5
Northern Pike	12		-	6.0
Largemouth Bass	6		-	3.0
			-	
White Sucker	6		-	12.0
Walleye EG	1		-	
			-	
			-	

PANFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
BG	25		-	50
Pumpkinseed	5		-	10
Black Crappie	12		-	24
Yellow Pereh	4		-	8
Common shiner	13		-	24
Mud minnow	4		-	8
Brown Bullhead				
			-	

Observations:

Only one EG walleye this main-lake station- they were all up in the river channel. Small musky were hybrids.

Compiled By:	Date
Frank Pratt	10/1/03

WDNR Comments

...in
...partment of Natural Resources

Panfish Length Frequency

Form 3600-64 Rev. 1-00

County	Water	Date	Gear
Sawyer	LH-St2 N	10/30/2003	vv AC bs

Size Range Inches	Species					Size Range Inches	Species				
	BG	BC	YP	PS	CS		Blg	BC	YP	Pkd	
Count						**7.0**	5			1	
1.0 - 1.4					5	7.1					
1.5 - 2.0		2			6	7.2					
2.1					1	7.3					
2.2						7.4					
2.3						7.5	1	1			
2.4						7.6					
2.5					1	7.7					
2.6				1		7.8					
2.7						7.9					
2.8						**8.0**		1			
2.9						8.1					
3.0						8.2					
3.1						8.3					
3.2						8.4					
3.3						8.5					
3.4						8.6					
3.5						8.7					
3.6						8.8					
3.7						8.9					
3.8						**9.0**		1			
3.9						9.1					
4.0						9.2					
4.1						9.3					
4.2						9.4					
4.3						9.5		1			
4.4						9.6					
4.5		1				9.7					
4.6						9.8					
4.7						9.9					
4.8						**10.0**		2			
4.9				1		10.2					
5.0	2					10.4					
5.1						10.6					
5.2						10.8					
5.3						**11.0**		1			
5.4						11.2					
5.5	3			1		11.4					
5.6						11.6					
5.7						11.8					
5.8						**12.0**					
5.9						12.2					
6.0	9	1		1		12.4					
6.1						12.6					
6.2						12.8					
6.3						**13.0**					
6.4						13.2					
6.5	5	1				13.4					
6.6						13.6					
6.7						13.8					
6.8						**14.+**					
6.9					13tot	TOTAL	**25**	**12**	**4**	**5**	

Notes:

Bluegill PSD6 = Bluegill RSD7 =

B. Crappie PSD8 = B. Crappie RSD10 = 33%

S **WDNR Comments**

Department of Natural Resources

Water Temp:

Gamefish Length Frequency

Form 3600-65 Rev.7-93

County	Water	Date	Gear: vv AC
Sawyer	Lake Hayward St2 N	10/01/2003	hrs: 0.8

Size Range Inches	Walleye	N Pike	Musky	LMB		W. Sucker		Size Range Inches	N Pike	Musky
<3.0				2				27.0 - 27.4		
3.0 - 3.4				1				27.5 - 27.9		
3.5 - 3.9								28.0 - 28.4		
4.0 - 4.4								28.5 - 28.9		
4.5 - 4.9								29.0 - 29.4		
5.0 - 5.4		1	1 hybrid					29.5 - 29.9		
5.5 - 5.9								30.0 - 30.4		
6.0 - 6.4	1	1						30.5 - 30.9		
6.5 - 6.9		1	2 hybrid					31.0 - 31.4		
7.0 - 7.4								31.5 - 31.9		
7.5 - 7.9								32.0 - 32.4		
8.0 - 8.4								32.5 - 32.9		
8.5 - 8.9								33.0 - 33.4		
9.0 - 9.4		2				1		33.5 - 33.9		
9.5 - 9.9								34.0 - 34.4		
10.0 - 10.4								34.5 - 34.9		
10.5 - 10.9								35.0 - 35.4		
11.0 - 11.4								35.5 - 35.9		
11.5 - 11.9								36.0 - 36.4		
12.0 - 12.4								36.5 - 36.9		
12.5 - 12.9						1		37.0 - 37.4		
13.0 - 13.4								37.5 - 37.9		
13.5 - 13.9				1				38.0 - 38.4		
14.0 - 14.4								38.5 - 38.9		
14.5 - 14.9								39.0 - 39.4		
15.0 - 15.4		1						39.5 - 39.9		
15.5 - 15.9								40.0 - 40.9		
16.0 - 16.4	1	1						41.0 - 41.9		
16.5 - 16.9								42.0 - 42.9		
17.0 - 17.4						1		43.0 - 43.9		
17.5 - 17.9						1		44.0 - 44.9		
18.0 - 18.4				1				45.0 - 45.9		
18.5 - 18.9				1				46.0 - 46.9		
19.0 - 19.4								47.0 - 47.9		
19.5 - 19.9	1							48.0 - 48.9		
20.0 - 20.4						2		49.0 - 49.9		
20.5 - 20.9								50.0 - 50.9		
21.0 - 21.4								51.0 - 51.9		
21.5 - 21.9		1						52.0 - 52.9		
22.0 - 22.4								53.0 - 53.9		
22.5 - 22.9		1						54.0 - 54.9		
23.0 - 23.4		1						55.0 - 55.9		
23.5 - 23.9								56.0 - 56.9		
24.0 - 24.4								57.0 - 57.9		
24.5 - 24.9								58.0 - 58.9		
25.0 - 25.4								59.0 - 59.9		
25.5 - 25.9								60.0+		
26.0 - 26.4	1									
26.5 - 26.9										
TOTALS	**4**			**6**		**6**		**TOTALS**	**12**	**3**

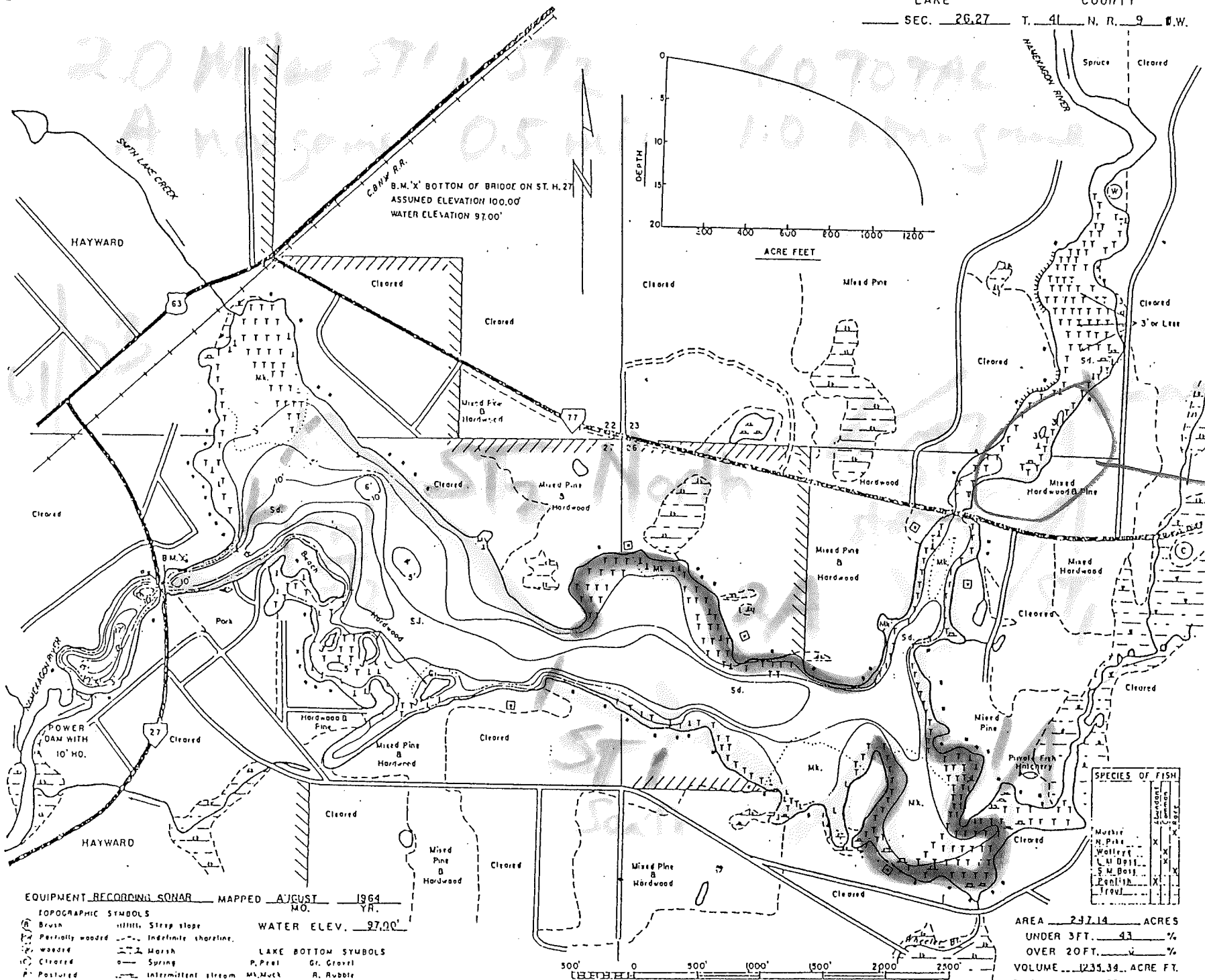
OBSERVATIONS:

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

Brush; Partially wooded; Wooded; Cleared; Pastured; Agricultural; BM Bench Mark; Drilling; Resort; Steep slope; Indefinite shoreline; Marsh; Spring; Intermittent stream; Permanent inlet; Permanent outlet; Dam

LAKE BOTTOM SYMBOLS

P. Peat; Mk. Muck; C. Clay; M. Marl; Sd. Sand; St. Silt; Gr. Gravel; R. Rubble; Br. Bedrock; T Submergent vegetation; E Emergent vegetation; Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmidt, M. Perlich, L. Sather Drawn by: L. Rath

SPECIES OF FISH

	Abundant	Common	Scarce
Muskie			X
N. Pike			X
Walleye		X	
L.M. Bass			X
S.M. Bass			X
Panfish	X		
Trout			X

AREA 247.14 ACRES

UNDER 3FT. 43 %

OVER 20FT. — %

VOLUME 1235.39 ACRE FT.

TOTAL ALK. 69 P.P.M

SHORELINE 8.64 MILES

MAX. DEPTH 17 FEET

all but no eg walleye

A-64

WDNR Comments

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County: Sawyer	Waters: Hayward MWBC: 2725500
Sampling Objective: Baseline Monitoring	Number and Locations of Stations (Habitat)
Period Fished (Dates): 10/01/03 AM/PM	Miles Actually Shocked = 4.4 (Source: LM) Acres = 247 (LM) Total Miles of Shoreline = 8.6 (LM) Total Miles of Shockable Shoreline = 8.6 (LM)

GEAR

Boomshocker (Hours): 1.9			Time: √ Night / Day	
Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth
Other (Hours or Lifts) Boomshocker(s): 1 Dip Netter(s): 1		Mini-boomshocker(s): Dip Netter(s):	Characteristics Walleye Recruitment Code: C-NR	

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	29	7.0-7.4	6.0 - 9.4	15.26 / hour	6.59 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	1	None	10.5 - 10.9	0.53 / hour	0.23 / mile
Walleye (Other)	6	None	13.5 - 27.4	3.16 / hour	1.36 / mile
Smallmouth Bass	0		-	0.00 / hour	0.00 / mile
Largemouth Bass	7	None	2.5 - 18.9	3.68 / hour	1.59 / mile
Muskellunge	7	None	5.0 - 9.4	3.68 / hour	1.59 / mile
Northern Pike	20	None	5.0 - 36.4	10.53 / hour	4.55 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Bluegill	Common	4.0-7.9	Common Shiner	Present	
Pumpkinseed	Present	2.5-7.4	Central Mudminnow	Present	
Black Crappie	Common	1.5-11.4			
Yellow Perch	Present	6.5-11.4			
White Sucker	Present	9.0-20.4			

1) Tank Mortality: None 2) Weather: NA 3) Reliabilty: Medium

4) Stocking: 2470 Walleye, 7.7 inches, 09/18/03, DNR

5) Comments:

Rev. 10-70

Signed (Compiler) Scott D. Plaster Date 11/26/03

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191

8-95

Lake: Hayward MWB Code: 2725500 Date: 10/01/03 County: Sawyer Collector(s): Warwick, Pratt

Target Fish: All species Survey Type: Baseline monitoring Mark Given: None Water Temperature: 50°F Station: Portion of Shoreline

Adverse Conditions: NA Gear Type: Boomshocker Distance Shocked: 4.4 miles

Volts: 150 Amps: 1.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: NA Shocking End Time: NA Generator Start Hour: 0.0 Generator End Hour: 1.9

Number of Dippers: [X]1 [ ]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4		
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4		
5.5-5.9			19.5-19.9	1	
6.0-6.4	2		20.0-20.4		
6.5-6.9	5		20.5-20.9		
7.0-7.4	7		21.0-21.4		
7.5-7.9	6		21.5-21.9		
8.0-8.4	5		22.0-22.4		
8.5-8.9	2		22.5-22.9		
9.0-9.4	2		23.0-23.4		
9.5-9.9			23.5-23.9		
10.0-10.4			24.0-24.4		
10.5-10.9	1		24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9			25.5-25.9		
12.0-12.4			26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4			27.0-27.4	1	
13.5-13.9	2		27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9			28.5-28.9		
15.0-15.4			29.0-29.4		
15.5-15.9	1		29.5-29.9		
16.0-16.4	1		30.0 +		
Totals:	36				

WALLEYE

WDNR Comments

artment of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 10/01/03 County: Sawyer Collector(s): Warwick, Pratt

Target Fish: All species Survey Type: Baseline monitoring Mark Given: None Water Temperature: 50°F Station: Portion of Shoreline

Adverse Conditions: NA Gear Type: Boomshocker Distance Shocked: 4.4 miles

Volts: 150 Amps: 1.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: NA Shocking End Time: NA Generator Start Hour: 0.0 Generator End Hour: 1.9

Number of Dippers: [X]1 [ ]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: NA

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9					2				26.0-26.4				
3.0-3.4					1				26.5-26.9				
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4	1		1						28.5-28.9				
5.5-5.9			1						29.0-29.4				
6.0-6.4	1		1						29.5-29.9				
6.5-6.9	2		2						30.0-30.4				
7.0-7.4			1						30.5-30.9				
7.5-7.9	1								31.0-31.4				
8.0-8.4									31.5-31.9				
8.5-8.9									32.0-32.4				
9.0-9.4	2		1						32.5-32.9				
9.5-9.9									33.0-33.4				
10.0-10.4									33.5-33.9				
10.5-10.9	1								34.0-34.4				
11.0-11.4	1								34.5-34.9				
11.5-11.9	1								35.0-35.4				
12.0-12.4	1								35.5-35.9				
12.5-12.9	1								36.0-36.4	1			
13.0-13.4									36.5-36.9				
13.5-13.9					1				37.0-37.4				
14.0-14.4									37.5-37.9				
14.5-14.9									38.0-38.4				
15.0-15.4	1								38.5-38.9				
15.5-15.9									39.0-39.4				
16.0-16.4	1								39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4					1				40.5-40.9				
17.5-17.9									41.0-41.4				
18.0-18.4					1				41.5-41.9				
18.5-18.9					1				42.0-42.4				
19.0-19.4									42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4				
21.0-21.4	1								44.5-44.9				
21.5-21.9	1								45.0-45.4				
22.0-22.4									45.5-45.9				
22.5-22.9	1								46.0-46.9				
23.0-23.4	2								47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	20	0	7	0	7	0	0	0	50.0+				

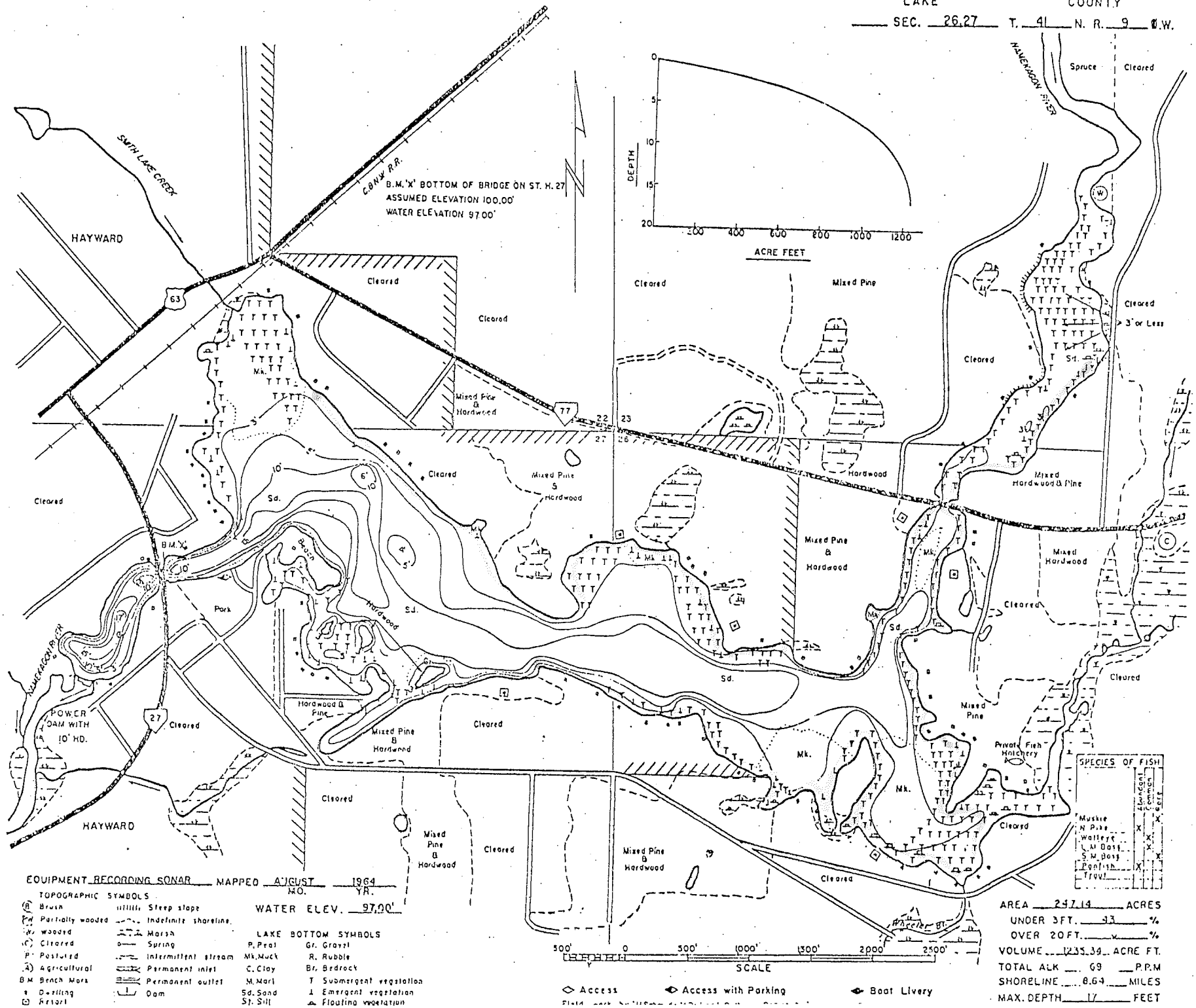
GAMEFISH

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

AREA 247.14 ACRES
UNDER 3FT. 93 %
OVER 20FT. x %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

WDNR Comments

site 1255 00
survey 5-21-64
Visit 486467

SUMMARY FISHING RECORD

FORM 3600-63 REVISED 1-94

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS	MWB CODE
Sawyer	Lake Hayward ST1	2725500
SAMPLING OBJECTIVE	**DATES FISHED**	**WATER TEMP.**
	October 1, 2003	50

GEAR

BOOMSHOCKER	PANFISH	0.4	NO. DIPPERS	1	NIGHT	X	AC	X
HOURS	GAMEFISH	1.1	NO. MILES	2.00	VOLTS	150	AMPS	1
FYKE NET	PANFISH							
LIFTS	GAMEFISH		LEAD LEN:		FRAME:		MESH:	
GILL NET	(NO. LIFTS)		LENGTH:		DEPTH:		MESH:	
SEINE	(NO. PULLS)		LENGTH:		DEPTH:		MESH:	
ANGLING	(TOT. HRS.)		NO. ANGLERS:		TIME OF DAY:			

OTHER

FISHING RESULTS

GAMEFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
Walleye	32		-	**16.0**
Musky	4		-	**2.0**
Northern Pike	8		-	**4.0**
Largemouth Bass	1		-	**0.5**
Smallmouth Bass			-	
White Sucker	5		-	**10.0**
Walleye EG	28		-	14.0
			-	
ST 1A			-	

PANFISH	NUMBER	MODAL SIZES (IN.)	SIZE RANGE (IN.)	CATCH/EFFORT
BG	31		-	**62**
Pumpkinseed	3		-	**6**
Black Crappie	6		-	**12**
Yellow Perch	4		-	**8**
Common shiner	8		-	**16**
Mud minnow	2		-	**4**
Brown Bullhead				
			-	

Observations: All muskellunge were yoy hybrids. EG walleye all in river upstream of STH 77 bridge.

Compiled By:	Date
Frank Pratt	10/1/03

WDNR Comments

State of Wisconsin
Department of Natural Resources

Water Temp: 50

Gamefish Length Frequency
Form 3600-65 Rev.7-93

County	Water	Date	Gear: VV AC
Sawyer	Lk Hayward-South St1	10/01/2003	hrs: 1.3

Size Range Inches	Walleye	N Pike	Musky	LMB	W. Sucker	Size Range Inches	N Pike	Musky
<3.0						27.0 - 27.4		
3.0 - 3.4						27.5 - 27.9		
3.5 - 3.9						28.0 - 28.4		
4.0 - 4.4						28.5 - 28.9		
4.5 - 4.9						29.0 - 29.4		
5.0 - 5.4						29.5 - 29.9		
5.5 - 5.9			1hybrid			30.0 - 30.4		
6.0 - 6.4	1		1hybrid			30.5 - 30.9		
6.5 - 6.9	5	1				31.0 - 31.4		
7.0 - 7.4	7					31.5 - 31.9		
7.5 - 7.9	6	1	1 hybrid			32.0 - 32.4		
8.0 - 8.4	5					32.5 - 32.9		
8.5 - 8.9	2					33.0 - 33.4		
9.0 - 9.4	2		1hybrid			33.5 - 33.9		
9.5 - 9.9						34.0 - 34.4		
10.0 - 10.4						34.5 - 34.9		
10.5 - 10.9	1	1				35.0 - 35.4		
11.0 - 11.4		1				35.5 - 35.9		
11.5 - 11.9						36.0 - 36.4	1	
12.0 - 12.4						36.5 - 36.9		
12.5 - 12.9		1			1	37.0 - 37.4		
13.0 - 13.4						37.5 - 37.9		
13.5 - 13.9	2					38.0 - 38.4		
14.0 - 14.4					1	38.5 - 38.9		
14.5 - 14.9						39.0 - 39.4		
15.0 - 15.4						39.5 - 39.9		
15.5 - 15.9	1					40.0 - 40.9		
16.0 - 16.4						41.0 - 41.9		
16.5 - 16.9					1	42.0 - 42.9		
17.0 - 17.4						43.0 - 43.9		
17.5 - 17.9					1	44.0 - 44.9		
18.0 - 18.4				1		45.0 - 45.9		
18.5 - 18.9						46.0 - 46.9		
19.0 - 19.4						47.0 - 47.9		
19.5 - 19.9					1	48.0 - 48.9		
20.0 - 20.4						49.0 - 49.9		
20.5 - 20.9						50.0 - 50.9		
21.0 - 21.4		1				51.0 - 51.9		
21.5 - 21.9						52.0 - 52.9		
22.0 - 22.4						53.0 - 53.9		
22.5 - 22.9						54.0 - 54.9		
23.0 - 23.4		1				55.0 - 55.9		
23.5 - 23.9						56.0 - 56.9		
24.0 - 24.4						57.0 - 57.9		
24.5 - 24.9						58.0 - 58.9		
25.0 - 25.4						59.0 - 59.9		
25.5 - 25.9						60.0+		
26.0 - 26.4								
26.5 - 26.9								
TOTALS	**32**					**TOTALS**		

OBSERVATIONS:

WDNR Comments

...nsin
...artment of Natural Resources

Panfish Length Frequency

Form 3600-64 Rev. 1-00

County	Water	Date	Gear
Sawyer	LH-St1 South	10/30/2003	vv AC bs

Size Range Inches	Species					Size Range Inches	Species				
	BG	BC	YP	CS	PS		Blg	BC	YP	Pkd	
Count						**7.0**	4	1	1		
1.0 - 1.4				3		7.1					
1.5 - 2.0				3		7.2					
2.1						7.3					
2.2						7.4					
2.3						7.5	3				
2.4						7.6					
2.5				1		7.7					
2.6						7.8					
2.7						7.9					
2.8						**8.0**		1			
2.9					1	8.1					
3.0						8.2					
3.1						8.3					
3.2						8.4					
3.3						8.5					
3.4						8.6					
3.5						8.7					
3.6						8.8					
3.7						8.9					
3.8						**9.0**		1	1		
3.9						9.1					
4.0	1				1	9.2					
4.1						9.3					
4.2						9.4					
4.3						9.5		2			
4.4						9.6					
4.5						9.7					
4.6						9.8					
4.7						9.9					
4.8						**10.0**					
4.9						10.2					
5.0	3				1	10.4					
5.1						10.6					
5.2						10.8					
5.3						**11.0**			1		
5.4						11.2					
5.5	4					11.4					
5.6						11.6					
5.7						11.8					
5.8						**12.0**					
5.9						12.2					
6.0	5					12.4					
6.1						12.6					
6.2						12.8					
6.3						**13.0**					
6.4						13.2					
6.5	8		1			13.4					
6.6						13.6					
6.7						13.8					
6.8						**14.+**					
6.9						TOTAL	**31**	**6**	**4**	**3**	

Notes:

1A nongame station= 0.5 mi. Bartz' Bay

WDNR Comments

11.6 and

State of Wisconsin
Department of Natural Resources

Water Temp: 50°F

Gamefish Length Frequency

Form 3600-65 Rev.7-93

County	Water	Date	Gear: VV AC
Sawyer	Lk Hayward-South St1	10/01/2003	hrs:

Size Range Inches	Walleye	N Pike	Musky	LMB	OTHER SMB	OTHER W. Sucker	RH	WS	Size Range Inches	N Pike	Musky
<3.0					-BG-	-PS-			27.0 - 27.4		
3.0 - 3.4					1				27.5 - 27.9		
3.5 - 3.9									28.0 - 28.4		
4.0 - 4.4					2				28.5 - 28.9		
4.5 - 4.9									29.0 - 29.4		
5.0 - 5.4			1Hyb		3	1			29.5 - 29.9		
5.5 - 5.9			1Hyb						30.0 - 30.4		
6.0 - 6.4	1 1				4 1	1			30.5 - 30.9		
6.5 - 6.9	5	1							31.0 - 31.4		
7.0 - 7.4	7		1Hyb		5	1			31.5 - 31.9		
7.5 - 7.9	6	1							32.0 - 32.4		
8.0 - 8.4	5				6	3PS			32.5 - 32.9		
8.5 - 8.9	2								33.0 - 33.4		
9.0 - 9.4	2		1Hyb		7 31				33.5 - 33.9		
9.5 - 9.9									34.0 - 34.4		
10.0 - 10.4					8 BG				34.5 - 34.9		
10.5 - 10.9	1	1	1Hyb						35.0 - 35.4		
11.0 - 11.4		1	Hyb						35.5 - 35.9		
11.5 - 11.9			Hyb						36.0 - 36.4	1	
12.0 - 12.4					-YP-	-BC-			36.5 - 36.9		
12.5 - 12.9		1			1			1	37.0 - 37.4		
13.0 - 13.4									37.5 - 37.9		
13.5 - 13.9	2				2				38.0 - 38.4		
14.0 - 14.4			1Hyb						38.5 - 38.9		
14.5 - 14.9					3				39.0 - 39.4		
15.0 - 15.4								1	39.5 - 39.9		
15.5 - 15.9	1 1				4				40.0 - 40.9		
16.0 - 16.4									41.0 - 41.9		
16.5 - 16.9					5				42.0 - 42.9		
17.0 - 17.4				1				1	43.0 - 43.9		
17.5 - 17.9					6				44.0 - 44.9		
18.0 - 18.4								1	45.0 - 45.9		
18.5 - 18.9					7 1	1			46.0 - 46.9		
19.0 - 19.4									47.0 - 47.9		
19.5 - 19.9					8	1		1	48.0 - 48.9		
20.0 - 20.4						1			49.0 - 49.9		
20.5 - 20.9					9 1	1			50.0 - 50.9		
21.0 - 21.4		1				11			51.0 - 51.9		
21.5 - 21.9					10				52.0 - 52.9		
22.0 - 22.4								5	53.0 - 53.9		
22.5 - 22.9					11 1			WS	54.0 - 54.9		
23.0 - 23.4		1							55.0 - 55.9		
23.5 - 23.9									56.0 - 56.9		
24.0 - 24.4									57.0 - 57.9		
24.5 - 24.9									58.0 - 58.9	6	
25.0 - 25.4									59.0 - 59.9	8	
25.5 - 25.9									60.0+	MP	
26.0 - 26.4											
26.5 - 26.9											
TOTALS									TOTALS		

OBSERVATIONS:

CS - 4.5 mm - 2.5 11

ST 1 include Bard 2 Bay as 0.5 mi. non-some hybrid Mu yoy 1

All CS above bridge - Plenty of food there

CS 1.5 - 2.0 111
1.0 11
<1 11

WDNR Comments

12,1

State of Wisconsin
Department of Natural Resources

Water Temp: 52

Gamefish Length Frequency

Form 3600-65 Rev.7-93

County	Water	Date	Gear: VV AC
Sawyer	Lake Hayward St2 N	10/01/2003	hrs:

Size Range Inches	Walleye	N Pike	Musky	LMB	OTHER SMB	OTHER W. Sucker	RH	WS	Size Range Inches	N Pike	Musky
<3.0				2.7 11	BG	PS			27.0 - 27.4		
3.0 - 3.4				3.3	1				27.5 - 27.9		
3.5 - 3.9									28.0 - 28.4		
4.0 - 4.4					2				28.5 - 28.9		
4.5 - 4.9						1			29.0 - 29.4		
5.0 - 5.4		1	Hyb		3				29.5 - 29.9		
5.5 - 5.9									30.0 - 30.4		
6.0 - 6.4	1	1			4				30.5 - 30.9		
6.5 - 6.9		1	Hyb 11						31.0 - 31.4		
7.0 - 7.4					5 11	1			31.5 - 31.9		
7.5 - 7.9						1			32.0 - 32.4		
8.0 - 8.4					6 1111 1111	1			32.5 - 32.9		
8.5 - 8.9									33.0 - 33.4		
9.0 - 9.4		11			7 1111	1		1	33.5 - 33.9		
9.5 - 9.9					1				34.0 - 34.4		
10.0 - 10.4					8				34.5 - 34.9		
10.5 - 10.9									35.0 - 35.4		
11.0 - 11.4					YP	BC			35.5 - 35.9		
11.5 - 11.9		1			1				36.0 - 36.4		
12.0 - 12.4						11			36.5 - 36.9		
12.5 - 12.9					2			1	37.0 - 37.4		
13.0 - 13.4									37.5 - 37.9		
13.5 - 13.9				1	3				38.0 - 38.4		
14.0 - 14.4									38.5 - 38.9		
14.5 - 14.9					4				39.0 - 39.4		
15.0 - 15.4		1				1			39.5 - 39.9		
15.5 - 15.9					5				40.0 - 40.9		
16.0 - 16.4	1	1							41.0 - 41.9		
16.5 - 16.9					6	1			42.0 - 42.9		
17.0 - 17.4								1	43.0 - 43.9		
17.5 - 17.9					7				44.0 - 44.9		
18.0 - 18.4				1	8 1	1			45.0 - 45.9		
18.5 - 18.9				1					46.0 - 46.9		
19.0 - 19.4									47.0 - 47.9		
19.5 - 19.9	1				9 1	1		11	48.0 - 48.9		
20.0 - 20.4									49.0 - 49.9		
20.5 - 20.9					10	11			50.0 - 50.9		
21.0 - 21.4					11 1	1			51.0 - 51.9		
21.5 - 21.9		1							52.9 - 52.9		
22.0 - 22.4									53.0 - 53.9		
22.5 - 22.9		1							54.0 - 54.9		
23.0 - 23.4		1							55.0 - 55.9		
23.5 - 23.9									56.0 - 56.9		
24.0 - 24.4									57.0 - 57.9		
24.5 - 24.9									58.0 - 58.9		
25.0 - 25.4									59.0 - 59.9		
25.5 - 25.9									60.0+		
26.0 - 26.4											
26.5 - 26.9	27.0										
TOTALS									TOTALS		

OBSERVATIONS:

ST 2 includes LP Bay as 0.5 mi.
Non-game

GS - 2.5; 2.0; 1.0 11; 1.5 11 1

MM 3.0, 3.5 2.0 2.5

S **WDNR Comments**

SVR 1324131
Site 814107

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET **GAMEFISH** Wisconsin Department of Natural Resources

Waterbody Name:	Hayward	Target Fish:	Juvenile Walleye	Generator Start Time:	542
MWB Code/WBIC:	2725500	Mark(s) Given:	None	Generator End Time:	543.8
Waterbody Type:	Drainage Impoundment	Survey Type:	CPE (Fall Shoreline)	Volts:	1.8
County:	Sawyer	Gear Type:	Boomshocker	Amps:	6
Date (MM/DD/YY):	06-Oct-04	Weather:	Clear, breezy, warm	Pulse Rate:	250
Station:	Entire lake and inlet	Adverse Conditions:	Weedy- walleye yoy very DEEP	Duty Cycle:	
Start Time:	1845	Water Temperature:	49 F	Current Type:	AC
End Time:	2145	Water Conductivity:	High	Distance Shocked:	6.6
Collectors:	Rw, JD, CS	Water Level:	Normal	Entire Shoreline Shocked:	Y
		Water Clarity:	L Brwn	Number of Dippers:	2
				Dipnet Mesh Size:	0.1285

	Walleye		Muskellunge		Largemouth Bass		Northern Pike			Northern Pike		Muskellunge	
inches	Above 77	Below77							inches				
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4	1			
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9	2			
3.5-3.9									27.0-27.4	1			
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9							1		29.0-29.4	1			
6.0-6.4	4						3		29.5-29.9				
6.5-6.9	1				1				30.0-30.4			1	
7.0-7.4	3		1 Hybrid						30.5-30.9	1			
7.5-7.9	1				1		1		31.0-31.4				
8.0-8.4	1								31.5-31.9				
8.5-8.9	2				1		1		32.0-32.4				
9.0-9.4	1				1		3		32.5-32.9				
9.5-9.9	2				1		3		33.0-33.4			1	
10.0-10.4	1				1		2		33.5-33.9				
10.5-10.9	1						2		34.0-34.4				
11.0-11.4					1		3		34.5-34.9			1	
11.5-11.9			2				1		35.0-35.4				
12.0-12.4	2		1		2		1		35.5-35.9				
12.5-12.9	1	1	4		2		4		36.0-36.4				
13.0-13.4		1					2		36.5-36.9				
13.5-13.9					2		2		37.0-37.4				
14.0-14.4							2		37.5-37.9				
14.5-14.9					2				38.0-38.4				
15.0-15.4									38.5-38.9				
15.5-15.9	1				2				39.0-39.4				
16.0-16.4					4		2		39.5-39.9				
16.5-16.9							2		40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9					1				41.0-41.4				
18.0-18.4							2		41.5-41.9				
18.5-18.9							1		42.0-42.4				
19.0-19.4			1		1		1		42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9							1		44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4							1		45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
TOTALS	23 WE tot				23 LMB				50.0+	46NP		12 MU tot	

WDNR Comments

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — **GAMEFISH** — Wisconsin Department of Natural Resources

Waterbody Name:	Hayward	Target Fish:	Juvenile Walleye	Generator Start Time:	543
MWB Code/WBIC:	2725500	Mark(s) Given:	None	Generator End Time:	543.8
Waterbody Type:	Drainage Impoundment	Survey Type:	CPE (Fall Shoreline)	Volts:	250
County:	Sawyer	Gear Type:	Boomshocker	Amps:	6
Date (MM/DD/YY):	06-Oct-04	Weather:	Clear, cold	Pulse Rate:	
Station:	Entire lake and inlet	Adverse Conditions:		Duty Cycle:	
Start Time:	1845	Water Temperature:	~~5 F~~ 48.8	Current Type:	AC
End Time:		Water Conductivity:		Distance Shocked:	6.6
Collectors:	Rw, JD, CS	Water Level:	Normal	Entire Shoreline Shocked:	Y
		Water Clarity:	L Brwn	Number of Dippers:	2
				Dipnet Mesh Size:	0.1285

inches	Walleye ~~Above 77~~ Below 77	~~Below77~~ Above 77	~~Muskellunge~~ LMB		~~Largemouth Bass~~ Musky		Smallmouth Bass	
<1.5								
1.5-1.9								
2.0-2.4								
2.5-2.9								
3.0-3.4	Lot of							
3.5-3.9	walleye							
4.0-4.4	But							
4.5-4.9	Deep							
5.0-5.4								
5.5-5.9								
6.0-6.4	||||							
6.5-6.9	|							
7.0-7.4	|||	to	|					
7.5-7.9	|	Deep	|		HY 7.4			
8.0-8.4	|		|					
8.5-8.9	||							
9.0-9.4	|		|					
9.5-9.9	||		|					
10.0-10.4			|					
10.5-10.9	|							
11.0-11.4			|		||			
11.5-11.9					|			
12.0-12.4	||		||		||||			
12.5-12.9	|	|	||					
13.0-13.4		|						
13.5-13.9			||					
14.0-14.4								
14.5-14.9			||					
15.0-15.4								
15.5-15.9	|		||					
16.0-16.4			||||					
16.5-16.9								
17.0-17.4								
17.5-17.9			|					
18.0-18.4								
18.5-18.9								
19.0-19.4			|		|		YP	
19.5-19.9								
20.0-20.4	Abundant						10.4	
20.5-20.9								
21.0-21.4	Suckers						10.2	
21.5-21.9							9.3	
22.0-22.4	Y.P. YOY							
22.5-22.9								
23.0-23.4	Shiner							
23.5-23.9	Above							
24.0-24.4								
TOTALS		[illegible]						

inches	Northern Pike NP	Northern Pike YP	Muskellunge	
24.5-24.9	~~8.5~~	~~10.5~~		RHS
25.0-25.4	~~10.6~~	~~10.0~~		11.0
25.5-25.9	~~9.5~~	N.P		
26.0-26.4	~~10.5~~	~~5.8~~		WS
26.5-26.9	~~14.4~~	~~11.5~~		4.0
27.0-27.4	[illegible]	~~3.5~~		
27.5-27.9	~~9.5~~	~~15.0~~		10.9
28.0-28.4	~~10.8~~	~~9.0~~		
28.5-28.9	~~15.0~~	~~16.3~~		
29.0-29.4	~~15.0~~	~~4.0~~		10.5
29.5-29.9	~~13.5~~	~~4.4~~		
30.0-30.4	~~14.5~~	~~16.3~~	|	
30.5-30.9	~~14.5~~	~~13.0~~		
31.0-31.4	~~9.3~~	[illegible]		
31.5-31.9	~~12.0~~	[illegible]		
32.0-32.4	~~10.5~~	~~14.0~~		
32.5-32.9	~~10.0~~	~~14.0~~		
33.0-33.4	~~22.0~~	~~13.0~~	|	
33.5-33.9	~~8.3~~	~~4.0~~		
34.0-34.4	~~10.5~~	~~9.5~~	|	
34.5-34.9	~~11.0~~	~~15.7~~		
35.0-35.4	~~6.4~~	~~8.9~~		
35.5-35.9	~~24.0~~	~~8.0~~		
36.0-36.4	~~20.5~~			
36.5-36.9				
37.0-37.4	~~18.0~~			
37.5-37.9	~~36.8~~			
38.0-38.4	~~15.3~~			
38.5-38.9	~~10.1~~			
39.0-39.4	~~4.0~~			
39.5-39.9				
40.0-40.4	Lot of			
40.5-40.9				
41.0-41.4	Crappie			
41.5-41.9				
42.0-42.4	Sucker			
42.5-42.9	Fin &			
43.0-43.4				
43.5-43.9	Fis			
44.0-44.4	very			
44.5-44.9				
45.0-45.4	Abundant!			
45.5-45.9				
46.0-46.9				
47.0-47.9				
48.0-48.9				
49.0-49.9				
50.0+				

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500
Sampling Objective	**Number and Locations of Stations (Habitat)**	
Walleye Recruitment Survey		Source
Period Fished (Dates)	Miles Actually Shocked = 6.6	LM
10/06/04	Acres = 247	LM
	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time
1.8	√ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-NR
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	9	None	6.0 - 7.9	5.00 / hour	1.36 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	*		-	/ hour	/ mile
Walleye (Other)	13	None	8.0 - 15.9	7.22 / hour	1.97 / mile
Smallmouth Bass	0		-	0.00 / hour	0.00 / mile
Largemouth Bass	22	16.0-16.4	7.0 - 19.4	12.22 / hour	3.33 / mile
Muskellunge	12	12.0-12.4	7.0 - 34.4	6.67 / hour	1.82 / mile
Northern Pike	47	None	5.5 - 30.9	26.11 / hour	7.12 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Bluegill	Abundant				
Black Crappie	Common				
Yellow Perch	Abundant	9.3-10.5			
White Sucker	Common	10.5-11.0			
Shorthead Redhorse	Present	11.0			

1) Tank Mortality: None

2) Weather: Clear, Breeze, Warm

3) Reliabilty: Medium

4) Stocking: 247 Muskellunge, 11 inches, 09/10/04, DNR 2460 Walleye, 6.8 inches, 09/20/04, DNR

5) Comments: *Age 1+ walleye included with Other walleye; no ageing available.

Rev. 10-70

Signed (Compiler) Jamison L. Wendel

Date 11/23/04

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)
Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 10/06/04 County: Sawyer Collector(s): Warwick, Pratt, Drabeck

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 49°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation, Stained water Gear Type: Boomshocker Distance Shocked: 6.6 miles

Volts: 250 Amps: 6.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 18:45 Shocking End Time: NA Generator Start Hour: 542.0 Generator End Hour: 543.8

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4		
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4		
5.5-5.9			19.5-19.9		
6.0-6.4	4		20.0-20.4		
6.5-6.9	1		20.5-20.9		
7.0-7.4	3		21.0-21.4		
7.5-7.9	1		21.5-21.9		
8.0-8.4	1		22.0-22.4		
8.5-8.9	2		22.5-22.9		
9.0-9.4	1		23.0-23.4		
9.5-9.9	2		23.5-23.9		
10.0-10.4			24.0-24.4		
10.5-10.9	1		24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9			25.5-25.9		
12.0-12.4	2		26.0-26.4		
12.5-12.9	2		26.5-26.9		
13.0-13.4	1		27.0-27.4		
13.5-13.9			27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9			28.5-28.9		
15.0-15.4			29.0-29.4		
15.5-15.9	1		29.5-29.9		
16.0-16.4			30.0 +		
			Totals:	22	0

WALLEYE

WDNR Comments

Department of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)
Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 10/06/04 County: Sawyer Collector(s): Warwick, Pratt, Drabeck

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 49°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation, Stained water Gear Type: Boomshocker Distance Shocked: 6.6 miles

Volts: 250 Amps: 6.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 18:45 Shocking End Time: NA Generator Start Hour: 542.0 Generator End Hour: 543.8

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/16 inch bar H20 Clarity: NA

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4	1			
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9	2			
3.5-3.9									27.0-27.4	1			
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9	1			
5.5-5.9	1								29.0-29.4	1			
6.0-6.4	3								29.5-29.9				
6.5-6.9									30.0-30.4			1	
7.0-7.4			1		1				30.5-30.9	1			
7.5-7.9									31.0-31.4				
8.0-8.4	1				1				31.5-31.9				
8.5-8.9	1								32.0-32.4				
9.0-9.4	4				1				32.5-32.9				
9.5-9.9	3				1				33.0-33.4			1	
10.0-10.4	2				1				33.5-33.9				
10.5-10.9	2								34.0-34.4			1	
11.0-11.4	2		2		1				34.5-34.9				
11.5-11.9	1		1						35.0-35.4				
12.0-12.4	1		4		2				35.5-35.9				
12.5-12.9	1				2				36.0-36.4				
13.0-13.4	5								36.5-36.9				
13.5-13.9					2				37.0-37.4				
14.0-14.4	2								37.5-37.9				
14.5-14.9	1				2				38.0-38.4				
15.0-15.4	2								38.5-38.9				
15.5-15.9					2				39.0-39.4				
16.0-16.4	2				4				39.5-39.9				
16.5-16.9	2								40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9					1				41.0-41.4				
18.0-18.4	1								41.5-41.9				
18.5-18.9	1								42.0-42.4				
19.0-19.4			1		1				42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9	1								44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	47	0	12	0	22	0	0	0	50.0+				

GAMEFISH

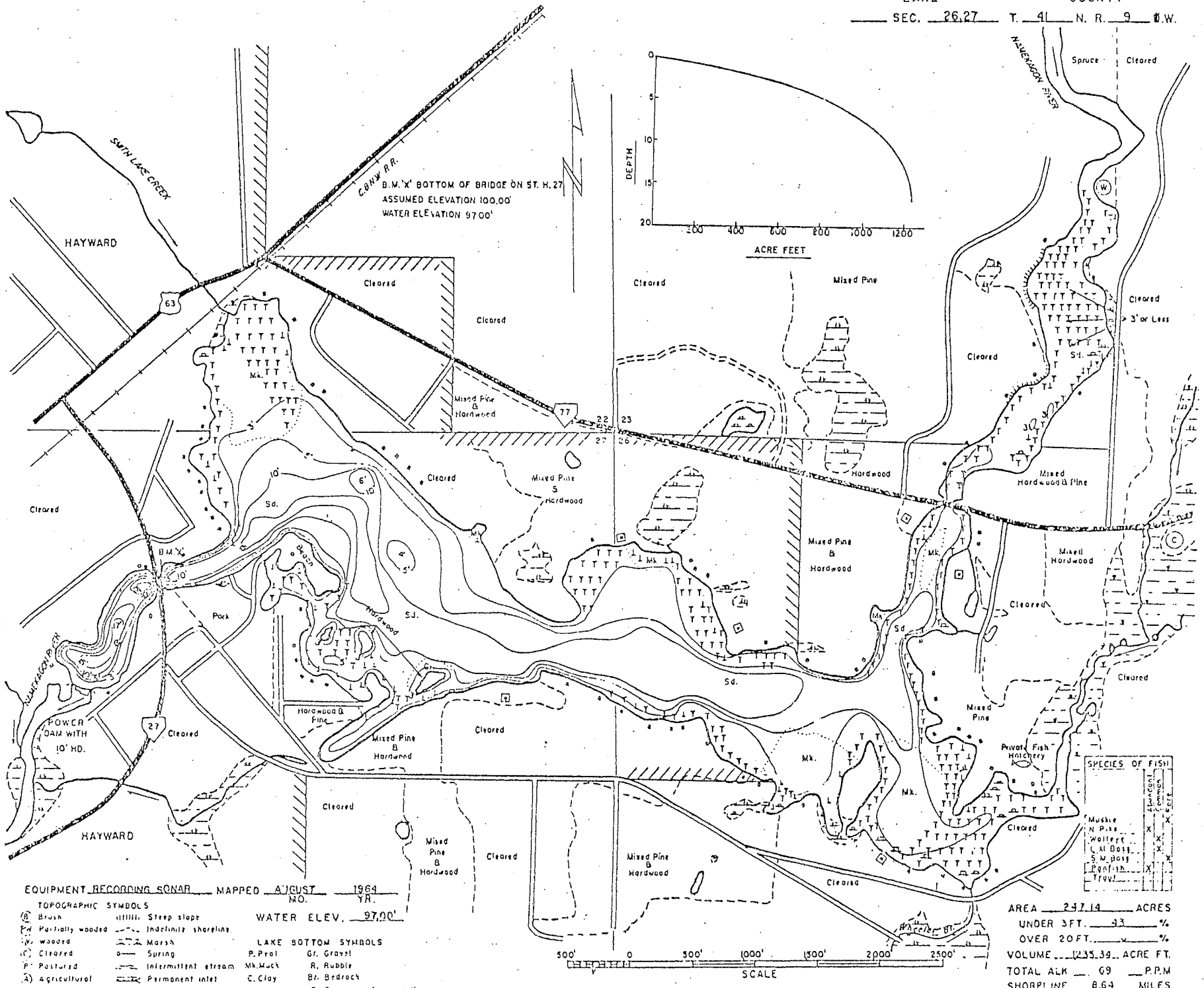
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.

WDNR Comments



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (Pw) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Beach Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Prot — Protected
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmidt, W. Prichard, L. Sather Drawn by: J. Rota

AREA 237.14 ACRES

UNDER 3 FT. 33 %

OVER 20 FT. x %

VOLUME 1235.39 ACRE FT.

TOTAL ALK. 69 P.P.M.

SHORELINE 8.64 MILES

MAX. DEPTH 17 FEET

WDNR Comments

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET **GAMEFISH** Wisconsin Department of Natural Resources

Waterbody Name:	Hayward	Target Fish:	Juvenile Walleye	Generator Start Time:	542
MWB Code/WBIC:	2725500	Mark(s) Given:	None	Generator End Time:	543.8
Waterbody Type:	Drainage Impoundment	Survey Type:	CPE (Fall Shoreline)	Volts:	1.8
County:	Sawyer	Gear Type:	Boomshocker	Amps:	6
Date (MM/DD/YY):	06-Oct-04	Weather:	Clear, breezy, warm	Pulse Rate:	250
Station:	Entire lake and inlet	Adverse Conditions:	Weedy- walleye yoy very DEEP	Duty Cycle:	
Start Time:	1845	Water Temperature:	49 F	Current Type:	AC
End Time:	2145	Water Conductivity:	High	Distance Shocked:	6.6
Collectors:	Rw, JD, CS	Water Level:	Normal	Entire Shoreline Shocked:	Y
		Water Clarity:	L Brwn	Number of Dippers:	2
				Dipnet Mesh Size:	0.1285

	Walleye		Muskellunge		Largemouth Bass		Northern Pike			Northern Pike		Muskellunge	
inches	Above 77	Below77							inches				
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4	1			
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9	2			
3.5-3.9									27.0-27.4	1			
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9							1		29.0-29.4	1			
6.0-6.4	4						3		29.5-29.9				
6.5-6.9	1				1				30.0-30.4			1	
7.0-7.4	3		1 Hybrid						30.5-30.9	1			
7.5-7.9	1				1		1		31.0-31.4				
8.0-8.4	1								31.5-31.9				
8.5-8.9	2				1		1		32.0-32.4				
9.0-9.4	1				1		3		32.5-32.9				
9.5-9.9	2				1		3		33.0-33.4			1	
10.0-10.4	1				1		2		33.5-33.9				
10.5-10.9	1						2		34.0-34.4				
11.0-11.4					1		3		34.5-34.9			1	
11.5-11.9			2				1		35.0-35.4				
12.0-12.4	2		1		2		1		35.5-35.9				
12.5-12.9	1	1	4		2		4		36.0-36.4				
13.0-13.4		1					2		36.5-36.9				
13.5-13.9					2		2		37.0-37.4				
14.0-14.4							2		37.5-37.9				
14.5-14.9					2				38.0-38.4				
15.0-15.4									38.5-38.9				
15.5-15.9	1				2				39.0-39.4				
16.0-16.4					4		2		39.5-39.9				
16.5-16.9							2		40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9					1				41.0-41.4				
18.0-18.4							2		41.5-41.9				
18.5-18.9							1		42.0-42.4				
19.0-19.4			1		1		1		42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9							1		44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4							1		45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
TOTALS	23 WE tot				23 LMB				50.0+	46NP		12 MU tot	

WDNR Comments

Hrs 25.7 to 26.7 2.0 hrs. entire shock

State of Wisconsin
Department of Natural Resources

H_2O -51 °F

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

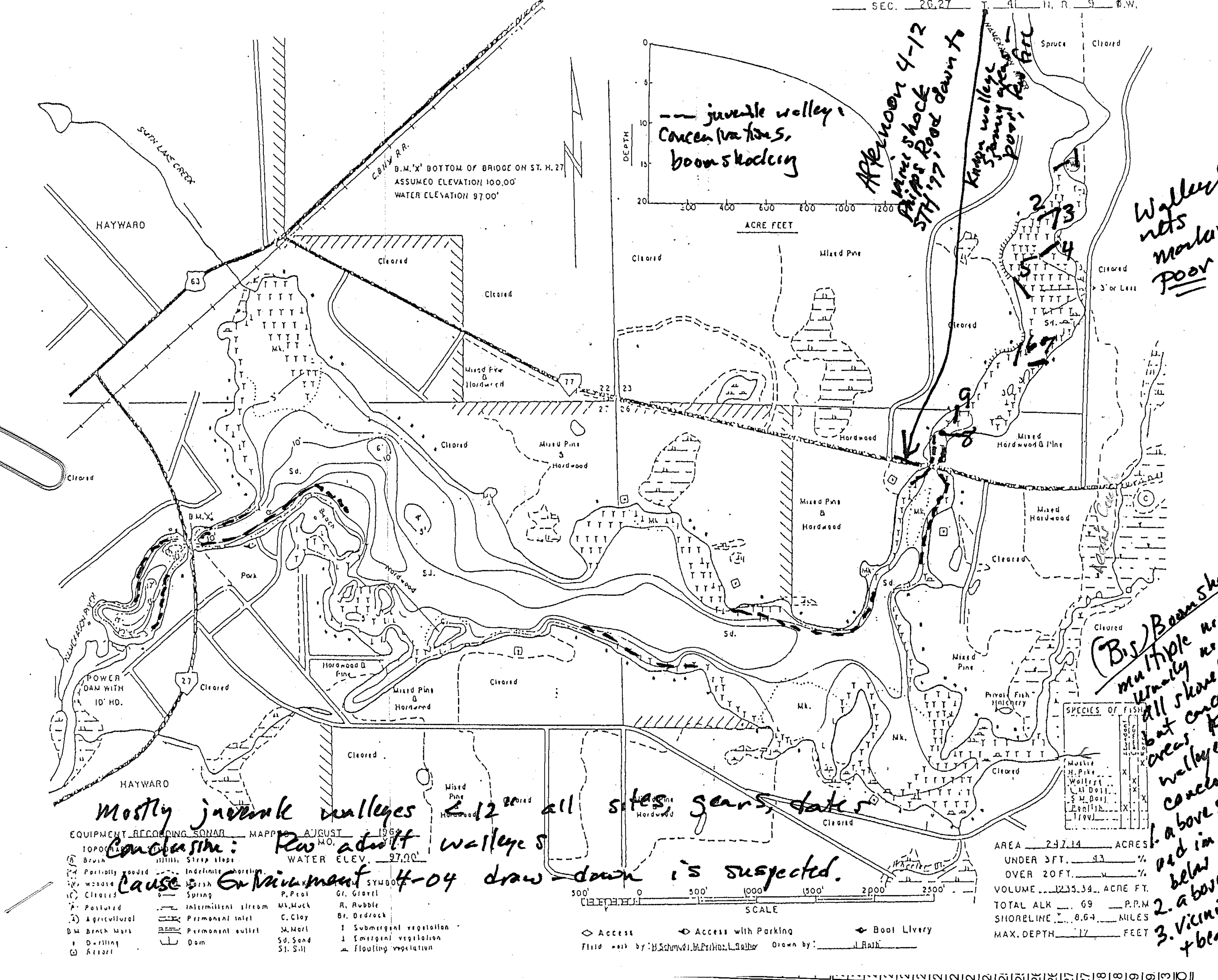
pick-up only targeted game fish

INCHES

2725500

COUNTY	WATER	DATE	GEAR
Sawyer 58 COUNTY CODE	Lake Hayward WATER CODE	5-25-04	200 V DC 2-4 Amps

SIZE RANGE — INCHES	SPECIES				SIZE RANGE — INCHES	SPECIES		
	WE	LMB	NP	MU		NP	MU	
<3.0					27.0-27.4	1		
3.0- 3.4					27.5-27.9			
3.5- 3.9					28.0-28.4			
4.0- 4.4					28.5-28.9	1		
4.5- 4.9					29.0-29.4			
5.0- 5.4					29.5-29.9			BG-C
5.5- 5.9					30.0-30.4			BG-A
6.0- 6.4	1				30.5-30.9			YP-C
6.5- 6.9	5				31.0-31.4			RB-P
7.0- 7.4	8				31.5-31.9			WS-C
7.5- 7.9	7				32.0-32.4			RH-P
8.0- 8.4	7				32.5-32.9			
8.5- 8.9	2	2			33.0-33.4			
9.0- 9.4	1	2	1		33.5-33.9			
9.5- 9.9					34.0-34.4			
10.0-10.4	3				34.5-34.9			
10.5-10.9	1		1		35.0-35.4			
11.0-11.4	3	1			35.5-35.9			
11.5-11.9	1		1		36.0-36.4			SMB 4.0
12.0-12.4		4	2		36.5-36.9			
12.5-12.9	1	2			37.0-37.4			
13.0-13.4		1	1		37.5-37.9			
13.5-13.9		3			38.0-38.4			
14.0-14.4		3			38.5-38.9			
14.5-14.9		3			39.0-39.4			
15.0-15.4	1				39.5-39.9			
15.5-15.9		1			40.0-40.9			YP 11.6
16.0-16.4	1	1			41.0-41.9		1	9.0
16.5-16.9		1			42.0-42.9			10.0
17.0-17.4					43.0-43.9			9.9
17.5-17.9			1		44.0-44.9			8.0
18.0-18.4					45.0-45.9			RB 7.2
18.5-18.9					46.0-46.9			
19.0-19.4					47.0-47.9			
19.5-19.9					48.0-48.9			
20.0-20.4					49.0-49.9			BG 10.6
20.5-20.9					50.0-50.9			
21.0-21.4					51.0-51.9			
21.5-21.9			1		52.0-52.9			
22.0-22.4					53.0-53.9			
22.5-22.9					54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9					56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9			1		58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9					60.0+			
26.0-26.4								
26.5-26.9								
TOTAL	42 WE	28 LMB			TOTAL	14 NP	1 MU	


SEC. 26,27 T. 41 N. R. 9 W.
HAYWARD
SWIFT LAKE CREEK
C.St.P.M.&O. R.R.
B.M.'X' BOTTOM OF BRIDGE ON ST. H. 27
ASSUMED ELEVATION 100.00'
WATER ELEVATION 97.00'
DEPTH
ACRE FEET
-- juvenile walleye concentrations, boomshocking
Afternoon 4-12 mini shock Phipps Road down to STH '77'
Known walleye spawning areas - poor, few fish
Walleye nets marking - Poor
(B.S.) Boomshocking multiple nights mostly not all shoreline but concentrated areas. Known walleye concentrations
1. above STH and immediately below
2. above dam
3. Vicinity of ... + beach
POWER DAM WITH 10' HD.
NAMEKAGON RIVER
Mostly juvenile walleyes < 12" all sites, gears, dates
Conclusion: Few adult walleyes
Cause: Entrainment 4-04 draw-down is suspected.
EQUIPMENT RECORDING SONAR
MAPPED AUGUST 1964
WATER ELEV. 97.00'
Brush
Partially wooded
Wooded
Cleared
Pastured
Agricultural
B.M. Bench Mark
Dwelling
Resort
Steep slope
Indefinite shoreline
Spring
Intermittent stream
Permanent inlet
Permanent outlet
Dam
P. Peat
Mk. Muck
C. Clay
M. Marl
Sd. Sand
Si. Silt
Gr. Gravel
R. Rubble
Br. Bedrock
Submergent vegetation
Emergent vegetation
Floating vegetation
SCALE
500' 0 500' 1000' 1500' 2000' 2500'
Access
Access with Parking
Boat Livery
Drawn by: J. Rath
SPECIES OF FISH
Muskie
N. Pike
Walleye
L.M. Bass
S.M. Bass
Panfish
Trout
AREA 247.14 ACRES
UNDER 3 FT. 43 %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

WALLEYE

Wisconsin Department of Natural Resources

Body Name: Namekagon R @ Lk Hayward
MWB Code/WBIC:
Waterbody Type: River-nonwadeable
County: Sawyer
Date (MM/DD/YY): ####### ####### 7/11/11
Station: nonwadeable mini Phipps Rd
Start Time:
End Time:
Total Time Shocking : 1.4 hrs.
Collectors: Pratt and Warwick

Target Fish: Walleye
Mark(s) Given: LP
Survey Type: Population Estimate
Gear Type: ~~Boomshocker~~ Mini-boom
Weather: Clear, warm
Adverse Conditions: None
Water Temperature: 49 F
Water Conductivity: Moderate
Water Level: early sprin Normal [LOW]
Water Clarity: L Br

Pulser Box Meter Start Time:
Pulser Box Meter End Time:
Total Elapsed Time:
Volts/Amps: 230/2.4
Pulse Rate:
Duty Cycle:
Current Type: AC
Distance Shocked: 2.7 miles
Entire Shoreline Shocked: No
Number of Dippers: One
Dipnet Mesh Size: 3/8"

MALE			FEMALE			UNKNOWN			
inches	Unclipped	Clipped	inches	Unclipped	Clipped	inches	Unclipped	NO CLIP	Clipped: Prim / Sec
<4.0			<4.0			<4.0			
4.0-4.4			4.0-4.4			4.0-4.4			
4.5-4.9			4.5-4.9			4.5-4.9			
5.0-5.4			5.0-5.4			5.0-5.4			
5.5-5.9			5.5-5.9			5.5-5.9			
6.0-6.4			6.0-6.4			6.0-6.4			
6.5-6.9			6.5-6.9			6.5-6.9			
7.0-7.4			7.0-7.4			7.0-7.4			
7.5-7.9			7.5-7.9			7.5-7.9			
8.0-8.4			8.0-8.4			8.0-8.4			
8.5-8.9			8.5-8.9			8.5-8.9			
9.0-9.4			9.0-9.4			9.0-9.4			
9.5-9.9			9.5-9.9			9.5-9.9			
10.0-10.4			10.0-10.4			10.0-10.4			
10.5-10.9			10.5-10.9			10.5-10.9			
11.0-11.4			11.0-11.4			11.0-11.4			
11.5-11.9			11.5-11.9			11.5-11.9			
12.0-12.4			12.0-12.4			12.0-12.4	1		
12.5-12.9			12.5-12.9			12.5-12.9	1		
13.0-13.4			13.0-13.4			13.0-13.4			
13.5-13.9			13.5-13.9			13.5-13.9			
14.0-14.4	1		14.0-14.4			14.0-14.4			
14.5-14.9	2		14.5-14.9			14.5-14.9			
15.0-15.4	1		15.0-15.4			15.0-15.4			
15.5-15.9	1		15.5-15.9			15.5-15.9			
16.0-16.4	1		16.0-16.4	1		16.0-16.4			
16.5-16.9	1		16.5-16.9			16.5-16.9			
17.0-17.4	2		17.0-17.4			17.0-17.4			
17.5-17.9	1		17.5-17.9			17.5-17.9			
18.0-18.4			18.0-18.4			18.0-18.4			
18.5-18.9	1		18.5-18.9	1		18.5-18.9			
19.0-19.4			19.0-19.4			19.0-19.4			
19.5-19.9			19.5-19.9			19.5-19.9			
20.0-20.4			20.0-20.4			20.0-20.4			
20.5-20.9			20.5-20.9	1		20.5-20.9			
21.0-21.4			21.0-21.4			21.0-21.4			
21.5-21.9			21.5-21.9			21.5-21.9			
22.0-22.4			22.0-22.4			22.0-22.4			
22.5-22.9			22.5-22.9	1		22.5-22.9			
23.0-23.4			23.0-23.4			23.0-23.4			
23.5-23.9			23.5-23.9			23.5-23.9			
24.0-24.4			24.0-24.4			24.0-24.4			
24.5-24.9			24.5-24.9			24.5-24.9			
25.0-25.4			25.0-25.4			25.0-25.4			
25.5-25.9			25.5-25.9			25.5-25.9			
26.0-26.4			26.0-26.4			26.0-26.4			
26.5-26.9			26.5-26.9			26.5-26.9			
27.0-27.4			27.0-27.4			27.0-27.4			
27.5-27.9			27.5-27.9			27.5-27.9			
28.0-28.4			28.0-28.4			28.0-28.4			
28.5-28.9			28.5-28.9			28.5-28.9			
29.0-29.4			29.0-29.4			29.0-29.4			
29.5-29.9			29.5-29.9			29.5-29.9			
30.0 +			30.0 +			30.0 +			
TOTALS:	11 males all LP clipped		TOTALS:	4 Females all LP clipped		TOTALS:	2 Immatures LP clipped		

WALLEYE / ELECTROFISHING / RUN: Mainstem

River Name

KOA → 77

WDNR Comments

DATA COLLECTION SHEET (3600-190-G/E/A1) **GAMEFISH** Wisconsin Department of Natural Resources

Waterbody Name: Namekagon Above LH
MWB Code/WBIC:
Waterbody Type: River
County: Sawyer
Date (MM/DD/YY): 4/11/2005 Minishock
Station: Phipps road nw mini
Start Time: 2:00 PM
End Time: 4:00 PM
Total Time Shocking : 1.4 hrs
Collectors: Pratt/Warwick

Target Fish: Spawning walleye/Brwn trout
Mark(s) Given: LP walleye only
Survey Type: Population Estimate
Gear Type: Boomshocker
Weather: suny, warm
Adverse Conditions: None

Water Temperature: 49
Water Conductivity: Moderate
Water Level: Normal
Water Clarity: L Brwn

Pulser Box Meter Start Time: MINI
Pulser Box Meter End Time:
Total Elapsed Time:
Volts/Amps: 230/2.3
Pulse Rate:
Duty Cycle:
Current Type: AC
Distance Shocked: 2.7 miles
Entire Shoreline Shocked:
Number of Dippers: [1
Dipnet Mesh Size: 3/8"

	MALrown trou Brwn Trout		FEMALE		UNKNOWN Rainbow Trout			OTHER Abundance					
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclip	Clip	Unclip	Clip	Unclip	Clip
<3.0							25.5-25.9						
3.0-3.4							26.0-26.4						
3.5-3.9							26.5-26.9	WS Abundant-spawning					
4.0-4.4							27.0-27.4	NHS-Common, spawning					
4.5-4.9							27.5-27.9	RH spp.-Common, pre-spawn					
5.0-5.4							28.0-28.4	WE-Present, post-spawn					
5.5-5.9							28.5-28.9	Brook trout- Rare					
6.0-6.4							29.0-29.4	Trout perch- Common, spawning					
6.5-6.9							29.5-29.9						
7.0-7.4	1						30.0-30.4						
7.5-7.9							30.5-30.9						
8.0-8.4	4						31.0-31.4						
8.5-8.9							31.5-31.9						
9.0-9.4	1						32.0-32.4						
9.5-9.9	1						32.5-32.9						
10.0-10.4	1						33.0-33.4						
10.5-10.9	1						33.5-33.9						
11.0-11.4	2						34.0-34.4						
11.5-11.9	1						34.5-34.9						
12.0-12.4	2						35.0-35.4						
12.5-12.9	1						35.5-35.9						
13.0-13.4	1						36.0-36.4						
13.5-13.9	3						36.5-36.9						
14.0-14.4	2						37.0-37.4						
14.5-14.9	4						37.5-37.9						
15.0-15.4	3						38.0-38.4						
15.5-15.9	4				1		38.5-38.9						
16.0-16.4							39.0-39.4						
16.5-16.9							39.5-39.9						
17.0-17.4	1						40.0-40.4						
17.5-17.9	2						40.5-40.9						
18.0-18.4	1						41.0-41.4						
18.5-18.9							41.5-41.9						
19.0-19.4							42.0-42.4						
19.5-19.9	2						42.5-42.9						
20.0-20.4	1						43.0-43.4						
20.5-20.9	1						43.5-43.9						
21.0-21.4							44.0-44.4						
21.5-21.9							44.5-44.9						
22.0-22.4							45.0-45.4						
22.5-22.9							45.5-45.9						
23.0-23.4							46.0-46.9						
23.5-23.9							47.0-47.9						
24.0-24.4							48.0-48.9						
24.5-24.9							49.0-49.9						
25.0-25.4							50.0+						
TOTALS:	40 Brwn				1 Rainbow								

_____ / ELECTROFISHIN TROUT

WDNR Comments

Hayward Survey

Station

Station 75985
Survey 81463 → Into Lake Hayward General
WBIC 496642

Out of Greater WE PE. Survey

Netting + Shocking (MW boom) for Marking

Boomshocker for recap.

Talk to Joanna

WISCONSIN CONSERVATION DEPARTMENT LAKE SURVEY MAP

WDNR Comments

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PANFISH LENGTH FREQUENCY
FORM 3600-64 REV. 3-81

net 1 - 150 TOT. WS - 19.5
net 2 - 50 TOT
net 3 - 30 TOT / 230 TOT - SHAES PD.

(Turtles) Soft shell - III
PT ~~IIII IIII~~ + 15 ~~IIII~~
PT ~~IIII~~ II
SNT - 1

16.8 30.0 8.8 21.0
NP 26.5 17.0 13.0 13.5
12.0 7.0 23.5 19.0 15.1

INCHES

COUNTY: COUNTY CODE 58 | WATER: LH | WATER CODE ____ | DATE: 5/18/05 | GEAR: 8 Fyke (4')

SIZE RANGE INCHES	BG	BC	YP	PS
1.0-1.4				
1.5-2.0				
2.1				
2.2				
2.3				
2.4				
2.5				
2.6				
2.7				
2.8				
2.9				
3.0				
3.1				
3.2	•			
3.3				
3.4				
3.5	•			
3.6				
3.7				
3.8	•			
3.9				
4.0				
4.1				
4.2			•	
4.3				
4.4				
4.5				
4.6				
4.7	••			
4.8				•
4.9				
5.0				
5.1	••			
5.2	••			••
5.3	••			
5.4	••			••
5.5	••			•
5.6	••			•
5.7	••		•	••
5.8	•••			•
5.9				
6.0	••••			•••
6.1	•			•••
6.2	•••			••
6.3	tally			tally
6.4	••			•••
6.5	☒ •			☒
6.6	☒		•	••
6.7	tally			••
6.8	☒ •••	•		••
6.9	tally			
TOTALS				

SIZE RANGE INCHES	BG	BC	YP	PS
7.0	☒ ☒ ☒ ••			•••
7.1	☒ ••••			
7.2	☒ ☒ •••		•	
7.3	☒ ☒ ••••			••
7.4	☒ •			
7.5	☒ ☒ •••	•	•	
7.6	••••			
7.7	☒ •	•		
7.8	•••			•
7.9	••••			
8.0	☒	•	•••	
8.1	••			
8.2	••••			
8.3		•	•	BIBh
8.4	•••	•	•	10.0
8.5	••			
8.6				
8.7	•			
8.8			••	
8.9				
9.0			••••	
9.1				
9.2			•	NE.
9.3				
9.4				24.5 Rele.
9.5		•	•••	19.8 Released
9.6				
9.7				
9.8				
9.9			•	
10.0		••	•	
10.2			•	
10.4		•		
10.6		•		
10.8				
11.0				
11.2				
11.4				
11.6				
11.8				
12.0				
12.2				
12.4				
12.6				
12.8				
13.0				
13.2				
13.4				
13.6				
13.8				
14.0+				
TOTALS				

net 4 - 10 | net 5 - 15 | net 6 - 20 | net 7 - 15 | net 8 - 10 | 60 to NFWFIHOF

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500

Sampling Objective	Number and Locations of Stations (Habitat)	
Basie Inventory		Source
	Miles Actually Shocked = 5.4	LM
Period Fished (Dates)	Acres = 247	LM
09/25/06	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time	
1.5	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Reeruitment Code:	C-NR
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	0		-	0.00 / hour	0.00 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	0		-	0.00 / hour	0.00 / mile
Walleye (Other)	10	None	11.0 - 23.4	6.67 / hour	1.85 / mile
Smallmouth Bass	1	None	17.0 - 17.4	0.67 / hour	0.19 / mile
Largemouth Bass	31	8.5-8.9	3.0 - 19.4	20.67 / hour	5.74 / mile
Muskellunge	5	None	10.0 - 48.9	3.33 / hour	0.93 / mile
Northern Pike	24	None	6.5 - 30.4	16.00 / hour	4.44 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Bluegill	Common		Bullhead spp.	Present	
Pumpkinseed	Present		Redhorse spp.	Common	
Black Crappie	Present				
Yellow Pereh	Common				
Rock Bass	Present				
White Sucker	Common				
Bluntnose Minnow	Present				
Blaeknose Shiner	Present				

1) Tank Mortality: None 2) Weather: NA 3) Reliabilty: Medium

4) Stoeking: 2469 Walleye, 6.8 inehes, 09/15/06, DNR 136 Muskellunge, 12.4 inehes, 09/21/06, DNR

5) Comments:

Rev. 10-70

Signed (Compiler)	Jamison L. Wendel	Date	12/12/06

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SH
Form 3600A-191

Lake: Hayward MWB Code: 2725500 Date: 09/25/06 County: Sawyer Collector(s): Warwick, Pratt

Target Fish: All Species Survey Type: Basic Inventory Mark Given: None Water Temperature: 59°F Station: Portion of Shoreline

Adverse Conditions: NA Gear Type: Boomshocker Distance Shocked: 5.4 miles

Volts: NA Amps: NA Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: NA Shocking End Time: NA Generator Start Hour: 584.1 Generator End Hour: 585.6

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4	1	
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4	1	
5.5-5.9			19.5-19.9		
6.0-6.4			20.0-20.4		
6.5-6.9			20.5-20.9		
7.0-7.4			21.0-21.4		
7.5-7.9			21.5-21.9	1	
8.0-8.4			22.0-22.4	1	
8.5-8.9			22.5-22.9		
9.0-9.4			23.0-23.4	1	
9.5-9.9			23.5-23.9		
10.0-10.4			24.0-24.4		
10.5-10.9			24.5-24.9		
11.0-11.4	1		25.0-25.4		
11.5-11.9	2		25.5-25.9		
12.0-12.4			26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4	1		27.0-27.4		
13.5-13.9			27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9			28.5-28.9		
15.0-15.4	1		29.0-29.4		
15.5-15.9			29.5-29.9		
16.0-16.4			30.0 +		
			Totals:	10	0

WALLEYE

WDNR Comments

of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)
Form 3600F-186
8-95

ayward MWB Code: 2725500 Date: 09/25/06 County: Sawyer Collector(s): Warwick, Pratt

Fish: All Species Survey Type: Basic Inventory Mark Given: None Water Temperature: 59°F Station: Portion of Shoreline

/erse Conditions: NA Gear Type: Boomshocker Distance Shocked: 5.4 miles

/olts: NA Amps: NA Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: NA Shocking End Time: NA Generator Start Hour: 584.1 Generator End Hour: 585.6

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4					2				26.5-26.9				
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9									29.0-29.4				
6.0-6.4					2				29.5-29.9	1			
6.5-6.9	1				1				30.0-30.4	1			
7.0-7.4	1								30.5-30.9				
7.5-7.9					1				31.0-31.4				
8.0-8.4									31.5-31.9				
8.5-8.9	3				6				32.0-32.4				
9.0-9.4					1				32.5-32.9				
9.5-9.9					1				33.0-33.4				
10.0-10.4	1		1						33.5-33.9				
10.5-10.9									34.0-34.4				
11.0-11.4	3								34.5-34.9				
11.5-11.9	2		1		1				35.0-35.4				
12.0-12.4	2				4				35.5-35.9				
12.5-12.9									36.0-36.4				
13.0-13.4	3		1		3				36.5-36.9				
13.5-13.9	2		1		1				37.0-37.4				
14.0-14.4	2								37.5-37.9				
14.5-14.9	1								38.0-38.4				
15.0-15.4									38.5-38.9				
15.5-15.9	1				3				39.0-39.4				
16.0-16.4					1				39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4					1		1		40.5-40.9				
17.5-17.9									41.0-41.4				
18.0-18.4					2				41.5-41.9				
18.5-18.9									42.0-42.4				
19.0-19.4					1				42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4									45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9			1	
24.0-24.4									49.0-49.9				
Totals:	24	0	5	0	31	0	1	0	50.0+				

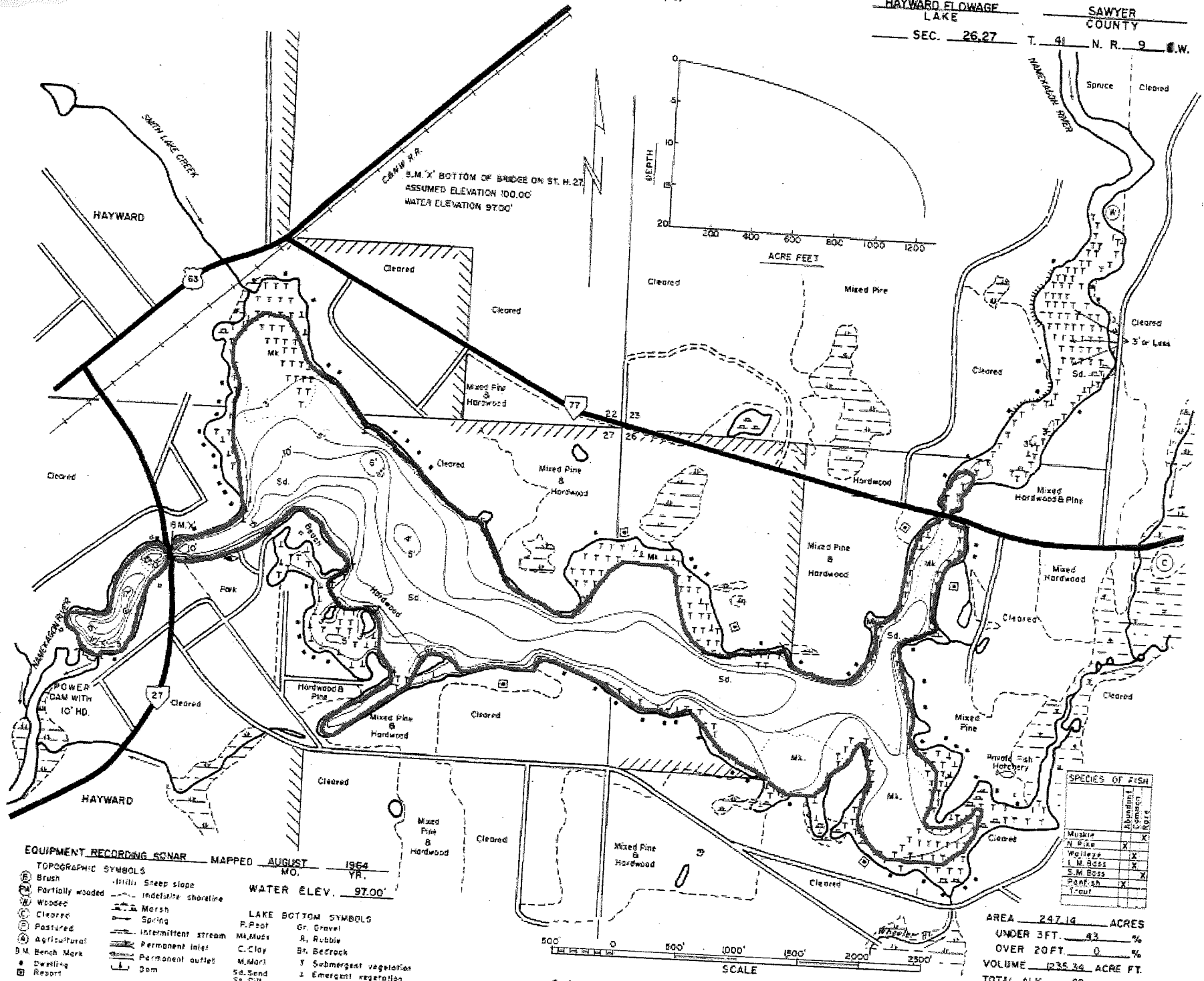
GAMEFISH

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- Submergent vegetation
- Emergent vegetation
- Floating vegetation

SCALE: 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H.Schmude W.Perkins J.Seither Drawn by: J.Rath

SPECIES OF FISH	Abundant	Common	Rare
Muskie			X
N. Pike	X		
Walleye		X	
L.M. Bass		X	
S.M. Bass			X
Panfish	X		
Trout			

AREA 247.16 ACRES

UNDER 3FT. 43 %

OVER 20FT. 0 %

VOLUME 1235.36 ACRE FT.

TOTAL ALK. 69 P.P.M.

SHORELINE 8.64 MILES

MAX DEPTH 17 FEET

WDNR Comments

Department of Natural Resources

WDNR Comments

Back for "A" (non-game, 0.5 mi.) substitution

Start 584.1

Stop 585.6

MONITORING

STATION FISH SAMPLING SUMM[ARY]

Form 3600-57

Temp 58.7

Nongame (Check)

~~STREAM~~ LAKE: HAYward

INVESTIGATOR: RW-JD L.N.

Area Sampled:	LENGTH: ~~2.0 mi~~	~~WIDTH~~ TOTAL ShoreLine	~~AREA (ACRES)~~	STATION NO. All	NO. PER ACRE	DATE 9/25/06

SIZE RANGE	Walleye	LMB	SMB	Mu	NP	Other
1						
1.0 - 1.4				36## +		
1.5 - 1.9				48.0 LV		
2.0 - 2.4	Survey ID					
2.5 - 2.9					29.5	
3.0 - 3.4	94137	II				
3.5 - 3.9					30.0	
4.0 - 4.4						
4.5 - 4.9						
5.0 - 5.4						
5.5 - 5.9						
6.0 - 6.4		II				
6.5 - 6.9		I			I	
7.0 - 7.4					I	
7.5 - 7.9		I				
8.0 - 8.4						
8.5 - 8.9		IIII I			II	
9.0 - 9.4		I				
9.5 - 9.9		I				
10.0 - 10.4				I	I	
10.5 - 10.9						
11.0 - 11.4	I				III	
11.5 - 11.9	II	I		I	II	
12.0 - 12.4		III			II	BG-C
12.5 - 12.9						YP-C
13.0 - 13.4	I	III		I	III	BC-P
13.5 - 13.9		I		I	II	BNM-P
14.0 - 14.4					II	BNS-P
14.5 - 14.9					I	Bh-P
15.0 - 15.4	I					WS/RH-C
15.5 - 15.9		III				PS-P
16.0 - 16.4		I			I	RB-P
16.5 - 16.9						
17.0 - 17.4	I		I			
17.5 - 17.9						
18.0 - 18.4		II				
18.5 - 18.9						
19.0 - 19.4	I	I				
19.5 - 19.9						
20.0 - 20.4						
20.5 - 20.9						
21.0 - 21.4						
21.5 - 21.9	I					
22.0 - 22.4	I					
22.5 - 22.9						
23.0 - 23.4	I					
23.5 - 23.9						
24.0 - 24.4						
24.5 - 24.9						
25 + (give actual size)						
TOTAL	10 WE	26 LMB	1 SMB	5 Mu	24 NP	

Done

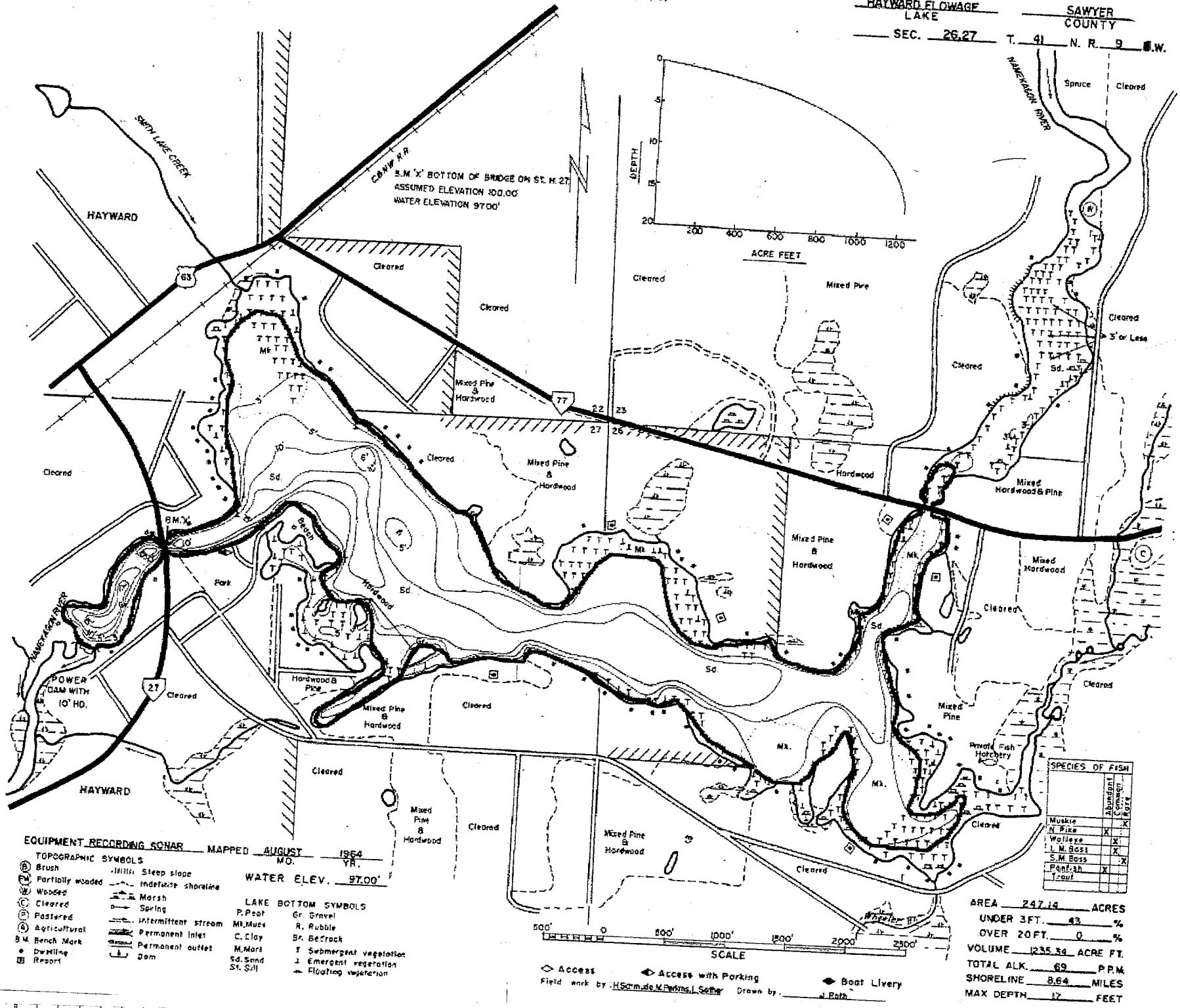
Proofed

Rev. 3-75

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 E.W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- Submergent vegetation
- Emergent vegetation
- Floating vegetation

SCALE 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◆ Access with Parking ● Boat Livery

Field work by H.Schmude, M.Perkins, J.Sather Drawn by J. Roth

SPECIES OF FISH	Abundant	Common	Rare
Muskie			X
N. Pike	X		
Walleye		X	
L.M. Bass		X	
S.M. Bass			X
Panfish	X		
Trout			

AREA 247.14 ACRES

UNDER 3FT. 43 %

OVER 20FT. 0 %

VOLUME 1235.34 ACRE FT.

TOTAL ALK. 69 P.P.M.

SHORELINE 8.64 MILES

MAX DEPTH 17 FEET

1.3 hrs. / 4.0 miles ST / Swims

WDNR Comments

Wisconsin
Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 Rev. 4-94

10005687

~~Tues~~ WED.

Lake Hayward MWB Code: 2725500 Date: 10 / 04 / 07 County: SAWYER Collector: RW / FBP / JD

Target Fish: All Survey Type: FERC ~~Lake Monitor~~ Mark Given: None* H_2O Temp: 58.9 Time 21 : 30

Adverse Conditions: None H_2O Conduct: High Station: 1 / 1A South

Volts: 190 Amps: 8 Current Type (AC/~~DC/Pulsed DC~~) ~~Pulse Rate:~~ ~~Duty Cycle:~~

Gear Type: VV AC BS Start Time: 20:30 End Time: Distance Shocked: 4.0 (0.5*)

# of Dippers: ~~1~~ (2) Entire Shoreline Shocked: ~~Y~~/N/I ~~Dip net mesh size:~~ 3/8" H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	W.E.	LMB	SMB	NP	Inches	NP	MU		OTHER
4.0 - 4.4		1.8			30.0 - 30.4				
4.5 - 4.9		1.9			30.5 - 30.9				17 mud minnows
5.0 - 5.4		2.5			31.0 - 31.4				2.4 - 4.2" - "A"
5.5 - 5.9		2.5			31.5 - 31.9		None		
6.0 - 6.4		II 3.9	None		32.0 - 32.4				SH RH
6.5 - 6.9		I 2.7			32.5 - 32.9				14.5
7.0 - 7.9		I			33.0 - 33.4	I			
7.5 - 7.9		I			33.5 - 33.9				Chestnut Lamprey
8.0 - 8.4		I			34.0 - 34.4				9.6"
8.5 - 8.9				I	34.5 - 34.9				
9.0 - 9.4		I			35.0 - 35.4				YBH
9.5 - 9.9		I		II	35.5 - 35.9				10.4
10.0-10.4	I	I			36.0 - 36.4				12.5
10.5-10.9	I	IIII			36.5 - 36.9				BIBH
11.0-11.4		I		I	37.0 - 37.4				11.0
11.5-11.9				II	37.5 - 37.9				
12.0-12.4		I			38.0 - 38.4				
12.5-12.9	I			I	38.5 - 39.9	17 NP	0 MU		
13.0-13.4		II		I	39.0 - 39.4				
13.5-13.9	II				39.5 - 39.9				
14.0-14.4	I				40 +				
14.5-14.9		I		I	* Nongame / PAN - 0.5 mile sub-station "A"				
15.0-15.4									
15.5-15.9						BG	BC	PS	YP
16.0-16.4		I		I	III <1.0	Abundant			
16.5-16.9	III	I			1.5				
17.0-17.4	II				2.0	II 2	I		
17.5-17.9					2.5	:: 14			I
18.0-18.4		II		I	3.0	:: 4		I 1	
18.5-18.9				III	3.5	C 17			
19.0-19.4	I			I	4.0	·· 22		IIII 4	II
19.5-19.9		I			4.5	· 11		III 3	
20.0-20.4					5.0	I I		II 2	
20.5-20-9					5.5	IIII 5			
21.0-21.4					6.0	:: 15		IIII II 7	I
21.5-21.9					6.5	· 11	II	IIII 5	I
22.0-22.4					7.0	· 11			
22.5-22.9					7.5	IIII 5		I I	I
23.0-23.4				I	8.0	I I			II
23.5-23.9					8.5		III		II
24.0-24.4					9.0				I
24.5-24.9					9.5				I
25.0-25.4					10.0		I		I
25.5-25.9					10.5				I
26.0-26.4					11.0				I
26.5-26.9					11.5				
27.0-27.4					12.0				
27.5-27.9									
28.0-28.4									
28.5-28.9				NP					
29.0-29.4				16 sub					
29.5-29.9	12 W.E.	30 LMB	0 SMB	TOT			~~0 MU~~		

Proof of Done

A very small <1.0" BG very abundant

Other fish: Can include rarely caught species and fish greater than 30 inches.
*Stocked EG fpl ~2500 OTC marked 93

WS - 21.0" 10.0, 13.6, 8.2
20.0" TOT. - 7 - "A"

1.0 hrs / 2.6 miles ST 2 "A" – 0.5 mi

WDNR Comments

...nt of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 Rev. 4-94

...: Hayward MWB Code: ________ Date: 10 / 05 (WED) / 07 County: SAWYER Collector: RW / FBP / JD

...rget Fish: All Survey Type: Pafl Muskie / FERC Mark Given: OTC Sp... H$_2$O Temp: 57.6 Time 22 : 00

Adverse Conditions: Cloudy, Rain H$_2$O Conduct: High Station: 2 North "A" = 0.5

Volts: 190 Amps: 8 Current Type (AC/~~DC/Pulsed DC~~) ~~Pulse Rate: Duty Cycle:~~

Gear Type: VV AC BS Start Time: ____________ End Time: 2300 Distance Shocked: 2.6 (0.5) * A

# of Dippers: 1 (2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: 3/8" H$_2$O Clarity: (Clear/Turbid/Very Turbid)

Inches	W.E.	LMB	SMB	NP	Inches	NP	Mu			
4.0 - 4.4					30.0 - 30.4		41.0			
4.5 - 4.9					30.5 - 30.9					
5.0 - 5.4					31.0 - 31.4					
5.5 - 5.9					31.5 - 31.9					
6.0 - 6.4					32.0 - 32.4					
6.5 - 6.9					32.5 - 32.9					
7.0 - 7.9					33.0 - 33.4					
7.5 - 7.9					33.5 - 33.9	|				
8.0 - 8.4					34.0 - 34.4					
8.5 - 8.9					34.5 - 34.9					
9.0 - 9.4					35.0 - 35.4					
9.5 - 9.9					35.5 - 35.9					
10.0-10.4					36.0 - 36.4					
10.5-10.9					36.5 - 36.9					
11.0-11.4					37.0 - 37.4					
11.5-11.9					37.5 - 37.9		1 Mu			
12.0-12.4		|			38.0 - 38.4					
12.5-12.9		|			38.5 - 39.9					
13.0-13.4					39.0 - 39.4					
13.5-13.9					39.5 - 39.9			"A" Pan		
14.0-14.4					40 +					
14.5-14.9				|	PS	TL	BG	BC	YP	
15.0-15.4				|||		1.0	*A			
15.5-15.9		|		|		1.5				
16.0-16.4	|					2.0				
16.5-16.9						2.5	||			
17.0-17.4						3.0			|	
17.5-17.9				|		3.5	||||| |			
18.0-18.4					|	4.0	||||| |||||			
18.5-18.9		|				4.5	||||| |			
19.0-19.4					|	5.0	||||			
19.5-19.9					||	5.5	|||		|	
20.0-20.4					||	6.0	||			
20.5-20-9					||	6.5	||	|		
21.0-21.4			0			7.0	|||||	|		
21.5-21.9						7.5	|||||		|	
22.0-22.4						8.0	|		|	
22.5-22.9	|					8.5				
23.0-23.4						9.0				
23.5-23.9						9.5				
24.0-24.4						10.0			||	
24.5-24.9						10.5		|		
25.0-25.4						11.0				
25.5-25.9						11.5				
26.0-26.4						12.0				
26.5-26.9						12.5				
27.0-27.4						13.0		*<1	BG – Cranna	
27.5-27.9										
28.0-28.4										
28.5-28.9										
29.0-29.4										
29.5-29.9										

Proofed Done

Other fish: Can include rarely caught species and fish greater than 30 inches. WS – 17.5, 18.5, 19.0 CS - 3.1
mm – 2.9 SHRH – 14.5, 10.2

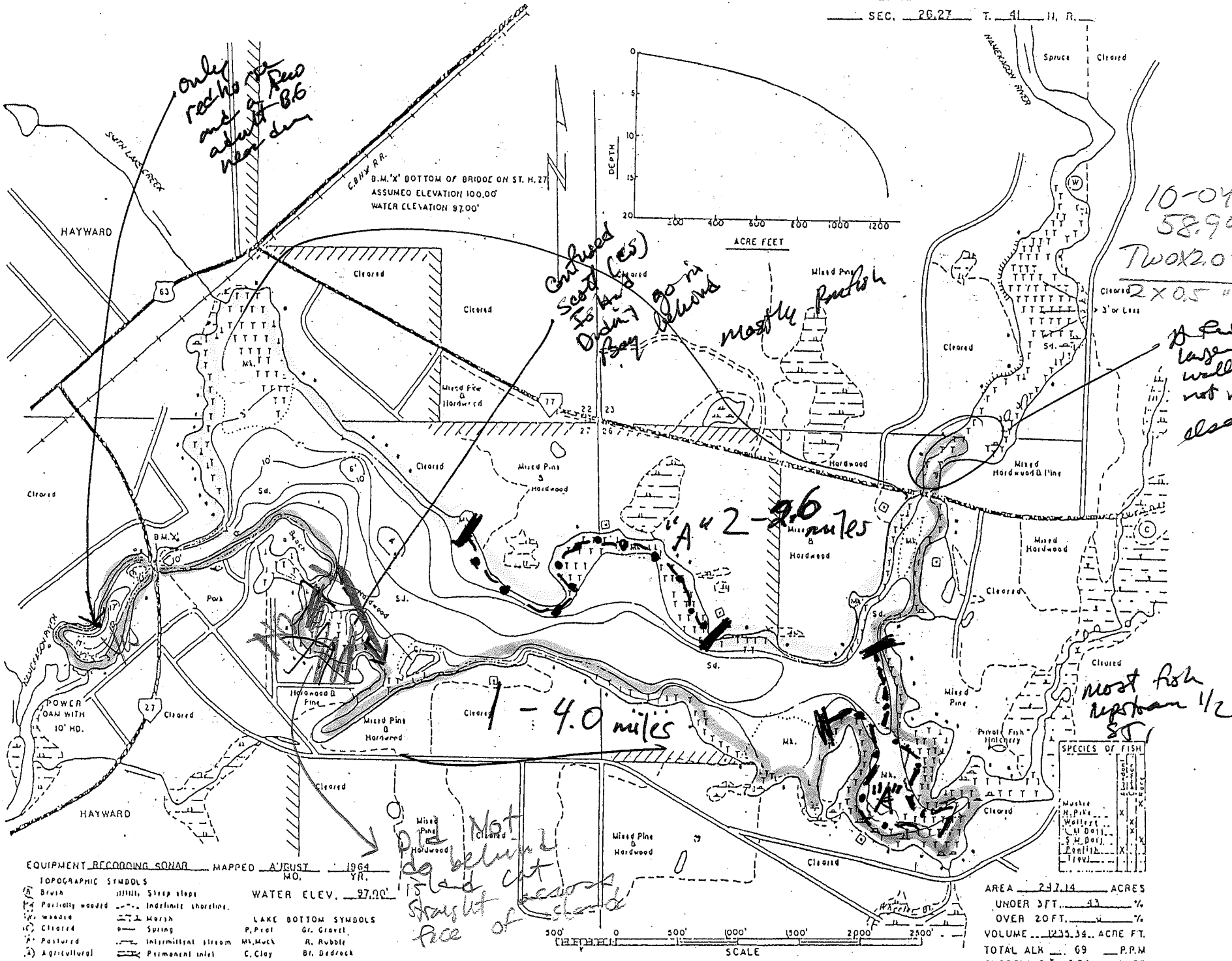
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE

SEC. 26,27 T. 41 N. R.

WDNR Comments



WISCONSIN CONSERVATION DEPARTMENT

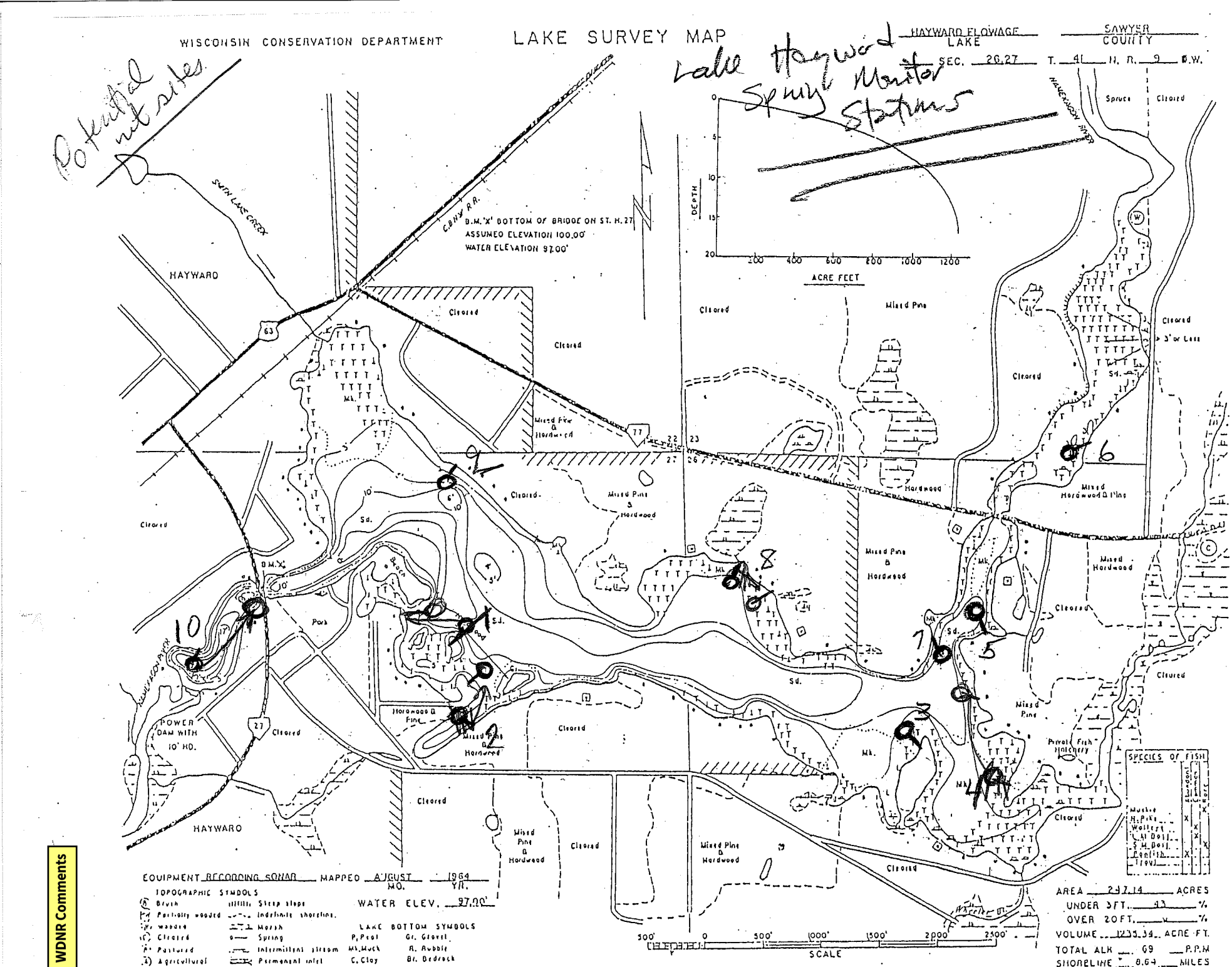
LAKE SURVEY MAP

Lake Hayward Spring Monitor Stations

Potential nit sites

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.W.



AREA 297.14 ACRES
UNDER 3FT. 93 %
OVER 20FT. — %
VOLUME 1235.34 ACRE-FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

A-96

WDNR Comments

Sheet noted 1-12-09 ~~Survey~~ Station 122431 Survey 3692814 WBIT 610312

rain paper

NETTING CPE DATA COLLECTION SHEET (3600-186-CPE/N)

Wisconsin Department of Natural Resources

Waterbody Name: Lake Hayward DAY 1-PAN
MWB Code/WBIC: 2725500
Waterbody Type: Impoundment
County: Sawyer
Date (MM/DD/YY): 4/24/08
Station: 1 - 10
Start Time: 9 Am
End Time:
Collectors: JK, FBP, JD

Target Fish: BC, YP
Mark Given: None
Survey Type: Population Estimate
Gear Type: Fyke Net 3/4"
Weather: Raining
Adverse Conditions: High Water
Water Temperature: 46
Water Level: (HI) [NORM] [LOW]
Water Clarity: LBr

Number of Nets: 10
Number of Nights: 1
Net Frame Height: 4
Net Frame Width: 5
Lead Length: 75'
Largest Bar Mesh Size: 3/4"
Smallest Bar Mesh Size:
Mesh Color: Green
Mesh Material: Nylon

SPECIES	Net # 6	Net # 5	Net # 7	Net # 4	Net # 3	Net # 8	Net # 2	Net # 1	Net # 9	Net # 10	Net #	Net #	TOTALS
BLG	23	38,9	22	26,13,+	21	23	23	12,11	22	1			248 BG
Rock bass	1	1	3	1	1	1	0	1	0	||||			13 RB
LMB	0	3	4	0	4	2	0	1	0	1			15 LMB
BLK Bull	0	2	0	11	0	1	1	|||	0	0			9 BlBh
SHRH	1	0	0	0	0	0	0	0	0	0			1 SHRH
BCP	2	39	7	30	23								BC 116 TOT
~~BLG~~				~~52~~									
NPK		16	~~||||~~ ~~||||~~ 1	23	6								103 NP
WAL		2						1	1	||||			9 WE
~~LMB~~						||							15 LMB
YLP		2		12	11								98 TOT YP
MSK			2	2	3								
PKS			2	~~||||~~ || 7	3	8	7	4					31 PS
CNL				1			1						2 CL
WHS					1					|||			4 WS
NHS					2			1					3 NHS
YEL bull								1	1				2 YBH

O. virilis common | mudpuppy in #1

WDNR Comments

…ment of Natural Resources

NETTING DATA COLLECTION SHEET (3.0 in. - 12.9 in.)
Form 3600-191 Rev. 5-95

Lake: Hayward MWB Code: 2725500 Date: 4 / 24 / 08 County: Sawyer Collector: JIC, FBP, JP

Target Fish: WE, E, YP, BC Survey Type: BLM Mark Given: None H_2O Temp: 46 Time: ___ : ___

Adverse Conditions: Rainy, high water Station: ___

Latitude: ___ Longitude: ___

Net Type: Fyke 3/4" Length/Frame: 4X5 Bar Mesh: 3/4"

Color: Green Mesh Type: Nylon Net Nights: 10

Inches	BCP	YLP	WHS	NHS	Inches	BCP	YLP		
<3.0									NET 1
3.0			15.3	9.8	8.0	6	5		Species
3.1			19.0	8.6	8.1	3	2		Count
3.2			19.5	4.5	8.2	8	4		
3.3			14.0	3 NHS	8.3	5	2		Species
3.4			17.0		8.4	7	2		Count
3.5					8.5	4			
3.6			5WS		8.6	6	3		Species
3.7			TOT		8.7	4	1		Count
3.8					8.8	5	2		
3.9					8.9	2			NET 2
4.0					9.0		3		Species
4.1					9.1	3	1		Count
4.2					9.2	3	2		
4.3					9.3	3	1		Species
4.4					9.4	3	2		Count
4.5					9.5				
4.6					9.6	3			Species
4.7					9.7	[illegible]	2		Count
4.8					9.8	1			
4.9					9.9	3			Net 3
5.0					10.0		1		Species
5.1		1			10.1		1		Count
5.2		1			10.2	1	1		
5.3		1			10.3				Species
5.4					10.4	1	1		Count
5.5		1			10.5	1			
5.6	1				10.6				Species
5.7	1	4			10.7				Count
5.8	2				10.8				
5.9	1				10.9				Net 4
6.0		2			11.0				Species
6.1	1	3			11.1				Count
6.2	2	4			11.2	1			
6.3					11.3				Species
6.4	2	1			11.4				Count
6.5	2	6			11.5				
6.6	1				11.6	1	1		Species
6.7	1	6			11.7				Count
6.8	2	4			11.8				
6.9	2	1			11.9	1			Net 5
7.0	2	4			12.0		1		Species
7.1	3	3			12.1				Count
7.2	5	5			12.2				
7.3					12.3				Species
7.4	2	3			12.4				Count
7.5	2	1			12.5				
7.6	3	2			12.6				Species
7.7	3	2			12.7				Count
7.8	2	3			12.8				
7.9	1	3			12.9				

~~110 TOT BC~~

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

248 BG counted/ not measured

WDNR Comments

ənt of Natural Resources

NETTING DATA COLLECTION SHEET (4.0 in. - 40+ in.)

Form 3600-188 Rev. 4-94

Lake Hayward MWB Code: _____ Date: 4/24/08 County: _____ Collector: JK, FBT, JD

Target Fish: YP, E, WE, BS Survey Type: BHM Mark Given: None H_2O Temp: 46 Time 9:00 AM

Adverse Conditions: Rain, high water/flow Station: Ten (See Map

Net Type: Fyke 3/4" Length/Frame: _____ Bar Mesh: _____

Color: Green Mesh Type: Nylon Net Nights: 10 x 1

Inches	NPK	LMB	WAL	SMRH	Inches	MSK	NPK	NET 1		
13.0-13.4					30.0 - 30.4			Species		
4.5 - 4.9					30.5 - 30.9		F	Count		
5.0 - 5.4					31.0 - 31.4					
5.5 - 5.9					31.5 - 31.9		F	Species		
6.0 - 6.4					32.0 - 32.4			Count		
6.5 - 6.9					32.5 - 32.9					
7.0 - 7.9					33.0 - 33.4			Species		
7.5 - 7.9					33.5 - 33.9			Count		
8.0 - 8.4					34.0 - 34.4	F	F			
8.5 - 8.9					34.5 - 34.9			NET 2		
9.0 - 9.4					35.0 - 35.4			Species		
9.5 - 9.9					35.5 - 35.9			Count		
10.0-10.4					36.0 - 36.4		F			
10.5-10.9					36.5 - 36.9			Species		
11.0-11.4	1 1		III	1	37.0 - 37.4	M		Count		
11.5-11.9					37.5 - 37.9	F				
12.0-12.4	1 1				38.0 - 38.4			Species		
12.5-12.9	FIMII 6				38.5 - 39.9	M		Count		
13.0-13.4	IIMMIMM 7				39.0 - 39.4					
13.5-13.95	MMMMM 4				39.5 - 39.9			NET 3		
14.0-14.46	MFFMM				40 +			Species		
14.5-14.94	MMFM		1		46.2	F		Count		
15.0-15.47	IIMFMM									
15.5-15.95	IMMMF		1		28.0	M		Species		
16.0-16.45	MFMFM		1					Count		
16.5-16.96	MFMMMF		1		48.4F					
17.0-17.45	FMMMM				46.5 F			Species		
17.5-17.93	IMM				42.5 U			Count		
18.0-18.45	FIFMM									
18.5-18.96	FIMMMM				9 TOT MU			NET 4		
19.0-19.44	MIIM							Species		
19.5-19.92	FF	15 TOT LMB					103 TOT NP	Count		
20.0-20.41	I									
20.5-20-91	F							Species		
21.0-21.41	F							Count		
21.5-21.91	M									
22.0-22.41	F							Species		
22.5-22.92	FM							Count		
23.0-23.43	FFF									
23.5-23.91	F		II					NET 5		
24.0-24.43	FFM							Species		
24.5-24.91	F							Count		
25.0-25.41	F									
25.5-25.9								Species		
26.0-26.4								Count		
26.5-26.9										
27.0-27.42	FF		9 TOTAL WE					Species		
27.5-27.91	F							Count		
28.0-28.42	FF									
28.5-28.9										
29.0-29.4										
29.5-29.91	F									

Other fish: Can include rarely caught species and fish greater than 30 inches.

38.6 - 16:13 - M, 37.2 - 13:14 - M, ← MU weights lbs:oz fish are included above

Shee **WDNR Comments** provided JHK 1-12-09 Station 122431

NETTING CPE DATA COLLECTION SHEET (3600-186-CPE/N) Survey 3692814 Visit 610313 Wisconsin Department of Natural Resources

Waterbody Name: Lake Hayward
MWB Code/WBIC:
Waterbody Type:
County:
Date (MM/DD/YY): 9/25/08
Station:
Start Time:
End Time:
Collectors:

Target Fish:
Mark Given:
Survey Type: Population Estimate
Gear Type: Fyke Net
Weather:
Adverse Conditions:
Water Temperature:
Water Level: [HI] [NORM] [LOW]
Water Clarity:

Number of Nets:
Number of Nights:
Net Frame Height:
Net Frame Width:
Lead Length:
Largest Bar Mesh Size:
Smallest Bar Mesh Size:
Mesh Color:
Mesh Material:

SPECIES	Net # 6	Net # 5	Net # 7	Net # 4	Net # 3	Net # 8	Net # 2	Net # 1	Net # 9	Net # 10	Net #	Net #	TOTALS
BLG	(4)	17,1,7 6,7,3 (41)	10,4 (14)	5,5,2 5,9,3,12 (41)	13,2,3 2 (20)	8,4,5 2,6 (25)	2	4,10,1 1 (16)	9,9,4 13,5,12 1,1 (54)	1			185 TOT BG
BC													69 BC
YP													111 YP
Mu													5 Mu
BIK bullhead	1		1					1,1,1 (3)					5 BLK H
SHRH	1			1				1					3 SHRH
Bwbt	1												1 Bulhd
Rockbass		3,2,1 (6)	2,1 (3)	1,2,3 (6)	1,1 (2)	1				8,3,1			30 RB
WAL		1							1				6 WE
LMB		1	1			1,1,1 (3)							5 LMB
PKS		1		12,1,1,7,3 (14)	1,3 (4)	2,3 (5)	3,1,1 (5)	2,1,1 (4)	1	2,			36 PS
Yellow bullhead				1				1	1				3 YBH
WHS	1									11			3 WS

Lots of Big NP

WDNR Comments

Natural Resources

NETTING DATA COLLECTION SHEET (4.0 in. - 40+ in.)

Form 3600-188 Rev. 4-94

e Hayward MWB Code: _____ Date: 4/25/08 County: 58 Collector: RW/JD/JK

arget Fish: WE, NP, YP, BG Survey Type: RLM Mark Given: None H_2O Temp: 50°F Time 8:00

Adverse Conditions: Rain / high-water / Deer Lk. schedule Station: 1-10

Net Type: Fyke Length/Frame: 4X5 Bar Mesh: 3/4"

Color: Green Mesh Type: Nylon Net Nights: 10 X 1 net

Inches	NPK		WS	WM	Inches	MSK	NP	NET 1		
4.0 - 4.4					30.0 - 30.4		M1	Species		
4.5 - 4.9					30.5 - 30.9		1	Count		
5.0 - 5.4					31.0 - 31.4		1			
5.5 - 5.9					31.5 - 31.9			Species		
6.0 - 6.4					32.0 - 32.4			Count		
6.5 - 6.9			1		32.5 - 32.9		F1			
7.0 - 7.9					33.0 - 33.4		F	Species		
7.5 - 7.9					33.5 - 33.9		F	Count		
8.0 - 8.4					34.0 - 34.4					
8.5 - 8.9	1				34.5 - 34.9			NET 2		
9.0 - 9.4					35.0 - 35.4			Species		
9.5 - 9.9					35.5 - 35.9		1	Count		
10.0-10.4					36.0 - 36.4					
10.5-10.9					36.5 - 36.9			Species		
11.0-11.4	M				37.0 - 37.4			Count		
11.5-11.9	M				37.5 - 37.9					
12.0-12.4	1M1			1	38.0 - 38.4			Species		
12.5-12.9	1			1	38.5 - 39.9	M		Count		
13.0-13.4	M1M				39.0 - 39.4					
13.5-13.9	MMM			1	39.5 - 39.9			NET 3		
14.0-14.4 F	M1FMMMM				40 +			Species		
14.5-14.9	1MFM			F	48.5 F			Count		
15.0-15.4	MFFM				41.0 M					
15.5-15.9	MMF				45.5 M	(LV) *		Species		
16.0-16.4	MMMM		1		46.5 F			Count		
16.5-16.9	M1M1MF		1							
17.0-17.4	M1M							Species		
17.5-17.9	1M							Count		
18.0-18.4	FIMMM									
18.5-18.9	M							NET 4		
19.0-19.4	F1MFMM							Species		
19.5-19.9	MMMMM							Count		
20.0-20.4	MMMFM			M						
20.5-20-9	F1M							Species		
21.0-21.4	FF							Count		
21.5-21.9	MM									
22.0-22.4	M							Species		
22.5-22.9								Count		
23.0-23.4	F									
23.5-23.9								NET 5		
24.0-24.4	MM			1				Species		
24.5-24.9	F							Count		
25.0-25.4	F									
25.5-25.9								Species		
26.0-26.4								Count		
26.5-26.9	F1M									
27.0-27.4								Species		
27.5-27.9								Count		
28.0-28.4										
28.5-28.9	F									
29.0-29.4										
29.5-29.9										

Other fish: Can include rarely caught species and fish greater than 30 inches.

38.5 = 14.0 41.0 = 19.4 * LV-Clip 45.5 = 24.10 Tiger = 20.0

WDNR Comments

Resources

NETTING DATA COLLECTION SHEET (3.0 in. - 12.9 in.)
Form 3600-191 Rev. 5-95

Hayward MWB Code: _____ Date: 9/25/08 County: _____ Collector: RW/JD/JK

Target Fish: WE, NP, YP, BC Survey Type: BLM Mark Given: _____ H_2O Temp: 50°F Time 8 : _____

Adverse Conditions: Rain, high-water/walleye up-river Station: 1-10

Latitude: _____ Longitude: _____

Net Type: Fyke 3/4" Length/Frame: 4 x 5 Bar Mesh: 3/4"

Color: Green Mesh Type: Nylon Net Nights: 10

Inches	BCP	YP		NHS	Inches	BCP	YP		
<3.0									NET 1
3.0				9.0	8.0	II	++++ II		Species
3.1					8.1		I		Count
3.2					8.2	I	III		
3.3					8.3	III	III		Species
3.4					8.4	II	II		Count
3.5					8.5	IIII	II		
3.6					8.6	II	I		Species
3.7					8.7	I	I		Count
3.8					8.8	IIII	II		
3.9					8.9				NET 2
4.0	I				9.0	II	IIII		Species
4.1					9.1	I			Count
4.2					9.2	II	II		
4.3					9.3	II	I		Species
4.4					9.4	I			Count
4.5		II			9.5	I	I		
4.6					9.6				Species
4.7					9.7	I	I		Count
4.8					9.8				
4.9					9.9	I			Net 3
5.0	I				10.0	I			Species
5.1					10.1				Count
5.2		II			10.2				
5.3					10.3	I			Species
5.4					10.4				Count
5.5	I	II			10.5		I		
5.6					10.6				Species
5.7		II			10.7	II	I		Count
5.8		II			10.8				
5.9		II			10.9		III YP		Net 4
6.0		IIII			11.0	I			Species
6.1	I	II			11.1				Count
6.2	II	IIII			11.2				
6.3	II	III			11.3	I			Species
6.4	I	III			11.4				Count
6.5	++++ II	++++ II			11.5				
6.6	II	II			11.6	69 BC			Species
6.7		++++			11.7				Count
6.8		III			11.8				
6.9	IIII	I			11.9				Net 5
7.0		++++ II			12.0				Species
7.1	I	II			12.1				Count
7.2		++++			12.2				
7.3	III	++++ I			12.3				Species
7.4	I	I			12.4				Count
7.5	IIII	++++			12.5				
7.6		II			12.6				Species
7.7	IIII	III			12.7				Count
7.8		I			12.8				
7.9		I			12.9				

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

SHRH = 11.0, 8.7, 8.3

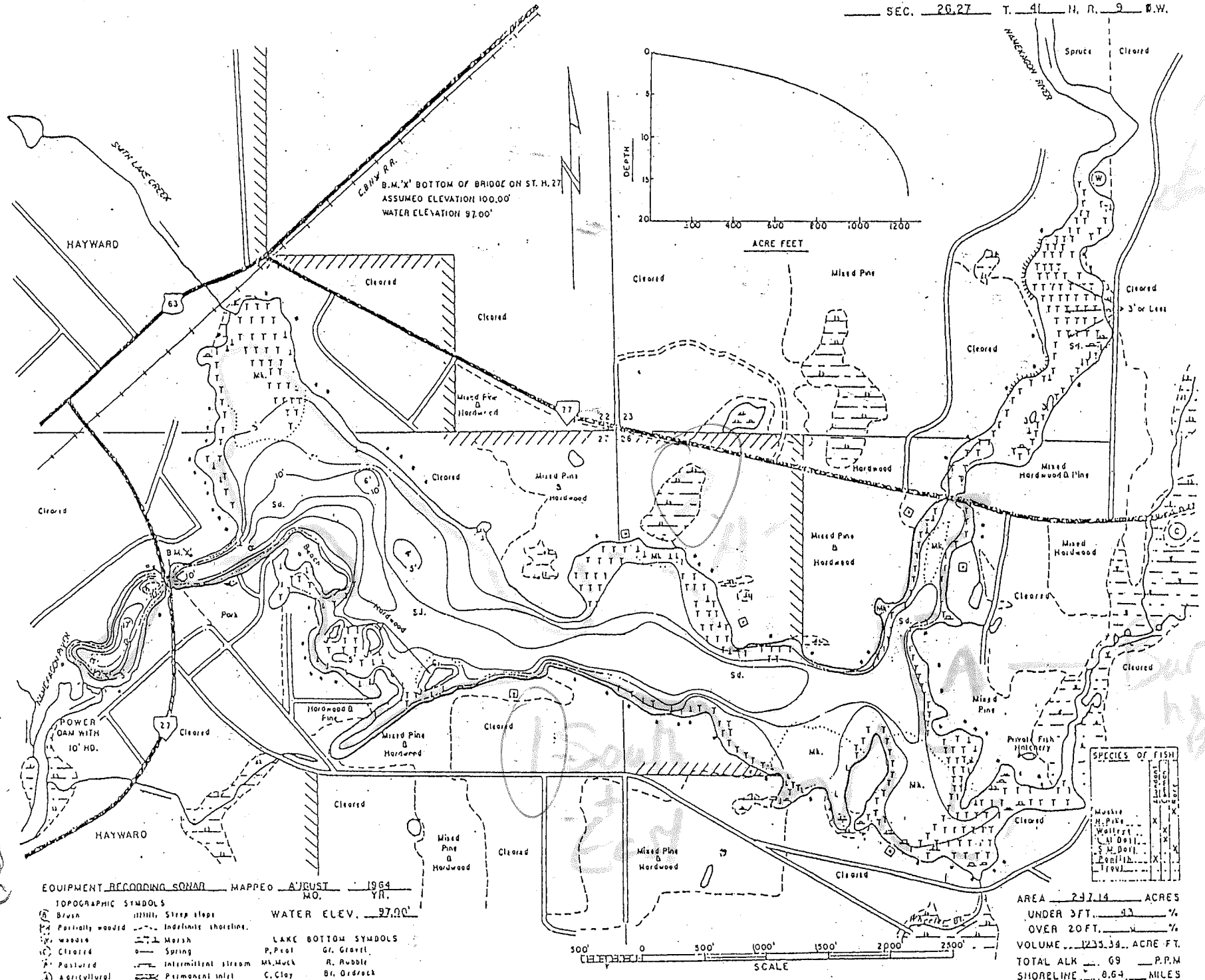
Burbot = 19.5

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- Brush
- Partially wooded
- Wooded
- Cleared
- Pastured
- Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Ordrock
- Submergent vegetation
- Emergent vegetation
- Floating vegetation

SCALE: 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◇ Access with Parking ◆ Boat Livery

Field work by: H. Schneider, M. Perlin, L. Sather Drawn by: J. Rath

AREA 247.14 ACRES
UNDER 20FT. 93 %
OVER 20FT. % %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

A-103

WDNR Comments

Department of Natural Resources

Stop 617.8 Barts Bay - Bridge @ C 1 mile

LAKE ELECTROFISHING DATA COLLECTION SHEET (3.0 in. - 13.1 in.)

Form 3600-190 Rev. 5-95

1A

Lake Haywood MWB Code: _____ Date: 6 / 9 / 08 County: Sawyer Collector: _____

Target Fish: Panfish Survey Type: _____ Mark Given: _____ H_2O Temp: 66.0 Time ____ : ____

Adverse Conditions: _____ H_2O Conduct: _____ Station: _____

Latitude: _____ Longitude: _____ 1 mile Panfish

Volts: 200 Amps: 8 Current Type (AC/DC/Pulsed DC) Pulse Rate: _____ Duty Cycle: _____

Gear Type: _____ Start Time: _____ End Time: _____ Distance Shocked: 1 mile

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: _____ H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	BG	PS	YP	BC	Inches	BG	PS	YP		WS
<3.0	IIII IIII	II	II						SHRH	
3.0	II		I		8.0				15.0	14.5
3.1	I				8.1					14.0
3.2	I		I		8.2					
3.3	I I	II	I		8.3					15.5
3.4	II	I			8.4					8.0
3.5		I			8.5					
3.6	I	II			8.6			I		8.5
3.7	III				8.7					14.5
3.8	I I				8.8					
3.9	IIII	IIII			8.9					20.5
4.0	IIIII II	I			9.0					
4.1	II				9.1					19.5
4.2	IIII	I			9.2					20.0
4.3	II				9.3					
4.4	II	III			9.4					16.5
4.5	IIII				9.5				BC	12.5
4.6	I				9.6				7.9	10.5
4.7	III				9.7					11.0
4.8					9.8				2.5	11.5
4.9					9.9					
5.0		I			10.0				(2)	9.5
5.1			I		10.1					
5.2	I	I			10.2					8.5
5.3	I	I			10.3					(16)
5.4	I	I			10.4					
5.5	II				10.5					MM
5.6	I				10.6					(3.2)
5.7	I		I		10.7					(3.1)
5.8					10.8					(2.3)
5.9		I			10.9					(3.0)
6.0	III	I			11.0					(2.6)
6.1	II	I			11.1					
6.2	I				11.2					(2.9)
6.3	III	I			11.3					(3.4)
6.4	II	I			11.4					
6.5	II	I	I		11.5					(3.0)
6.6	II				11.6					(2.7)
6.7	II	I			11.7					
6.8					11.8					(9)
6.9	II				11.9					
7.0	III		I		12.0					
7.1					12.1					
7.2	II	I			12.2					
7.3	I		I		12.3					
7.4	II				12.4					
7.5					12.5				CMLP	
7.6	II				12.6					
7.7					12.7					
7.8					12.8					
7.9			II		12.9					

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

(93) (30) (13)

Station 122431
Survey 5957379
Visit 610515
proofed SHC 1-12-09

WDNR Comments

LP BAY – Olsen 2A

[Depart]ment of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (3.0 in. - 13.1 in.)

Form 3600-190 Rev. 5-95

[L]ake: L. Hayward MWB Code: ______ Date: 6/9/08 County: ______ Collector: 1/2 Mile

Target Fish: PanFish Survey Type: B.L Mark Given: ______ H_2O Temp: 67.1 Time ___ : ___

Adverse Conditions: ______ H_2O Conduct: ______ Station: ______

Latitude: ______ Longitude: ______ Stop 618.1

Volts: 200 Amps: 6 Current Type (AC/DC/Pulsed DC) Pulse Rate: ______ Duty Cycle: PanFish

Gear Type: ______ Start Time: ______ End Time: ______ Distance Shocked: 1/2 mile

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: ______ H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	BG	PS	Y.P		Inches					
<3.0	|||||	||	||||				Rell	Hou[illegible]SC	SHRH	W.S
3.0	||	||				8.0		JRH	GRH	9.5	2.[illegible]
3.1					8.1					
3.2					8.2		7.0	17.0	6.5	
3.3					8.3			9.5	7.5	
3.4					8.4					
3.5	||				8.5					
3.6							8.6					
3.7	||				8.7					
3.8								8.8					
3.9	|||||					8.9					
4.0	||||					9.0					
4.1	||||				9.1					
4.2	||||					9.2					
4.3								9.3					
4.4								9.4					
4.5	||	||			9.5					
4.6									9.6					
4.7						9.7					
4.8								9.8					
4.9								9.9					
5.0								10.0					
5.1								10.1					
5.2						10.2					
5.3								10.3					
5.4							10.4					
5.5						10.5					
5.6	|||	|||			10.6					
5.7						10.7					
5.8		||			10.8					
5.9	|||				10.9					
6.0			||||			11.0					
6.1	||				11.1					
6.2							11.2					
6.3	|||||						11.3					
6.4					11.4				6.5	
6.5	|||				11.5				3.5	
6.6							11.6					
6.7	||				11.7			RB	3.1	
6.8									11.8					
6.9							11.9					
7.0	||||						12.0			4.7		
7.1								12.1					
7.2	|||				12.2					
7.3					12.3					
7.4							12.4					
7.5							12.5					
7.6					12.6					
7.7					12.7					
7.8					12.8					
7.9								12.9					

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

(89) (33) (11)

Station 122431
Survey 5957379 1-12-09
[illegible] 610519 proofed SHK

TPMT
3.0

WDNR Comments

Wisconsin
Department of Natural Resources

1

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 Rev. 4-94

S 616.7
stop 617.8

Lake LH MWB Code: _____ Date: 6 / 9 / 08 County: Sawyer Collector: D - K W

Target Fish: X100 Survey Type: B. C Mark Given: _____ H_2O Temp: 65.5 Time _____ : _____

Adverse Conditions: _____ H_2O Conduct: _____ Station: _____

Volts: 200 Amps: 8 Current Type (AC/DC/Pulsed DC) Pulse Rate: _____ Duty Cycle: _____

Gear Type: _____ Start Time: _____ End Time: _____ Distance Shocked: 3 miles

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: _____ H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	NP	WC	LMB	SMB	Inches					
4.0 - 4.4			2		30.0 - 30.4					
4.5 - 4.9					30.5 - 30.9					
5.0 - 5.4					31.0 - 31.4					
5.5 - 5.9					31.5 - 31.9					
6.0 - 6.4					32.0 - 32.4					
6.5 - 6.9					32.5 - 32.9					
7.0 - 7.9			1		33.0 - 33.4					
7.5 - 7.9					33.5 - 33.9					
8.0 - 8.4				1	34.0 - 34.4					
8.5 - 8.9	1				34.5 - 34.9					
9.0 - 9.4	1		111		35.0 - 35.4					
9.5 - 9.9			1111		35.5 - 35.9					
10.0-10.4		1	1		36.0 - 36.4					
10.5-10.9					36.5 - 36.9					
11.0-11.4			1		37.0 - 37.4					
11.5-11.9	1				37.5 - 37.9					
12.0-12.4	1	1	1		38.0 - 38.4					
12.5-12.9					38.5 - 39.9					
13.0-13.4		1	1		39.0 - 39.4					
13.5-13.9	1		1		39.5 - 39.9					
14.0-14.4	1	1	1		40 +					
14.5-14.9	1		111							
15.0-15.4	1		1							
15.5-15.9	1									
16.0-16.4	1									
16.5-16.9	1									
17.0-17.4	1									
17.5-17.9	1									
18.0-18.4	1		1							
18.5-18.9										
19.0-19.4										
19.5-19.9										
20.0-20.4										
20.5-20-9										
21.0-21.4										
21.5-21.9										
22.0-22.4										
22.5-22.9										
23.0-23.4										
23.5-23.9										
24.0-24.4										
24.5-24.9										
25.0-25.4										
25.5-25.9										
26.0-26.4										
26.5-26.9										
27.0-27.4										
27.5-27.9										
28.0-28.4										
28.5-28.9										
29.0-29.4										
29.5-29.9										

Other fish: Can include rarely caught species and fish greater than 30 inches.

(14) (4) (20) (1)

proofed SHH 11-2-09

Station 122431
Survey 5957380
USFT 6105716

2

WDNR Comments

...nt of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)

Form 3600-187 Rev. 4-94

Start 6.17 8
Stop 618.5

Lake: HAYward MWB Code: ________ Date: 06 / 9 / 08 County: SAwyer Collector: ________

Target Fish: 2100 Survey Type: B.Line Mark Given: ________ H_2O Temp: 660 Time ____ : ____

Adverse Conditions: ________ H_2O Conduct: ________ Station: 2 GAME

Volts: 200 Amps: 8 Current Type (AC/DC/Pulsed DC) Pulse Rate: ________ Duty Cycle: ________

Gear Type: B. S. Start Time: ________ End Time: ________ Distance Shocked: 2 miles

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: ________ H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	NP	LMB	WE	
4.0 - 4.4				
4.5 - 4.9				
5.0 - 5.4				
5.5 - 5.9				
6.0 - 6.4				
6.5 - 6.9		I		
7.0 - 7.9				
7.5 - 7.9				
8.0 - 8.4		I		
8.5 - 8.9				
9.0 - 9.4				
9.5 - 9.9				
10.0-10.4		II		
10.5-10.9				
11.0-11.4				
11.5-11.9		II	I	
12.0-12.4	II		I	
12.5-12.9	I	I		
13.0-13.4	I	I	I	
13.5-13.9			I	
14.0-14.4		I	I	
14.5-14.9				
15.0-15.4	II			
15.5-15.9	I			
16.0-16.4		I	I	
16.5-16.9			I	
17.0-17.4		II	II	
17.5-17.9	I	I		
18.0-18.4		I	II	
18.5-18.9				
19.0-19.4		II		
19.5-19.9	I			
20.0-20.4	I			
20.5-20-9				
21.0-21.4				
21.5-21.9				
22.0-22.4				
22.5-22.9				
23.0-23.4				
23.5-23.9				
24.0-24.4				
24.5-24.9				
25.0-25.4				
25.5-25.9				
26.0-26.4	I			
26.5-26.9				
27.0-27.4				
27.5-27.9				
28.0-28.4				
28.5-28.9				
29.0-29.4				
29.5-29.9				

Inches					
30.0 - 30.4					
30.5 - 30.9					
31.0 - 31.4					
31.5 - 31.9					
32.0 - 32.4					
32.5 - 32.9					
33.0 - 33.4					
33.5 - 33.9					
34.0 - 34.4					
34.5 - 34.9					
35.0 - 35.4					
35.5 - 35.9					
36.0 - 36.4					
36.5 - 36.9					
37.0 - 37.4					
37.5 - 37.9					
38.0 - 38.4					
38.5 - 39.9					
39.0 - 39.4					
39.5 - 39.9					
40 +					

MU
24.0

HY MUSK
7.5

proofed JHL 1-12-09

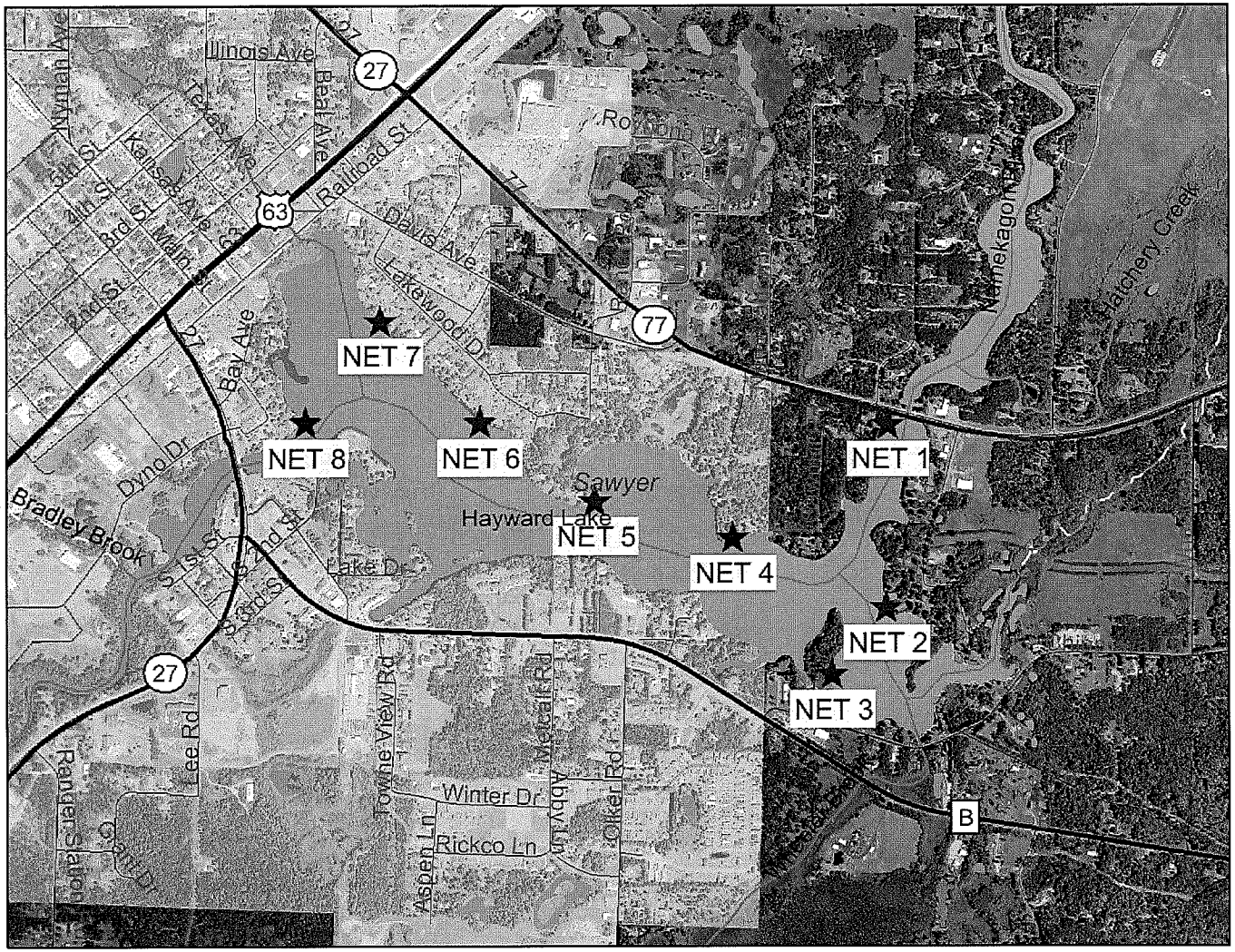
Other fish: Can include rarely caught species and fish greater than 30 inches.

(11) (16) (11)

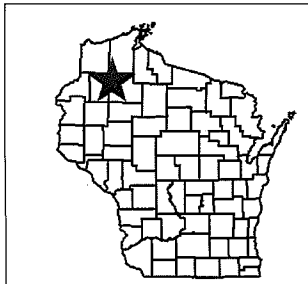
MU (1)
TIGER (1)

Station 122431
Survey 5957380

Lake Hayward SN1



0 1750 3500 5250 ft.



Legend

Major Highways
- Interstate
- State Highway
- U.S. Highways
- County Roads
- Local Roads

Rivers and Streams
- Intermittent
- Fluctuating
- Perennial

24K Open Water

County Boundary

Municipalities
- Village
- City

N

Scale: 1:18,716

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Notes: Net locations used in "bonus" SN1 in 2013. May not need all 8 nets in the future.

WDNR Comments

WDNR Comments Resources

NETTING DATA COLLECTION SHEET (4.0 in. - 40+ in.)

Form 3600-188 Rev. 4-94

Hayward MWB Code: ______ Date: 5 / 2 / 13 County: Sawyer Collector: MW RW SB BS

Fish: WAE, NOP, MUE Survey Type: SN1 Mark Given: ______ H_2O Temp: 45 Time ___ : ___

erse Conditions: ______ Station: ______

t Type: Fyke Length/Frame: ______ Bar Mesh: ______

Color: ______ Mesh Type: ______ Net Nights: 1 8 Nets

All Nets

Inches	NOP	WAE	MUE	SMB	CMB	Inches	MUE	NOP	NET 1		
4.0 - 4.4						30.0 - 30.4			Species		
4.5 - 4.9						30.5 - 30.9			Count		
5.0 - 5.4						31.0 - 31.4		II			
5.5 - 5.9						31.5 - 31.9			Species		
6.0 - 6.4						32.0 - 32.4		I	Count		
6.5 - 6.9						32.5 - 32.9					
7.0 - 7.9						33.0 - 33.4		I	Species		
7.5 - 7.9	I					33.5 - 33.9			Count		
8.0 - 8.4					I	34.0 - 34.4					
8.5 - 8.9	I					34.5 - 34.9			NET 2		
9.0 - 9.4						35.0 - 35.4			Species		
9.5 - 9.9	II					35.5 - 35.9			Count		
10.0-10.4	II					36.0 - 36.4					
10.5-10.9						36.5 - 36.9			Species		
11.0-11.4	II				II	37.0 - 37.4			Count		
11.5-11.9						37.5 - 37.9	I				
12.0-12.4	I	I				38.0 - 38.4	I		Species		
12.5-12.9	II				III	38.5 - 39.9			Count		
13.0-13.4	III				II	39.0 - 39.4					
13.5-13.9	III				IIIII	39.5 - 39.9			NET 3		
14.0-14.4	IIII				卌	40 +			Species		
14.5-14.9	I				IIII		44.5 F		Count		
15.0-15.4	卌 III				IIIIII		42.0 M				
15.5-15.9	卌				IIII		39.5 F	[illegible]	Species		
16.0-16.4	IIII				III		39.0 M		Count		
16.5-16.9							47.5 F				
17.0-17.4							41.5 F		Species		
17.5-17.9	I						44 F		Count		
18.0-18.4	IIII	F ([illegible])					42.5 F				
18.5-18.9	I						45.5 F		NET 4		
19.0-19.4	IIII			I			42		Species		
19.5-19.9	II						42		Count		
20.0-20.4	III										
20.5-20-9									Species		
21.0-21.4	II								Count		
21.5-21.9	I										
22.0-22.4									Species		
22.5-22.9	II								Count		
23.0-23.4	I										
23.5-23.9	III								NET 5		
24.0-24.4	III								Species		
24.5-24.9									Count		
25.0-25.4	I										
25.5-25.9			I						Species		
26.0-26.4	II								Count		
26.5-26.9	II										
27.0-27.4	II	I							Species		
27.5-27.9	III								Count		
28.0-28.4	II										
28.5-28.9	II										
29.0-29.4	II										
29.5-29.9	I										

Other fish: Can include rarely caught species and fish greater than 30 inches. Panfish not measured

MF musky pairings common females only [illegible] banded spent

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500

Sampling Objective	Number and Locations of Stations (Habitat)		
Walleye Recruitment Survey			Source
	Miles Actually Shocked =	4.6	GPS
Period Fished (Dates)	Acres =	247	LM
09/11/14	Total Miles of Shoreline =	8.6	LM
	Total Miles of Shockable Shoreline =	8.6	LM

GEAR

Boomshocker (Hours)	Time	
1.4	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh Size**	**Depth**
Minnow Seine (No. of Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-ST
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	0			0.00 / hour 0.00 / mile
Serns Index NA YOY / acre				
Walleye (Age 1+)	0			0.00 / hour 0.00 / mile
Walleye (Other)	0			0.00 / hour 0.00 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None 2) Weather: Clear, Calm, Cold 3) Reliabilty: Medium

4) Stocking: 253 Muskellunge, 10.7 inches, 09/09/14, DNR

5) Comments: Only walleye <12.0" targeted.

Rev. 10-70

Signed (Compiler) Gene Hatzenbeler Date 11/26/14

WDNR Comments

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL) Department of Natural Resources
Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/11/14 County: Sawyer Collector(s): Rood, Kufahl, Sunderland

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None Water Temperature: 55°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 4.6 miles

Volts: 125 Amps: 2.8 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 2007 Shocking End Time: 2137 Generator Start Hour: 292.1 Generator End Hour: 293.5

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: Clear

Walleye < 12.0"			
Inches	Number	Inches	Number
<3.0		**7.5**	
3.0		**7.6**	
3.1		**7.7**	
3.2		**7.8**	
3.3		**7.9**	
3.4		**8.0**	
3.5		**8.1**	
3.6		**8.2**	
3.7		**8.3**	
3.8		**8.4**	
3.9		**8.5**	
4.0		**8.6**	
4.1		**8.7**	
4.2		**8.8**	
4.3		**8.9**	
4.4		**9.0**	
4.5		**9.1**	
4.6		**9.2**	
4.7		**9.3**	
4.8		**9.4**	
4.9		**9.5**	
5.0		**9.6**	
5.1		**9.7**	
5.2		**9.8**	
5.3		**9.9**	
5.4		**10.0**	
5.5		**10.1**	
5.6		**10.2**	
5.7		**10.3**	
5.8		**10.4**	
5.9		**10.5**	
6.0		**10.6**	
6.1		**10.7**	
6.2		**10.8**	
6.3		**10.9**	
6.4		**11.0**	
6.5		**11.1**	
6.6		**11.2**	
6.7		**11.3**	
6.8		**11.4**	
6.9		**11.5**	
7.0		**11.6**	
7.1		**11.7**	
7.2		**11.8**	
7.3		**11.9**	
7.4		**Total:**	0

Inches	Walleye	Northern Pike	Muskellunge	Largemouth Bass	Smallmouth Bass	Inches	Walleye	Northern Pike	Muskellunge
<1.5						**24.5-24.9**			
1.5-1.9						**25.0-25.4**			
2.0-2.4						**25.5-25.9**			
2.5-2.9						**26.0-26.4**			
3.0-3.4						**26.5-26.9**			
3.5-3.9						**27.0-27.4**			
4.0-4.4						**27.5-27.9**			
4.5-4.9						**28.0-28.4**			
5.0-5.4						**28.5-28.9**			
5.5-5.9						**29.0-29.4**			
6.0-6.4						**29.5-29.9**			
6.5-6.9						**30.0-30.4**			
7.0-7.4						**30.5-30.9**			
7.5-7.9						**31.0-31.4**			
8.0-8.4						**31.5-31.9**			
8.5-8.9						**32.0-32.4**			
9.0-9.4						**32.5-32.9**			
9.5-9.9						**33.0-33.4**			
10.0-10.4						**33.5-33.9**			
10.5-10.9						**34.0-34.4**			
11.0-11.4						**34.5-34.9**			
11.5-11.9						**35.0-35.4**			
12.0-12.4						**35.5-35.9**			
12.5-12.9						**36.0-36.4**			
13.0-13.4						**36.5-36.9**			
13.5-13.9						**37.0-37.4**			
14.0-14.4						**37.5-37.9**			
14.5-14.9						**38.0-38.4**			
15.0-15.4						**38.5-38.9**			
15.5-15.9						**39.0-39.4**			
16.0-16.4						**39.5-39.9**			
16.5-16.9						**40.0-40.4**			
17.0-17.4						**40.5-40.9**			
17.5-17.9						**41.0-41.4**			
18.0-18.4						**41.5-41.9**			
18.5-18.9						**42.0-42.4**			
19.0-19.4						**42.5-42.9**			
19.5-19.9						**43.0-43.4**			
20.0-20.4						**43.5-43.9**			
20.5-20.9						**44.0-44.4**			
21.0-21.4						**44.5-44.9**			
21.5-21.9						**45.0-45.4**			
22.0-22.4						**45.5-45.9**			
22.5-22.9						**46.0-46.9**			
23.0-23.4						**47.0-47.9**			
23.5-23.9						**48.0-48.9**			
24.0-24.4						**49.0-49.9**			
Totals:	0	0	0	0	0	**50.0+**			

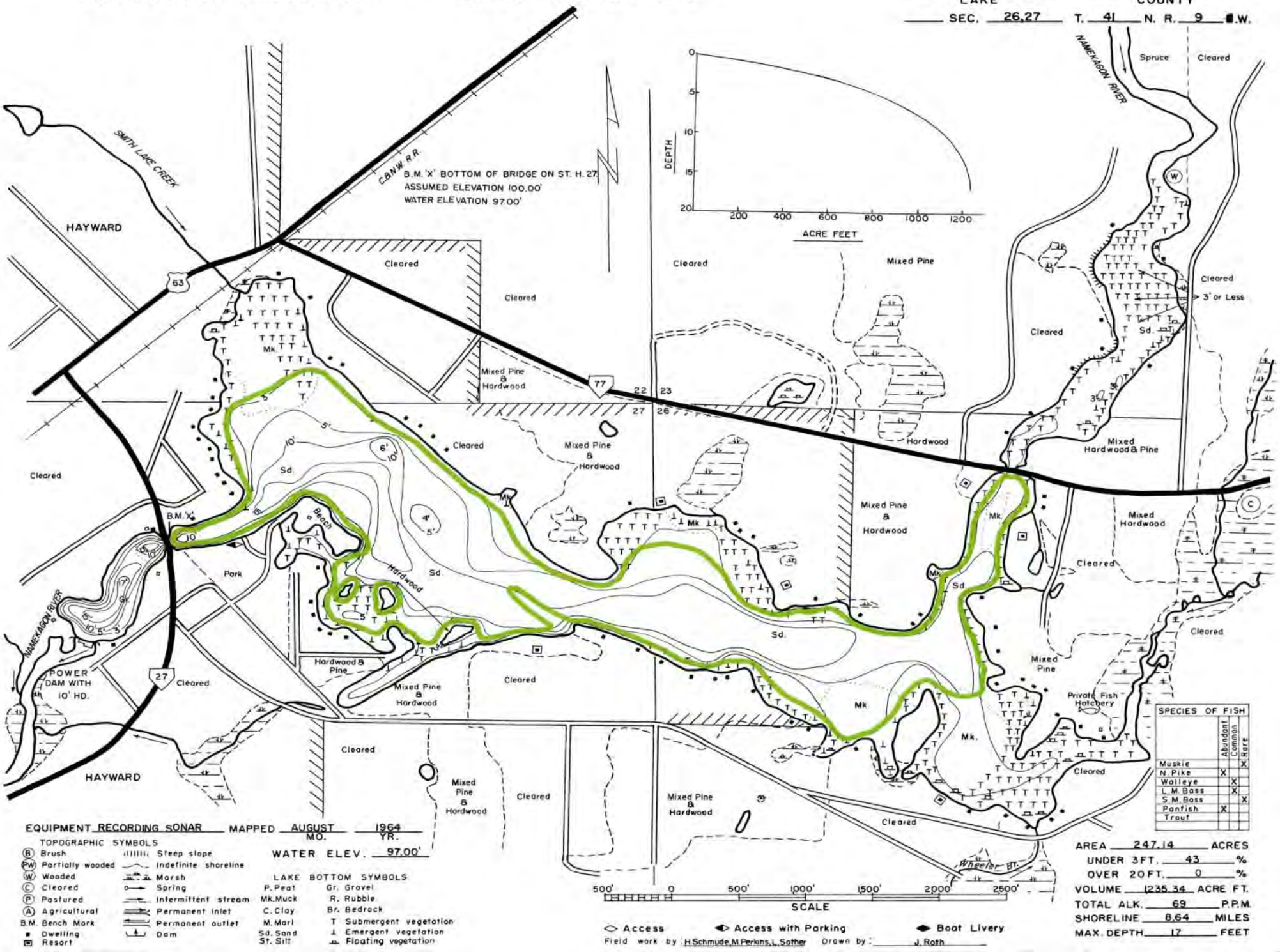
WDNR Comments

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



SPECIES OF FISH	Abundant	Common	Rare
Muskie			X
N. Pike	X		
Walleye		X	
L.M. Bass		X	
S.M. Bass			X
Panfish	X		
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST (MO.) 1964 (YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by H.Schmude, M.Perkins, L.Sather Drawn by: J. Roth

AREA 247.14 ACRES
UNDER 3FT. 43 %
OVER 20FT. 0 %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Wednesday, July 29, 2020 2:42 PM
To: Darrin Johnson
Cc: Shawn Puzen; Laatsch, Cheryl - DNR
Subject: RE: WDNR Hayward Data Submission - Fisheries (Part 2 of 2)
Attachments: WDNR Fisheries Data for Xcel_Hayward P-2417_ Part 2 of 2.zip

Hi Darrin,

Here is part 2 of 2 Hayward Hydro WDNR fisheries information.

Thanks,
Macaulay

From: Haller, Macaulay G - DNR
Sent: Wednesday, July 29, 2020 2:39 PM
To: 'Darrin Johnson' <Darrin.Johnson@meadhunt.com>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Subject: WDNR Hayward Data Submission - Fisheries (Part 1 of 2)

Hi Darrin,

Please find attached part 1 of 2 Hayward Hydro Project data and reports from WDNR's fisheries biologist. Attachments include reports, fisheries survey data (recent and historical), fish stocking/spawning data, and fish habitat information.

I will continue to send data and information as it comes in from our program staff.

Thank you,

Macaulay Haller
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Wednesday, July 22, 2020 1:56 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: Hayward and Trego Questionnaire

Cheryl,

Per our discussion last week, I am sending electronic copies of the Hayward and Trego Hydroelectric Project Questionnaires and Factsheets. They were sent out in the mail today. Feel free to contact me if you have any questions.

DARRIN JOHNSON

WDNR Comments

FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

WDNR Comments

Discussion of Lake Hayward Fishery Status for Inclusion in the Aquatic Plant Management Plan

Max Wolter- WDNR Fisheries Biologist

Overview of the fishery- Lake Hayward contains muskellunge (stocked), northern pike, largemouth bass, smallmouth bass, walleye (stocked), bluegill, pumpkinseed sunfish, yellow perch, black crappie, yellow and black bullhead, white sucker, and several species of redhorse that primarily inhabit the area surrounding the inlet of the Namekagon River. Brook and chestnut lamprey are also present (chestnut lamprey are parasitic on fish and can be seen on bass, pike, and muskellunge in Lake Hayward on occasion).

There is very little successful muskellunge reproduction in Lake Hayward but stocked fish appear to have high survival and reach trophy length (see accompanying report and photograph). Muskellunge in Lake Hayward benefit from the influx of forage fish from the Namekagon River (redhorse, sucker, and likely the occasional trout). Muskellunge will use aquatic vegetation as a refuge when young, and as foraging habitat as they grow.

Northern pike are entirely self-sustaining and size of pike is very good compared to many lakes in the area. Pike likely benefit from the same forage base as muskellunge. Northern pike are very reliant on aquatic vegetation for reproduction (eggs stick to aquatic plants) and foraging.

Largemouth bass are common in Lake Hayward and size structure is better than many other lakes in the area with many legal sized (>14 inches) fish present. Largemouth bass use aquatic vegetation as their primary habitat. Smallmouth bass are considerably rarer and are focused in the area around the inlet of the Namekagon River. Smallmouth bass are more keyed on rocky habitat in comparison to aquatic plants.

Walleye are relatively rare in Lake Hayward indicating that stocking success is low and natural reproduction is non-existent. Walleye of several sizes were stocked aggressively for many years with little result. Stocked walleye that do survive grow well and are a nice "bonus" species in the lake for anglers. Both walleye and muskellunge are susceptible to "dam escapement", which is movement through or over a dam in a manner that prevents their return to the lake. We suspect that many stocked walleye and muskellunge wind up in the Namekagon River below Lake Hayward. From 2005 to 2010 there was a barrier net installed seasonally (purchased by DNR and Xcel) to address this issue, but over time this project was deemed infeasible because the net had to be cleaned ~3 times a week as a result of entrainment of dead aquatic plants (primarily CLP).

Bluegill and pumpkinseed sunfish are abundant in Lake Hayward but have above average size. These species use aquatic plants as refuge from predation but excessive plant growth can pose management problems for panfish. Healthy fish populations rely on a large percentage of the panfish born each year to be eaten by predators, otherwise stunting can occur. These high levels of predation are not possible when aquatic vegetation becomes

overly dense. Despite dense vegetation in some areas of Lake Hayward stunting of panfish has not been observed in Lake Hayward up to this point.

Yellow perch and black crappie are more rare than bluegill and do not comprise a significant portion of the fishery. Both can reach large sizes.

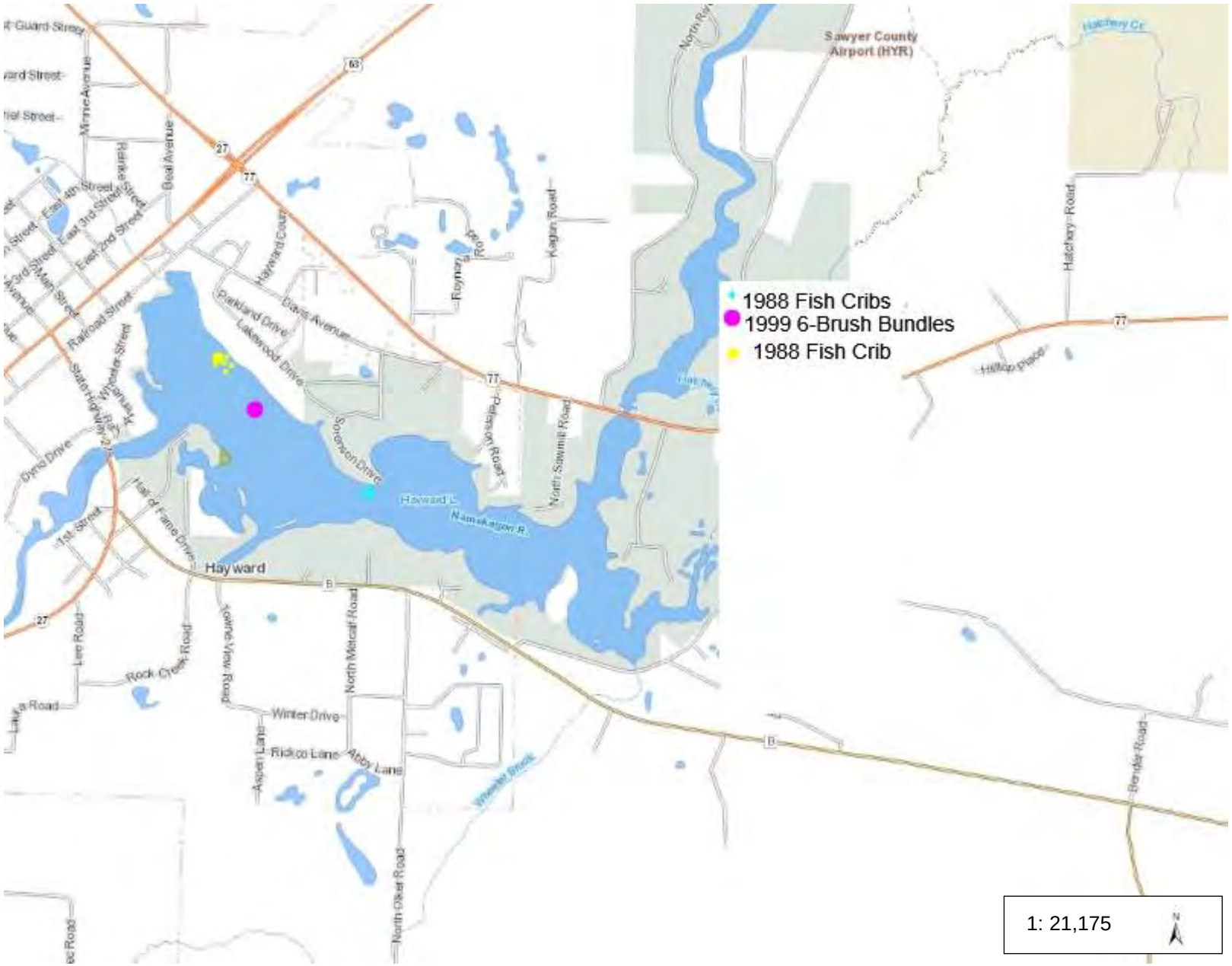
General comments on aquatic plants and the fish community- The fish community of Lake Hayward benefits from the diversity of the plant community and the inflowing water of the Namekagon River. Without either of these factors it is reasonable to presume that the fishery would decrease in quality. While sections of the lake certainly have aquatic plant densities that are too high for optimum fish habitat (these areas are impacted by invasive species) there has not been a noticeable impact on the overall fish community to date. Manual removal of aquatic plants if undertaken should be done after fish spawning if possible. Disturbance of the sediments and plants themselves could have negative effects on spawning success of essentially all species of fish in Lake Hayward it timed incorrectly. Chemical treatment of aquatic invasive plants should be undertaken with great caution and with intense scrutiny of any potential chemical product. Any chemical selected should ideally lead to no further restrictions on fish consumption since this is a popular lake for families to fish.

Schedule of upcoming surveys- Lake Hayward was surveyed in 2013 for early spawning species (muskellunge, northern pike, and walleye, see attached report). The next survey is scheduled for 2015 and will include a comprehensive study of the fish population including estimations of the total number of muskellunge and walleye. Lake Hayward is officially on a 7 year survey rotation based on its size, but because of its proximity to town it is typically surveyed more often.

Stocking plan- At this point in time the DNR plans to continue to stock Lake Hayward with both muskellunge and walleye when they are available. However, Lake Hayward is a lower priority stocking location than many other lakes in the area due to the low success of previous walleye stocking and lack of necessity to stock muskellunge more frequently than every few years. Private stocking of both muskellunge and walleye will be permitted if the stocking specifications match DNR protocol.

WDNR Comments

Surface Water Data Viewer Map



Legend

- PNW-PRF Other Public Rights
- PNW-ASNRI Sensitive Areas c
- PNW-ASNRI Wild and Scenic
- PNW-ASNRI Outstanding and Streams
- PNW-ASNRI Trout Streams
- PNW-ASNRI Wild Rice Stream
- PNW-ASNRI Quality Wetland S
- PNW-ASNRI Outstanding and Lakes
- PNW-ASNRI Quality Wetland A
- PNW-ASNRI Wild Rice Areas
- PNW-ASNRI Trout Spring Pon
- PNW-ASNRI State Natural Are
- PNW Musky Streams
- PNW Sturgeon Streams
- PNW Musky Areas
- PNW Sturgeon Areas
- PNW Walleye Areas
- PNW Lakes Less Than 50 Acr
- Municipality
  - City or Village
  - Township
- State Boundaries
- County Boundaries
- Major Roads

Notes

1: 21,175

0.7 0 0.33 0.7 Miles

NAD_1983_HARN_Wisconsin_TM

DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made aregarding accuracy, applicability for a particular use, completemenss, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

WDNR Comments

Smallmouth Bass and Muskellunge Fisheries in Northwestern Wisconsin Rivers:

A Guide to the Future Project

5-year report

Max Wolter
WDNR Senior Fisheries Biologist

Dave Neuswanger
Area Team Supervisor

WISCONSIN DEPT. OF NATURAL RESOURCES

WDNR Comments

Foreword and Acknowledgments

The "Guide to the Future" project was initiated in 2012 to meet a data collection need for sportfish populations in some of the most popular rivers in northwest Wisconsin. Five years of partnership between the Wisconsin DNR and the Hayward Fly Fishing Company has generated 1,487 records of guided angler trips. The data from these guided trips has allowed for comparisons of catch rate for smallmouth bass, muskellunge, and other species among rivers, times of year, different river conditions, and more. Collection of this large volume of data would not be possible without the excellent participation of each of the individual guides working for the Hayward Fly Fishing Company including Wendy Williamson, Larry Mann, Stu Neville, Erik Huber, Brett Nelson, and Cory Andraschko. Rarely does science get to be as fun as this project has been. Max Wolter



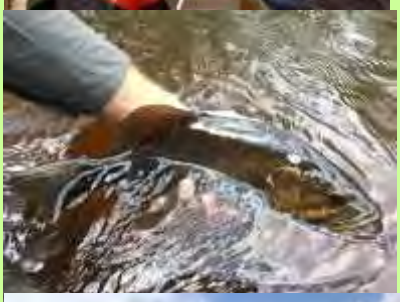
Table of Contents

- Summary of Major Findings p. 2
- Objectives/General Methods/Study Area p. 3
- Description of Angling Effort p. 6
- Smallmouth Bass Abundance and Size p. 7
- Muskellunge Abundance and Size p. 10
- Temporal Trends in Catch Rates p. 13
- Spatial Trends in Catch Rates p. 16
- Influence of Environmental Conditions on Catch Rates p. 19
- Other Species p. 23

WDNR Comments

Summary of Major Findings

- Angler skill accounts for a significant amount of variation in catch rates for both smallmouth bass and muskellunge. Accounting for skill with a correction factor allows for more meaningful comparisons of catch rate, particularly when sample size is limiting.
- Smallmouth bass catch rate (relative abundance) and size structure varied among rivers. Rivers with high catch rate demonstrated smaller size of fish caught, and vice versa.
- Muskellunge catch rate varied among rivers, but size differences among rivers were generally less pronounced. The Namekagon River emerged as a better river for catching larger muskellunge (>40”) than the Chippewa or Flambeau.
- Catch rates for smallmouth bass and muskellunge appeared relatively stable from one year to the next. Smallmouth catch rates were positively related to water temperature and were highest during peak summer (July). Muskellunge catch rates appeared higher in early summer and fall compared to mid-summer, though the relationship was not statistically significant.
- Spatial trends in catch rates for both species within rivers did not demonstrate consistent increases or decreases from upstream to downstream reaches.
- The amount of discharge on a river (cubic feet per second) generally had a negative impact on both smallmouth bass and muskellunge catch rates, though the relationship was typically not statistically significant.
- Catch rates for smallmouth bass were significantly higher under flat water conditions compared to rising water. There was an indication of a similar trend for muskellunge but it was not statistically significant.
- Northern pike catch rates were significantly higher on the Namekagon compared to the Flambeau with the Chippewa being intermediate. Incidental catch of other species like walleye and largemouth bass were rare.



WDNR Comments

Project Objectives and General Methods

Due to a variety of factors including current, water clarity, structural complexity, and access, river fish populations are often not easily (or representatively) sampled by traditional fisheries methods such as netting or electrofishing. On an experimental and voluntary basis from 2012 to 2016, the Wisconsin Department of Natural Resources (WDNR) enlisted a group of river fishing guides who completed hundreds of fishing trips on these rivers annually with their clients while targeting smallmouth bass and muskellunge using fly fishing gear. Records of the effort and catch from these fishing trips can provide important information on relative abundance and size structure of river populations of smallmouth bass and muskellunge in a manner that is efficient to the monitoring agency (WDNR) and informative to the guides, their clients, and other anglers.

WDNR personnel and guides met and developed the following protocol for data collection. For each trip, the guide recorded the catch for each client (typically two people) separately. There was no set schedule or locations that guides were asked to follow with their fishing activities. However, as a result of the use of logical access points, fishing trips were assigned to "reaches" within each river with set start and end points. Each captured fish was recorded on a labeled 12-key mechanical counter corresponding to the angler that caught the fish. Four sizes categories of smallmouth bass (7-11, 11-14, 14-17, and >17 inches) and muskellunge (20-30, 30-40, 40-50, and >50 inches) were recorded. Guides also recorded catches, but not sizes, of northern pike, walleye, and largemouth bass. "Encounters" with muskellunge were recorded whenever a fish followed but did not strike, struck and missed, or was lost after hooking but before landing.

Each guide recorded daily water temperature (degrees F), which was measured in a shaded portion of the river near noon. Guides also recorded "mitigating conditions" (inclement weather, challenging water level, off-color water, etc.) that they judged may have negatively impacted fishing success. Data on river discharge (cubic feet per second) was obtained for each day from nearby USGS or hydropower dam gauges. Short-term variation in discharge was calculated and expressed as the most recent 3-day change in discharge (noon discharge three days prior minus noon discharge on day of fishing). Based on this calculation, river conditions on each day of fishing were classified as either falling (≥15% *decrease* in discharge over 3-day period), stable (<15% change in discharge over 3 day period), or rising (≥15% *increase* in discharge over 3-day period).

Data were entered into an Excel database and analyzed using R software. Trips when guides noted "mitigating conditions", as described above, were excluded from all analyses unless specified otherwise. Similarly, only trips where at least four hours of targeted effort for a species were used for analyses of that species. A non-parametric Kruskal-Wallis test was used to make statistical comparisons of catch rates across classes of data (i.e. different rivers, months) because of non-normal shape of the catch rate data. When significant differences were found between classes, multiple comparison analysis was made using a Dunn Test with a Holm modification of the Bonferroni adjustment. Comparisons between catch rate and river discharge or temperature were made using standard linear regression. Results of statistical tests were considered significant at P values less than 0.05.

WDNR Comments

Study Area

There was no set schedule or locations that guides were asked to follow with their fishing activities. However, as a result of the use of logical access points, fishing trips were assigned to "reaches" within each river with set start and end points. In this report these are labeled with the river name (or abbreviation) and a number corresponding to the relative downstream location of the reach within that river (e.g., Chippewa 4 is downstream from Chippewa 3). To protect the proprietary information of these guides, the specific start and end points of each reach are not presented in this report. Individual reaches were rarely fished on sequential days. Three rivers were primarily fish by the guides– the Flambeau (Figure 1, Price and Sawyer counties), Chippewa (Sawyer and Rusk counties), and Namekagon (Sawyer, Washburn, and Burnett counties). However, data was also collected on the West Fork of the Chippewa River (Sawyer County) and the St. Croix River (Burnett County). Because of smaller sample size, these two rivers are not included in all analyses.

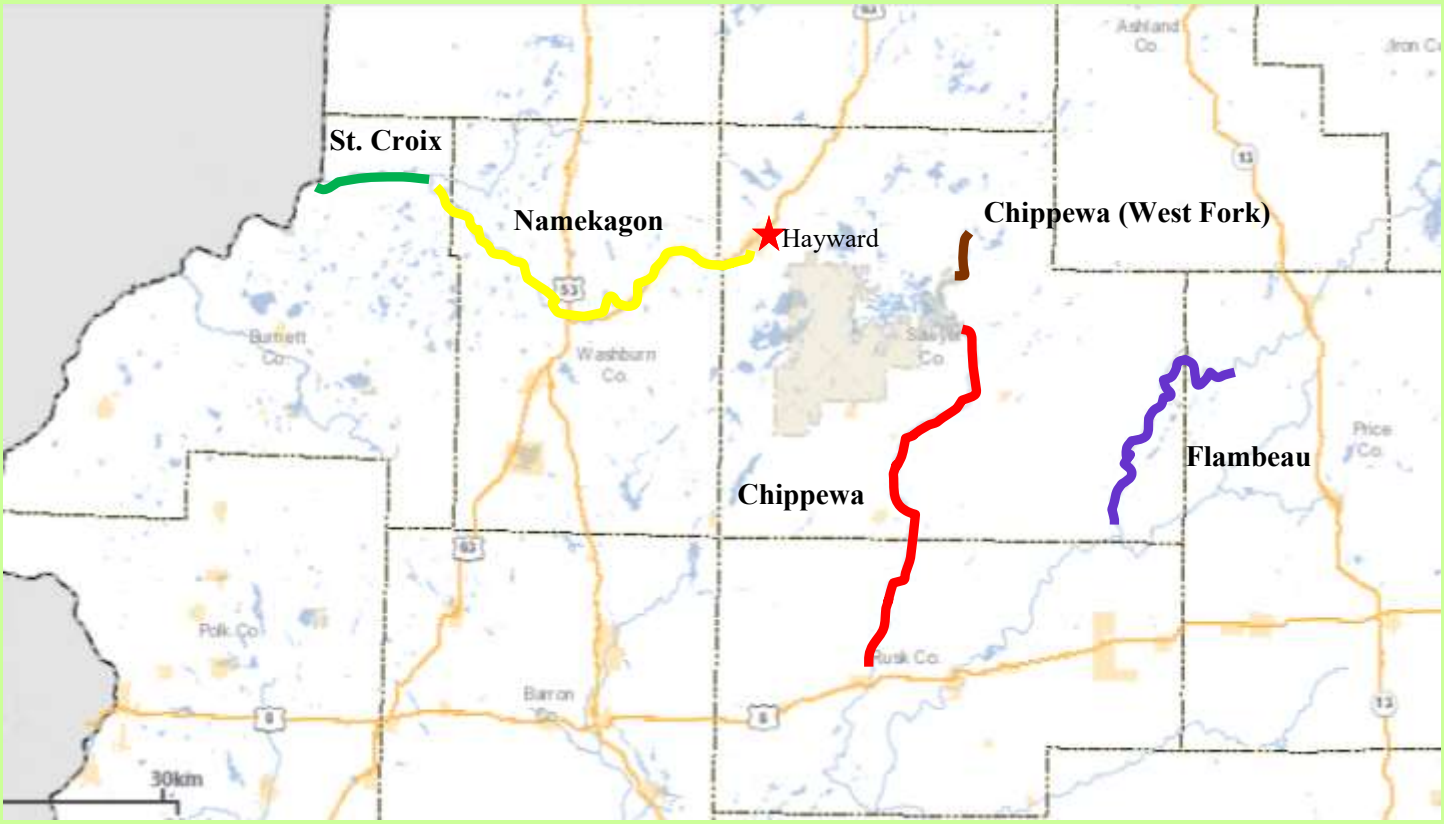


Figure 1. The sections of rivers fished by guides in the "Guide to the Future" fisheries data collection program. Each river is broken into multiple reaches that are fished for single-day float trips. Hayward, the home base for the guides, is denoted with a star.

WDNR Comments

Description of Angling Effort and Skill

Fishing effort for guides varied considerably among rivers, with the Namekagon River receiving the most total trips and hours of targeted effort for each species (Table 1). Most guided trips took place between June and October. October had the most overall trips (353) followed by July (278) and August (224). Trips in the summer (May-August) were more likely to target smallmouth bass while trips in the fall (September-November) are more likely to target muskellunge.

Table 1. Total number of angler trips and hours spent targeting muskellunge (musky) and smallmouth bass between 2012 and 2016 as a part of the Guide to the Future project.

River	Total trips	Hours targeting musky	Hours targeting smallmouth bass
Chippewa	315	1,035	1,194
Chippewa (West Fork)	70	161	295
Flambeau	155	677	493
Namekagon	851	2,086	3,987
St. Croix	94	481	189

It was known at the onset of this project that anglers fishing with guides would have wide variation in their skill, which would likely affect catch rate data. To account for this, we asked guides to discreetly assign a skill level rating to each client. Assignment of a skill level rating was done early in the trip and was based on casting ability and prior experience so rating would not be influenced by the day's catch. The three rating categories were inexperienced/beginner, average, or expert.

As expected, catch rates for both muskellunge and smallmouth (Figure 2) differed by angler skill level. To prevent this known source of variation from influencing other comparisons, we developed a correction factor to standardize catch rates. Multipliers were applied to catch rates in each skill level (Table 2).

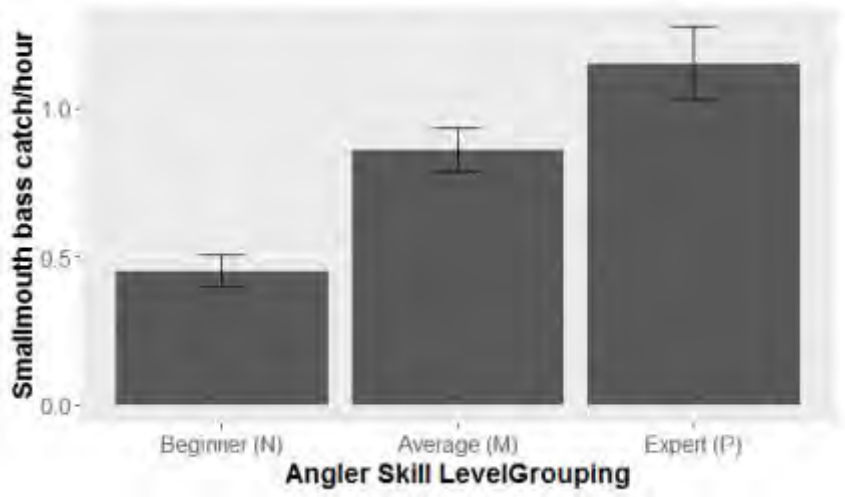


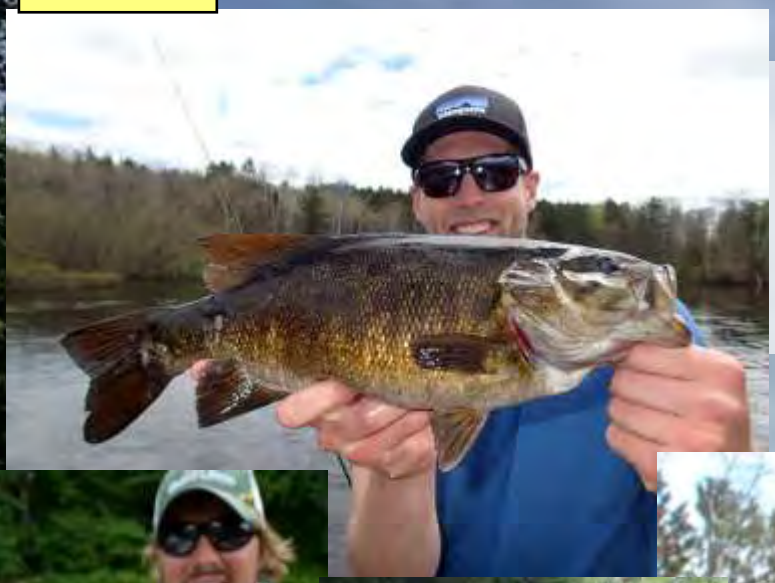
Figure 2. Catch rates (number of fish per hour of targeted angling effort) for smallmouth bass by anglers of different skill levels, shown with no correction factor applied. Error bars represent 95% confidence intervals. Skill levels were assigned by guides to account for the expected variation in catch due to individual anglers' fishing experience. Differences between the three skill levels were used to develop a correction factor to account for this variation when making other comparisons (i.e. catch rate among rivers).

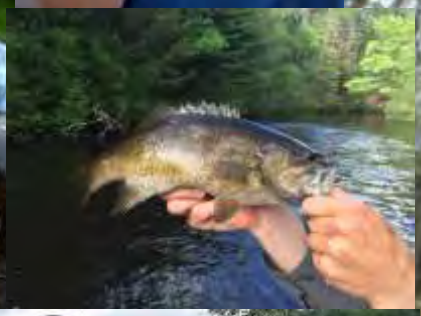
Table 2. Correction factors applied to smallmouth bass and muskellunge catch rates.

	Beginner	Average	Expert
Smallmouth Bass	2.0	1.0	0.75
Muskellunge	1.5	1.0	0.5

WDNR Comments

SMALLMOUTH BASS ABUNDANCE AND SIZE





WDNR Comments

Smallmouth Bass Relative Abundance and Size

Smallmouth bass are well-suited for life in shallow rocky riverine habitats and as a result they are one of the most abundant sportfish in many northern Wisconsin rivers. Smallmouth bass are a popular target for anglers fishing either from shore or on float trips, yet little is known about the relative abundance of smallmouth in one river compared to the next or how size distribution compares among rivers. Data collected by guides demonstrated significantly different catch rates for smallmouth bass among five northwestern Wisconsin Rivers (Figure 3). Differences in catch rate are assumed to reflect differences in abundance.

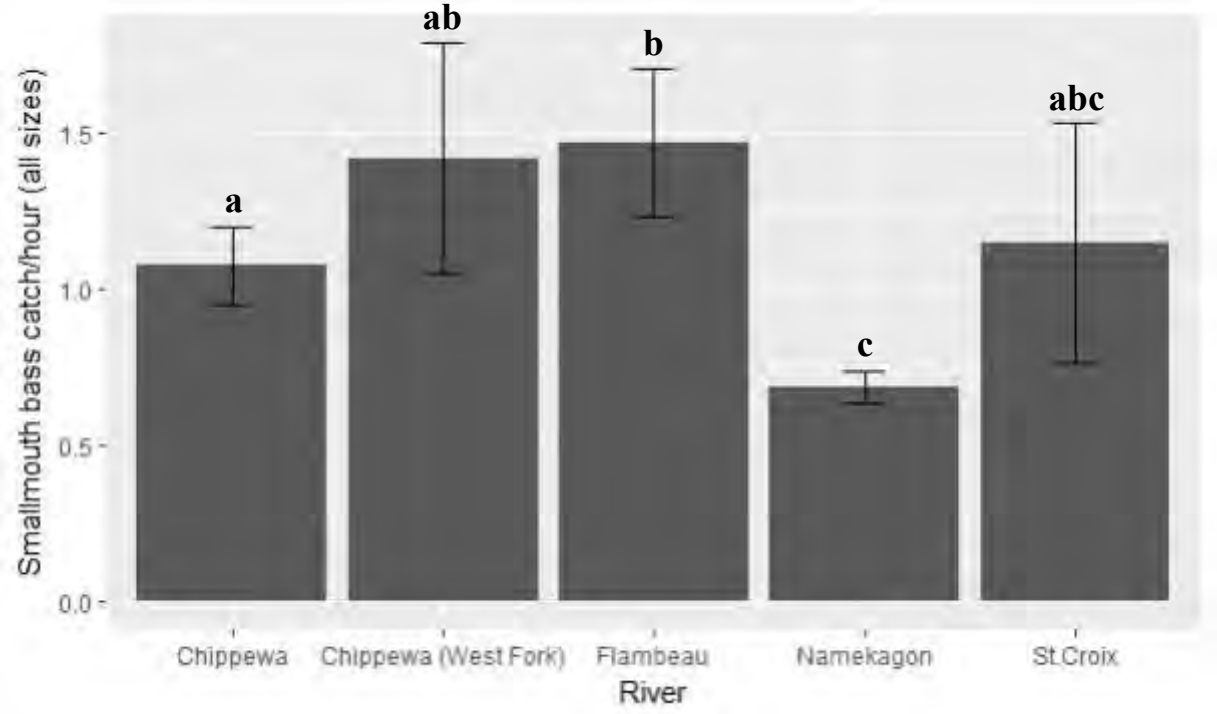


Figure 3. Skill level corrected catch rates (number of fish per hour of targeted angling effort) for smallmouth bass by river from 2012-2016. Error bars represent 95% confidence intervals. Statistically different groupings are denoted with letters.

Variation in overall catch rate of smallmouth bass among rivers is driven by variation within specific size classes. Comparing just the three rivers with the largest volume of data, the catch rates for smaller smallmouth bass was significantly higher on the Flambeau River than on the Chippewa or Namekagon (Table 3). However, catch rate for larger smallmouth bass (>17 inches) was significantly higher on the Namekagon River than the Chippewa or Flambeau. These three rivers offer differing fishing experiences. The Flambeau would be considered more of an action destination, with high overall catch rates but smaller fish, while the Namekagon is clearly more of a trophy opportunity with lower catch rates but higher catch of large smallmouth.

Table 3. Skill level corrected catch rates (number of fish per hour of targeted angling effort) of smallmouth bass by size class for three northwestern Wisconsin Rivers from 2012-2016. Statistically different groupings are denoted with letters.

Size Class	Chippewa	Flambeau	Namekagon
7-11 inches	0.38 (±0.07)[b]	0.70 (±0.16)[a]	0.10 (±0.02)[c]
11-14 inches	0.39 (±0.06)[a]	0.44 (±0.09)[a]	0.20 (0.02)[b]
14-17 inches	0.24 (±0.05)	0.30 (±0.08)	0.27 (±0.03)
>17 inches	0.07 (±0.02)[b]	0.03 (±0.02)[b]	0.11 (±0.02)[a]
All sizes	1.07 (±0.12)[b]	1.47 (±0.24)[a]	0.69 (±0.05)[c]

WDNR Comments

Smallmouth Bass Size Structure

Based on reported data from guides, size structure of smallmouth bass varied considerably among rivers. Catch in the Flambeau River was dominated by smaller bass, while catch in the Namekagon was predominantly larger fish, the Chippewa River catch was intermediate with the three smaller size classes represented fairly evenly in the catch (Figure 4). In the Flambeau, only 22% of smallmouth caught were over 14 inches, while on the Chippewa 33% were over 14 inches, and on the Namekagon 56% were over 14 inches. Interestingly, all three rivers have the same fishing regulations. It is not clear why the apparent difference in size structure among rivers exists. It appears, based on catch rate, that density of smallmouth bass is higher in the Flambeau River which may lead to slower, density-dependent growth. It is possible that prey availability differs among these three rivers independent of smallmouth bass density. Mortality may also play a role in structuring these smallmouth bass populations. If mortality of adult smallmouth bass is higher on one river compared to another it may result in differing size structure. Mortality could be due to environmental conditions, including overwintering habitat, or angler harvest, though harvest is believed to be minimal on all three rivers. A growth rate and age structure analysis would be beneficial to better understanding dynamics of these populations.

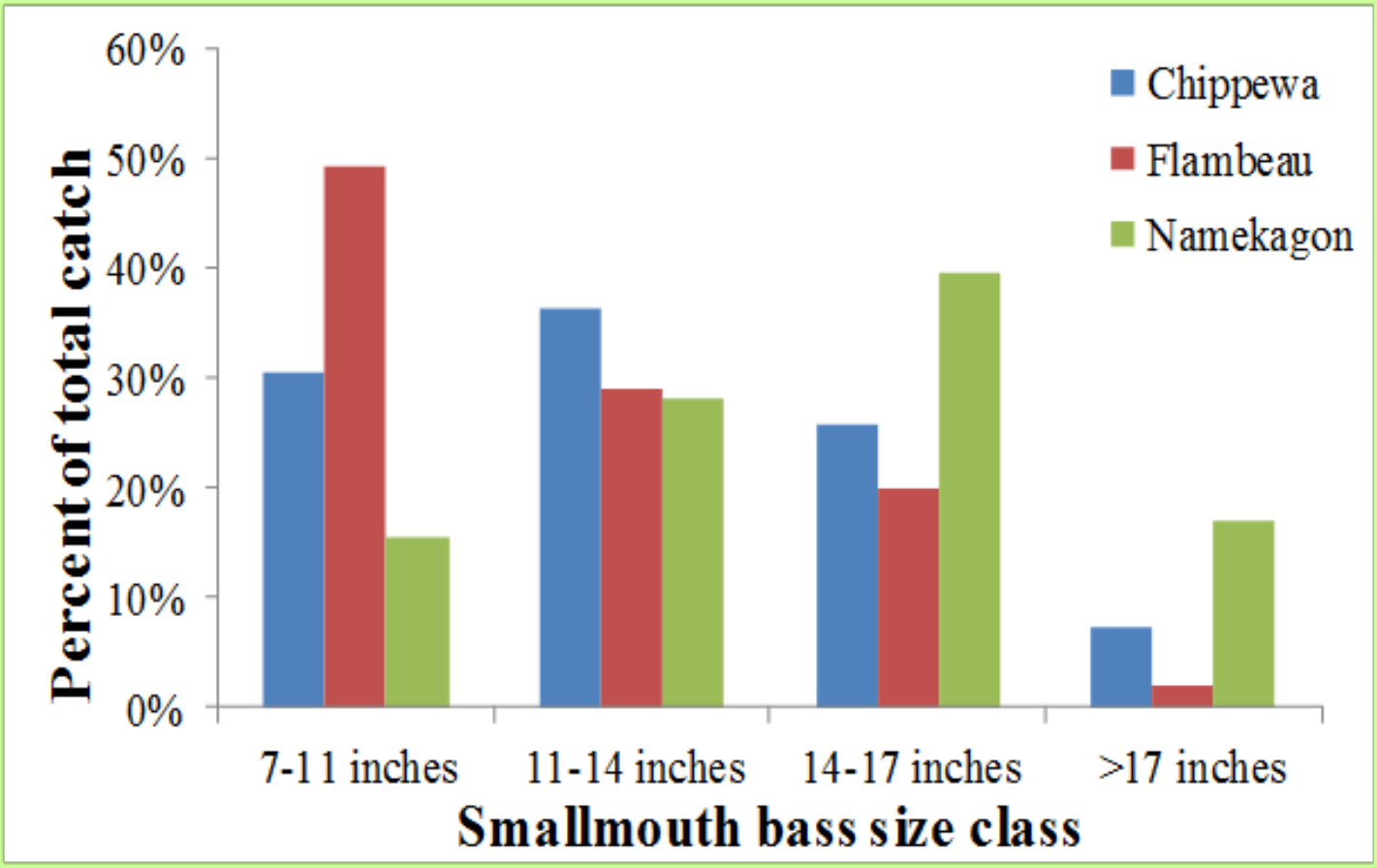
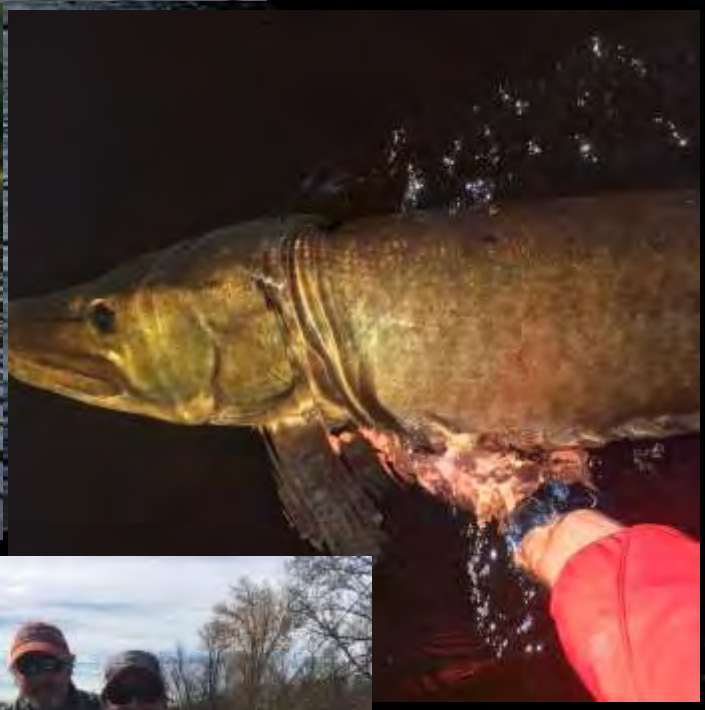


Figure 4. Smallmouth bass catch by size category for three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016.

WDNR Comments

MUSKELLUNGE ABUNDANCE AND SIZE



WDNR Comments

Muskellunge Relative Abundance and Size

Interpreting muskellunge catch rate data was made more difficult by the high degree of variation that inevitably exists when dealing with a species that occurs in low abundance and is challenging to catch. However, five seasons of data collection have provided enough data to start making statistical comparisons of muskellunge catch. Data collected by guides demonstrated significantly different catch rates for muskellunge among five northwestern Wisconsin Rivers (Figure 5). Differences in catch rate are assumed to reflect differences in abundance.

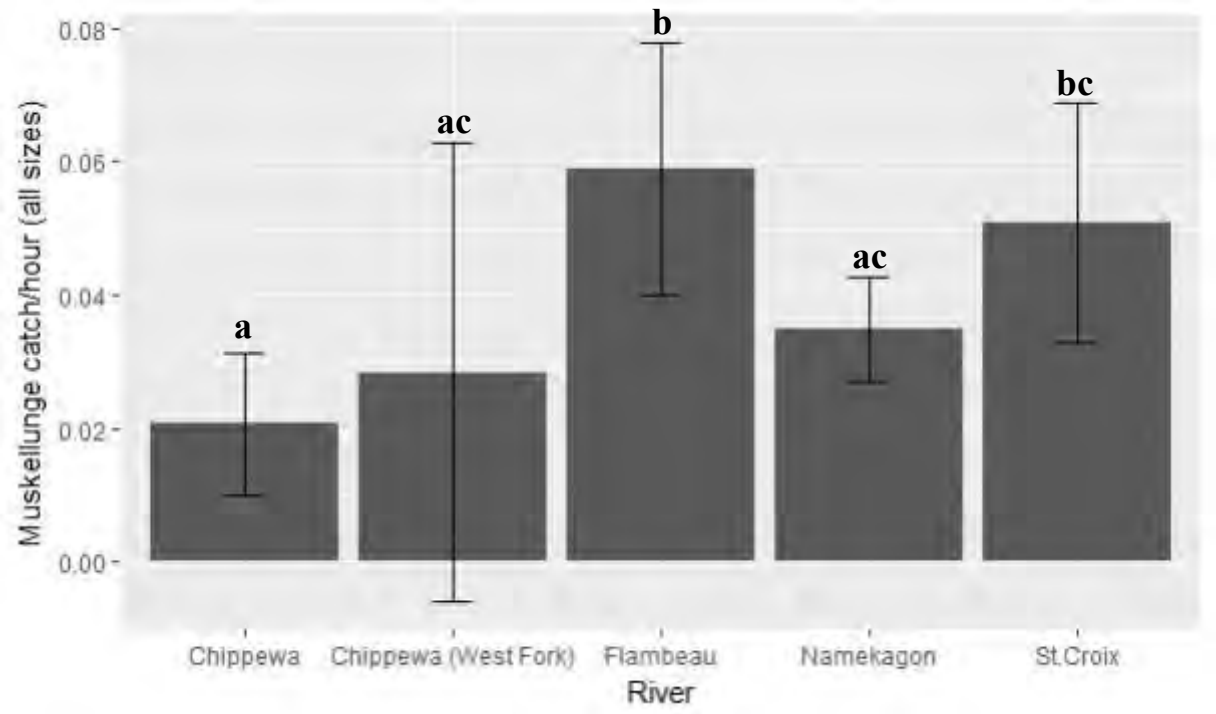


Figure 5. Skill level corrected catch rates (number of fish per hour of targeted angling effort) for muskellunge by river from 2012-2016. Error bars represent 95% confidence intervals. Statistically different groupings are denoted with letters.

Variation in overall catch rate of muskellunge among rivers was driven by variation within specific size classes. Comparing just the three rivers with the largest volume of data, the catch rates for smaller muskellunge (20-30 inches and 30-40 inches) were significantly higher on the Flambeau River than on the Chippewa or Namekagon (Table 4). However, catch rate for larger muskellunge (>40 inches) was significantly higher on the Namekagon River than the Chippewa or Flambeau. Catching a musky is rare under any circumstances, but the average catch rate of muskellunge by guided anglers as a part of this project (17.1 hours of fishing per musky) compare favorably to catch rates for anglers on lakes (~33 hours of angling per musky).

Table 4. Skill level corrected catch rates (number of fish per hour of targeted angling effort) of muskellunge by size class for three northwestern Wisconsin Rivers from 2012-2016. Statistically different groupings are denoted with letters.

Size Class	Chippewa	Flambeau	Namekagon
20-30 inches	0.008 (±0.006)^{b}	0.033 (±0.017)^{a}	0.013 (±0.005)^{b}
30-40 inches	0.011 (±0.008)^{b}	0.024 (±0.011)^{a}	0.013 (±0.005)^{b}
40-50 inches	0.002 (±0.003)^{b}	0.003 (±0.003)^{ab}	0.009 (±0.004)^{a}
>50 inches	0.000	0.000	0.001 (±0.001)
All sizes	0.021 (±0.011)^{b}	0.059 (±0.019)^{a}	0.035 (±0.008)^{b}

WDNR Comments

Muskellunge Size Structure

Based on reported data from guides, size structure of muskellunge varied slightly among rivers. Catch in all three rives is dominated by fish in the 20-40 inch range (Figure 6). The Namekagon River has demonstrated the best size potential evidenced by a larger percentage of the catch being over 40 inches and producing the only 50 inch muskellunge recorded by guides and their clients during the span of this project.

The relative infrequency of muskellunge over 40 inches being caught by guided anglers on these rivers is of interest. Many of the rivers fished as a part of this project are connected to impoundments which generally have larger fish than what was being caught in the rivers. The discrepancy in size structure between impoundments and rivers may be due to gear selectivity where fly fishing disproportionately targets the smaller sized muskellunge. But it may also be a result of habitat selection by larger fish, slower growth of fish inhabiting rivers, higher mortality of adult muskellunge in rivers, or other factors. More exploration into these trends is warranted.

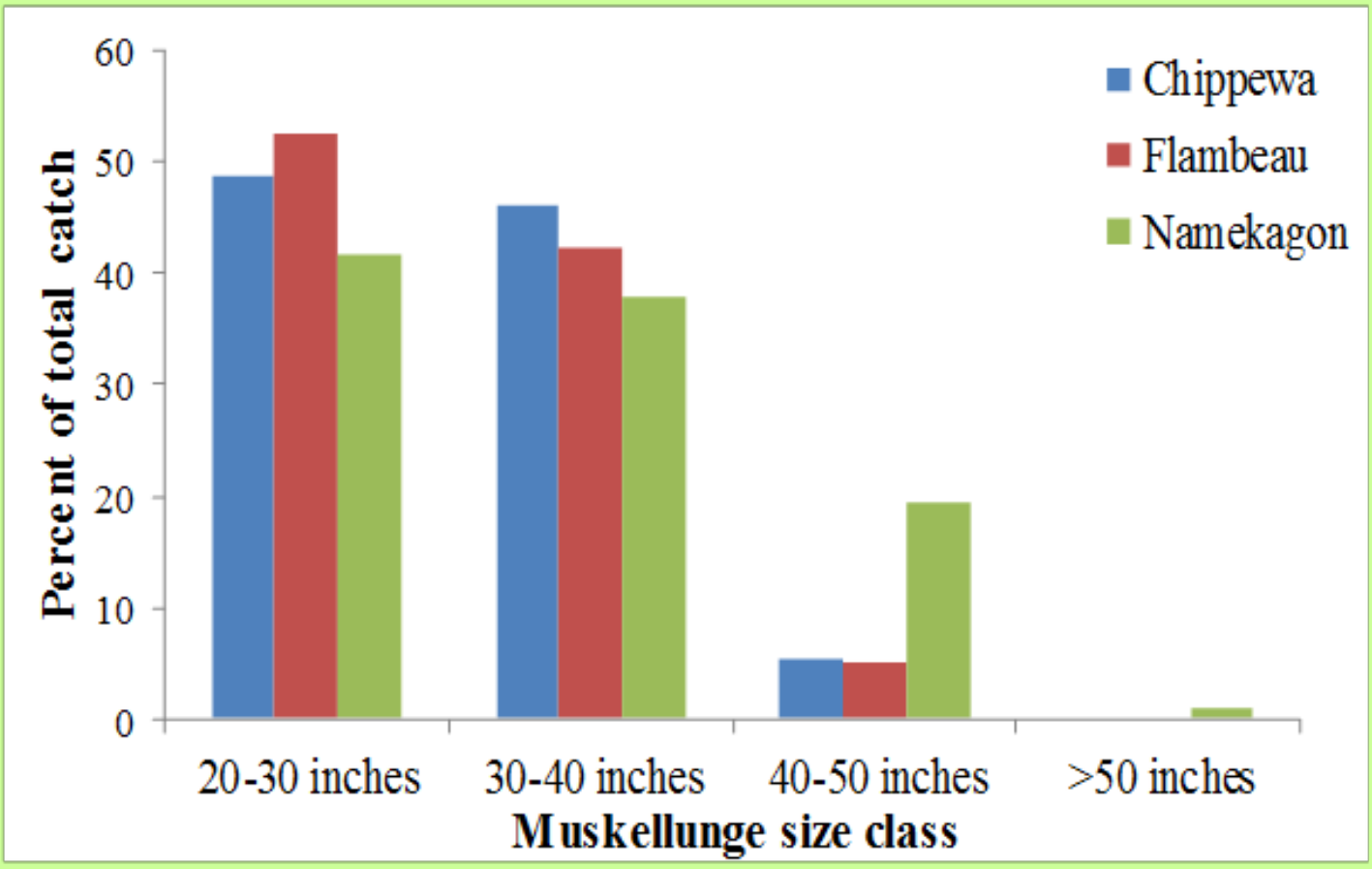


Figure 6. Muskellunge catch by size category for three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016.

WDNR Comments

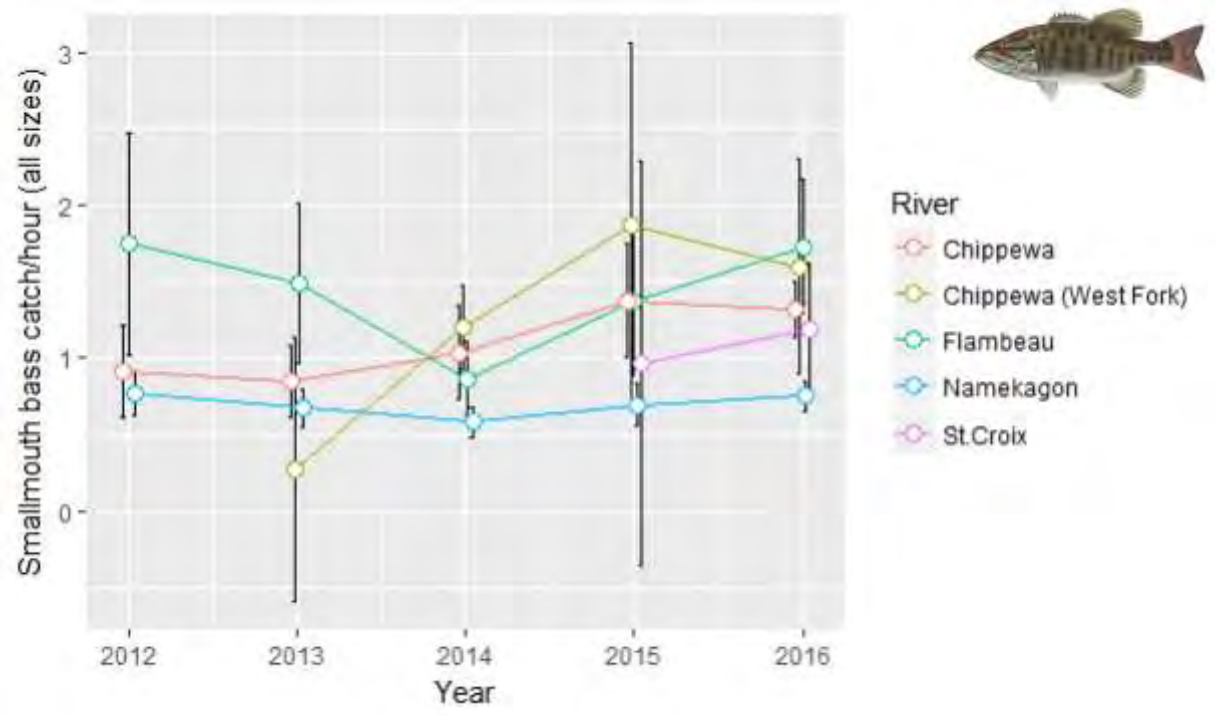
TEMPORAL TRENDS IN CATCH RATES

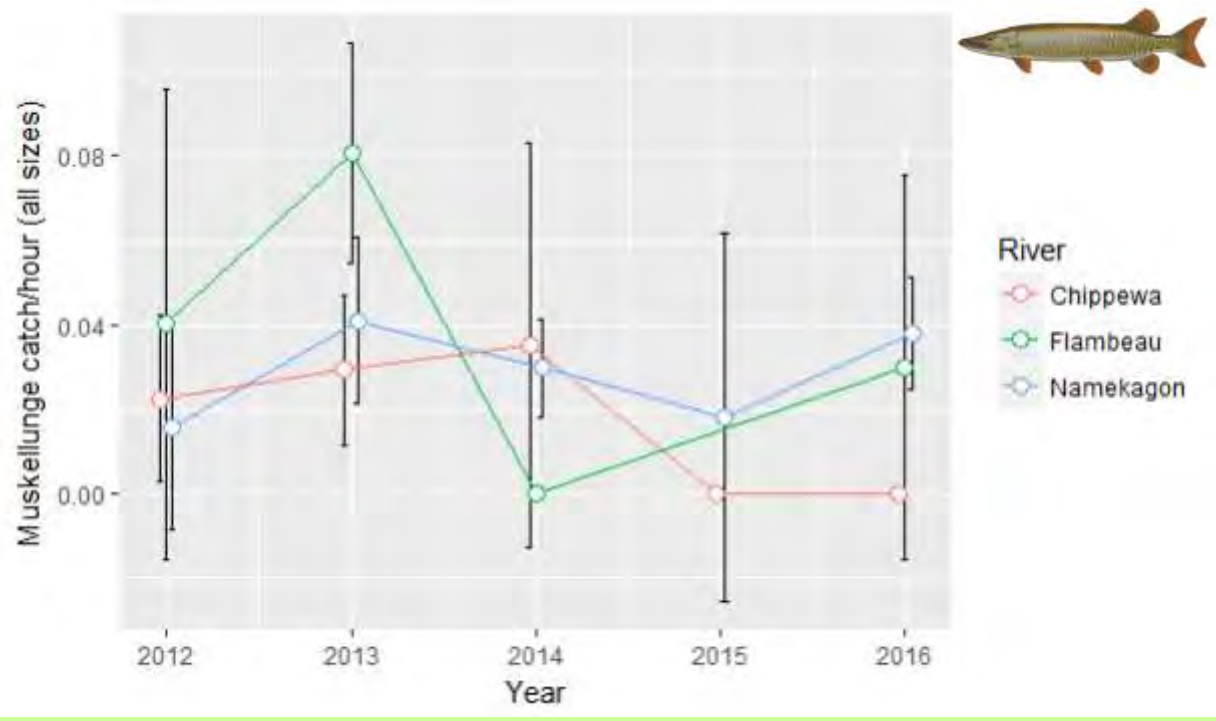
WDNR Comments

Catch By Year

Clear trends in catch rate by year within individual rivers were not always evident for either species. Catch rate for smallmouth bass on the Namekagon has been remarkably consistent across time. Catch rate for smallmouth bass on the Flambeau River demonstrated the greatest oscillation (Figure 7). Year-to-year data for muskellunge catch rate on the St. Croix and West Fork Chippewa rivers was limiting and therefor those rivers were excluded from that analysis. Other rivers demonstrated relatively consistent catch rates for muskellunge, with some evidence of declining catch rate for the Chippewa River. Once again, catch rate data for muskellunge was marked by a high degree of variability.

Figure 7. Smallmouth bass (top panel) and muskellunge (bottom panel) skill level corrected catch rates in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals.





WDNR Comments

Catch By Month

Catch rates by month showed interesting patterns for both smallmouth bass and muskellunge, though differences were not always statistically significant. For smallmouth, catch rate was higher in July than in the cooler months of June and September (Figure 8). Guides have anecdotally reported poor success targeting smallmouth in these rivers after September, and as a result very little smallmouth bass data exists for those months. Catch rates for muskellunge showed an inverse pattern to smallmouth, with generally higher catch in cooler months (early summer and fall), though there were not statistically significant differences among months. It should be noted that muskellunge catch data from summer months is more limited since guides are typically targeting smallmouth bass at that time. Trips targeting muskellunge in December have been rare, but successful.

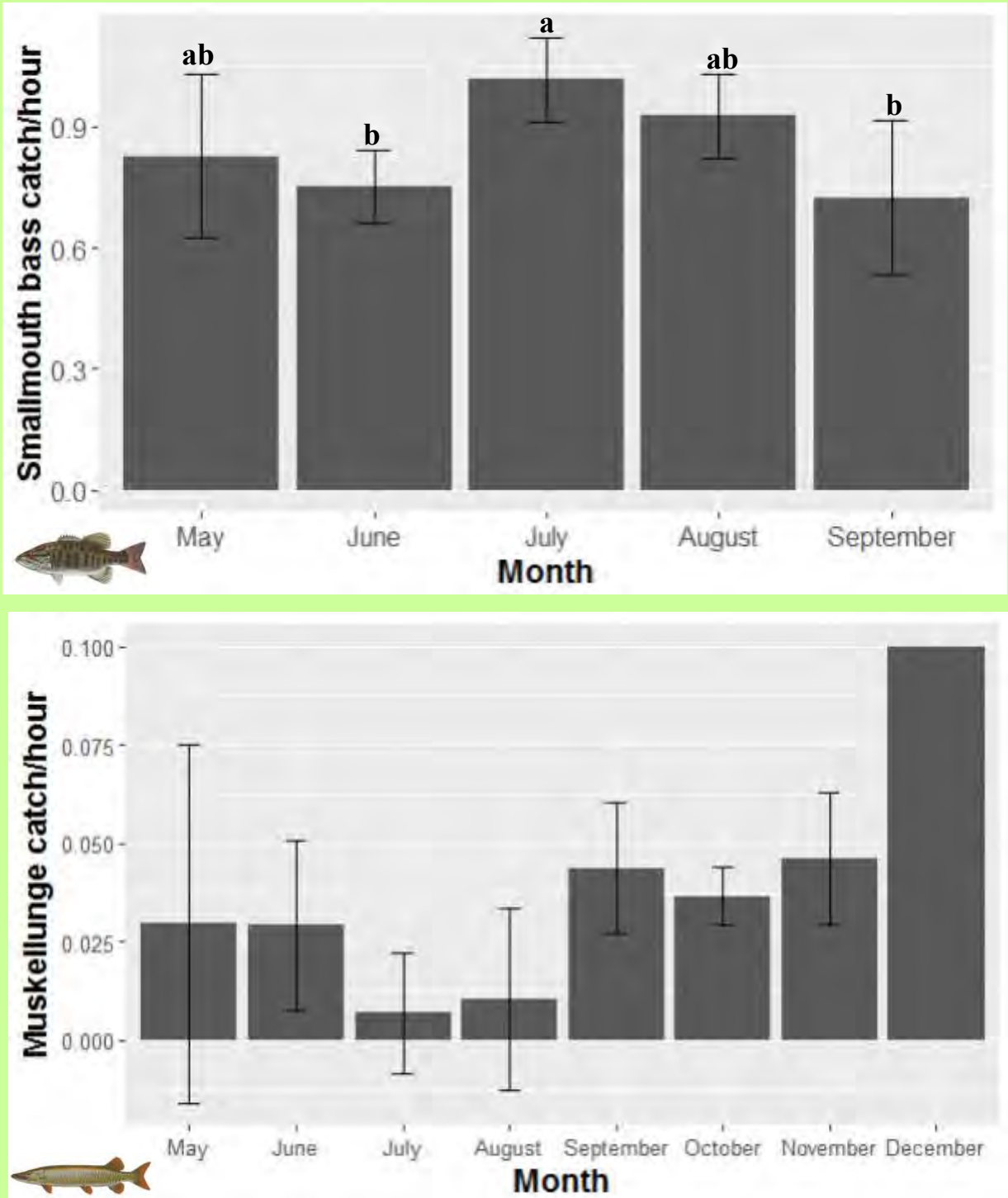
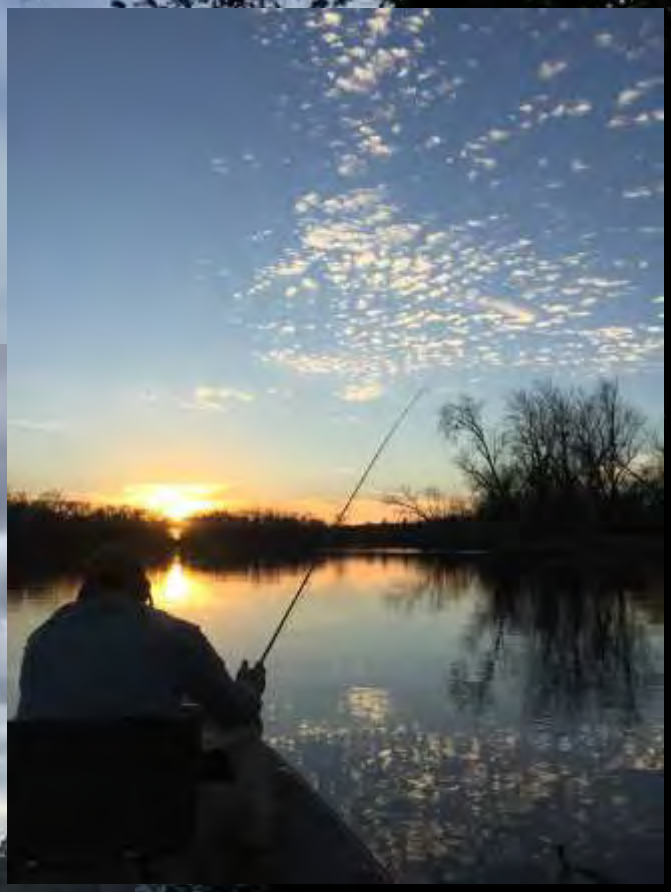


Figure 8. Smallmouth bass (top panel) and muskellunge (bottom panel) skill level corrected catch rates by month in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings.

WDNR Comments

SPATIAL TRENDS IN CATCH RATES



WDNR Comments

Smallmouth Bass Catch By River Reach

Smallmouth bass catch rate across different reaches within the same river did not reveal many consistent patterns (Figure 9). For example, there was no evidence that smallmouth bass catch rate consistently increased or decreased from upstream reaches to downstream reaches. Catch rates on the Chippewa River were significantly lower at Chip3 compared to Chip1 and Chip5, but no other trends were present. Catch rates on the Flambeau and Namekagon were statistically similar across all reaches. Given that few differences in catch rate were observed, one can conclude that smallmouth bass fishing quality is generally similar along the entire stretch of each river fished by guides as a part of this project. It also indicates that there are few major habitat issues (dams, impaired discharge, etc.) that limit smallmouth bass populations in particular reaches.

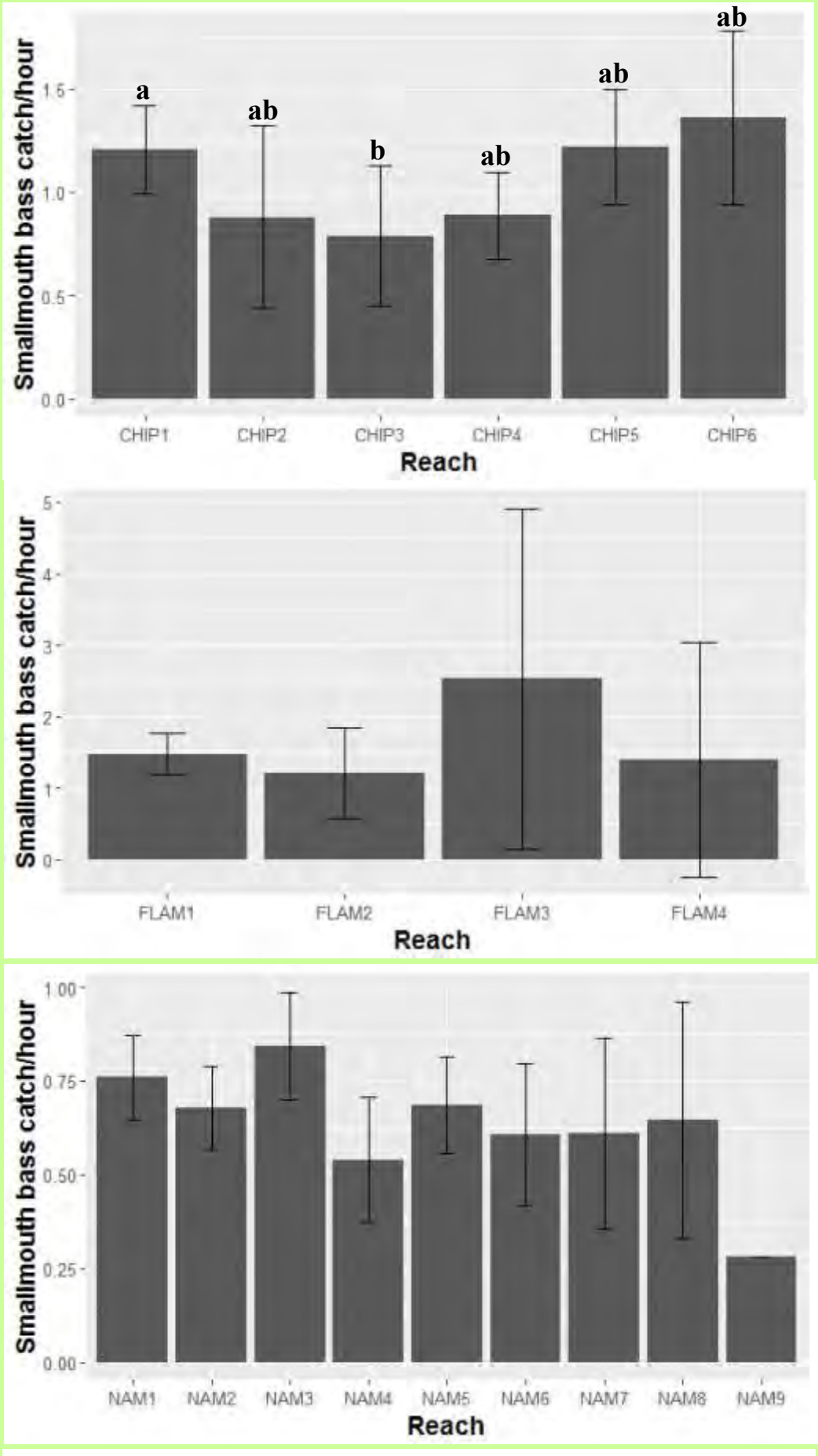


Figure 9. Smallmouth bass skill level corrected catch rates by reach in three rivers (top=Chippewa, middle=Flambeau, bottom=Namekagon) in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings. Reaches are arranged from upstream to downstream (i.e. CHIP1 is upstream of CHIP2 and so on).

WDNR Comments

Muskellunge Catch By River Reach

Muskellunge catch rate by river reach similarly did not reveal statistically significant patterns (Figure 10). However, several notable trends are present. Almost no muskellunge are caught on the Namekagon River upstream from Namekagon4. Muskellunge are known to inhabit these upper reaches and it is not clear why this pattern exists

As with other analyses in this report, the comparison of muskellunge catch by river reach was limited by high variation (see wide error bars in Figure 10) and was exacerbated by low sample size for some reaches. Perhaps the inclusion of more data from future years of fishing will allow for better comparisons of muskellunge catch within rivers.

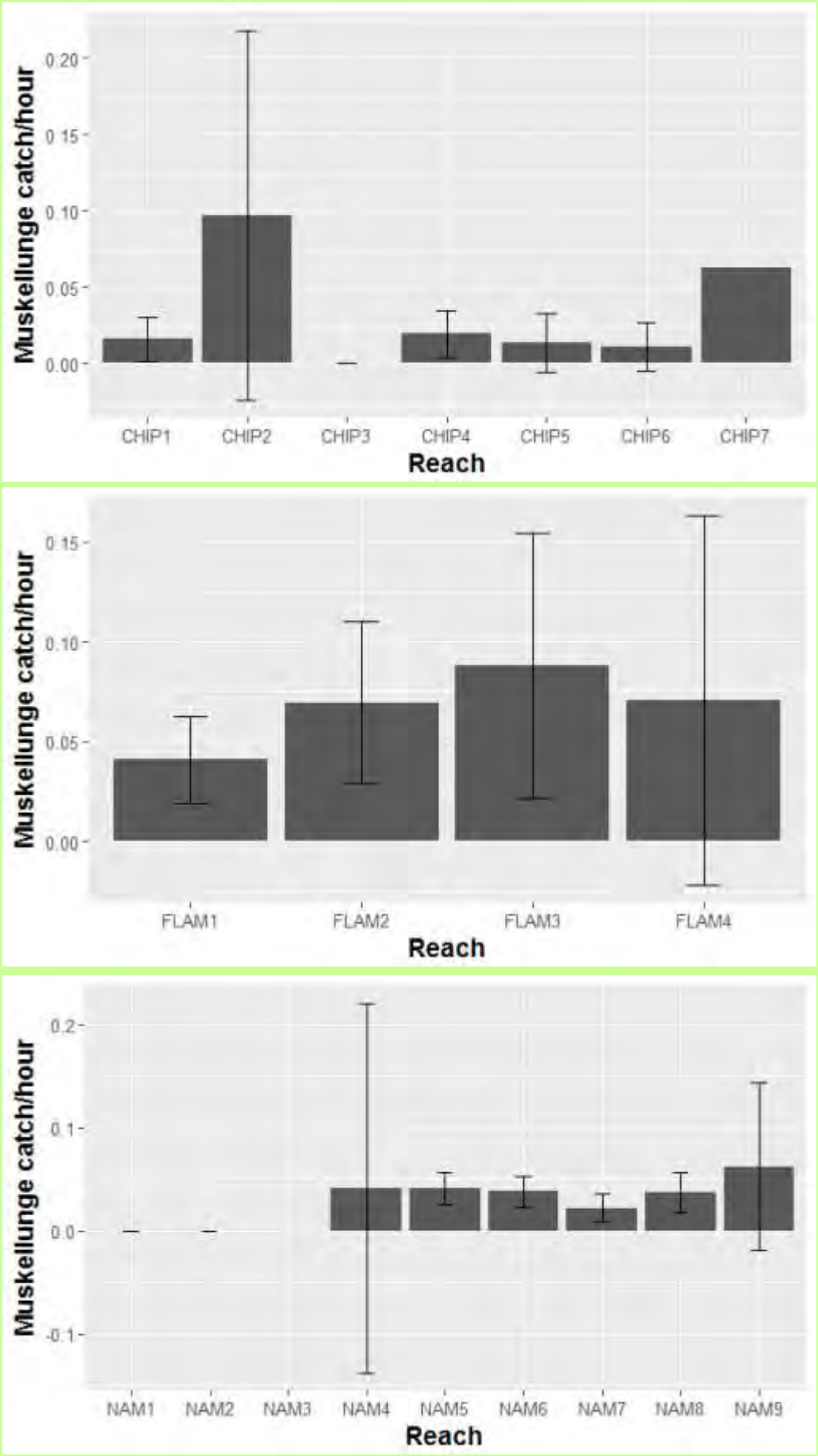
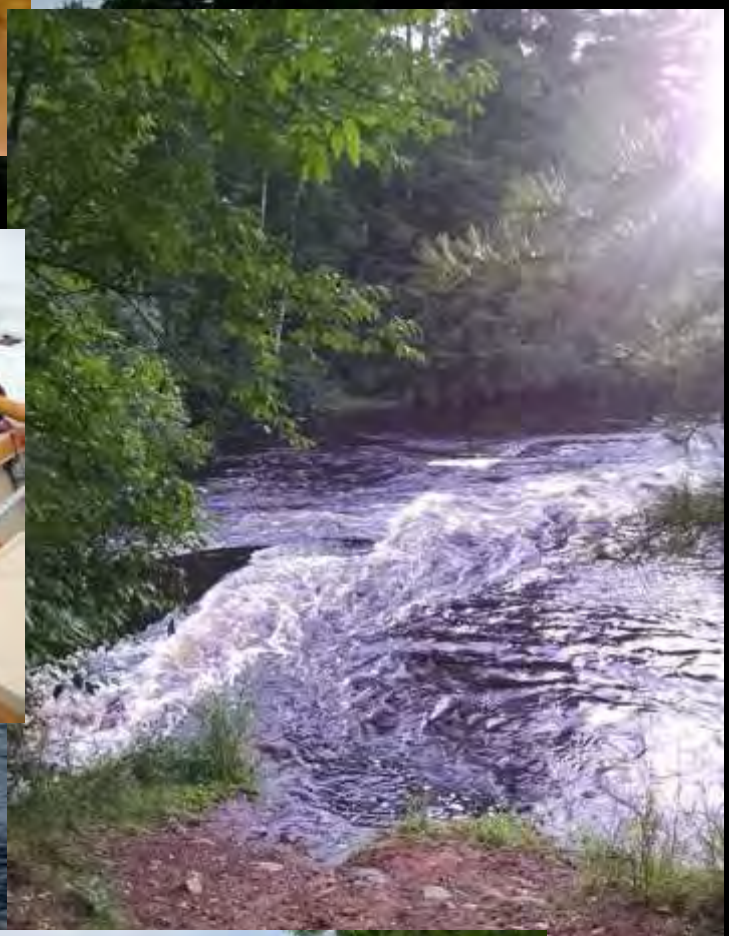
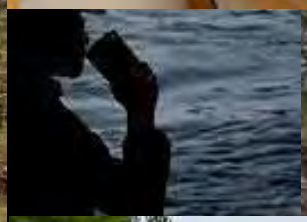


Figure 10. Muskellunge skill level corrected catch rates by reach in three rivers (top=Chippewa, middle=Flambeau, bottom=Namekagon) in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings. Reaches are arranged from upstream to downstream (i.e. CHIP1 is upstream of CHIP2 and so on).

WDNR Comments

INFLUENCE OF ENVIRONMENTAL CONDITIONS ON CATCH RATES





WDNR Comments

Catch Rates and River Discharge

The guides who participated in this project consider river discharge to have a considerable impact on fishing success. We conducted a regression analysis to compare catch rates for smallmouth bass and muskellunge with discharge. This analysis included days with mitigating conditions to capture fishing under extreme discharge. A separate model was constructed for each species x river combination. Generally speaking, catch rates for both smallmouth bass and muskellunge demonstrated a negative trend with increasing discharge. However, in all but one case (smallmouth bass in the Flambeau River) the trend was not statistically significant (Figure 11). Future data collection may allow us to better describe this relationship. Similarly, more data may allow for exploration of quadratic or nonlinear relationships, which may effectively allow for determination of "ideal" discharge conditions for catching each species.

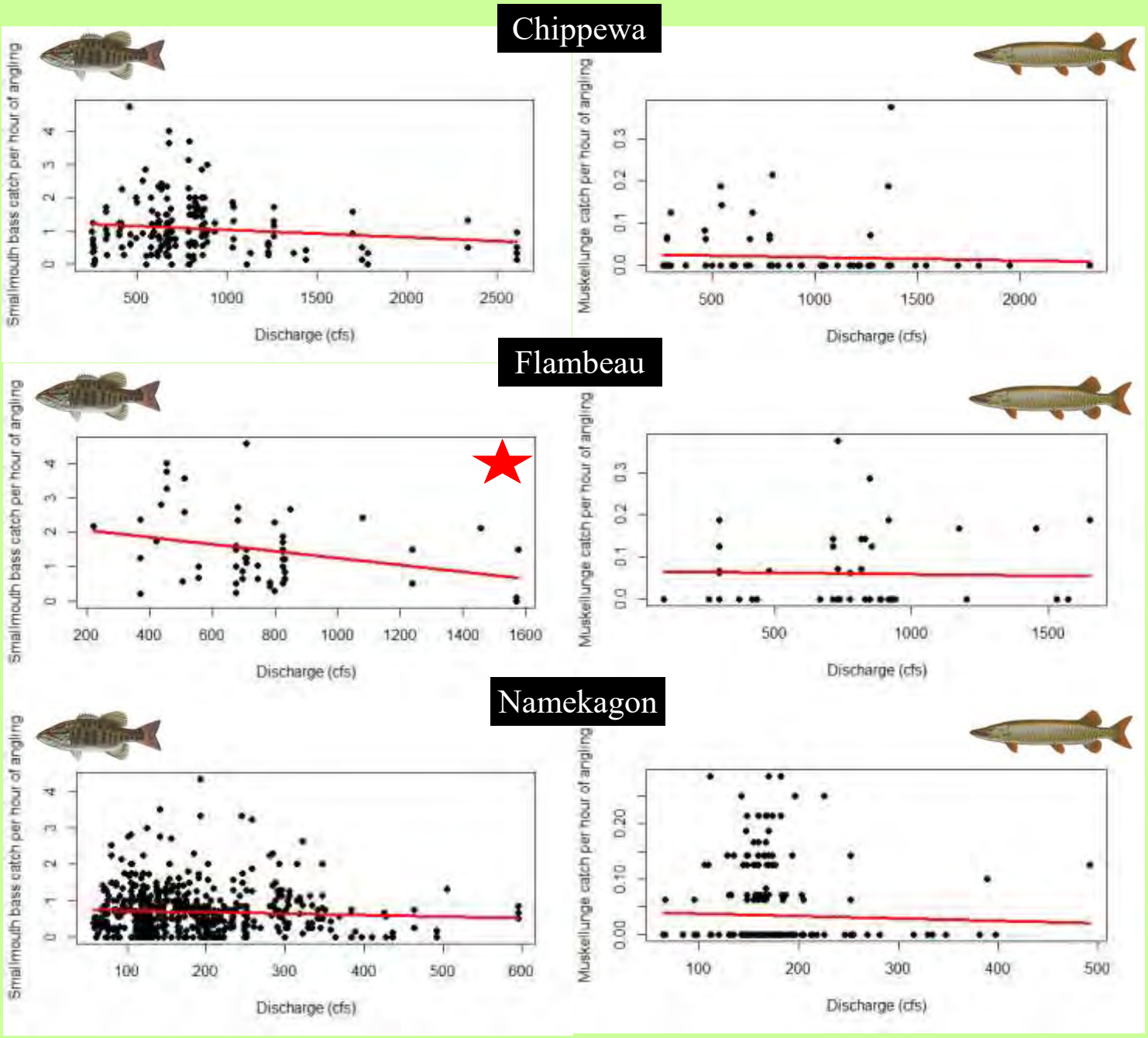


Figure 11. Comparison of skill level corrected catch rates for smallmouth bass (left column) and muskellunge (right columns) with river discharge (cubic feet per second) on the day of fishing for guided anglers on three northwestern Wisconsin rivers from 2012-2016. A red star in a panel demotes a statistically significant relationship ($P<0.05$).

WDNR Comments

Catch Rates and River Level Changes

Changing river conditions prior to a day of fishing is also considered to be an important factor determining fishing success. We compared catch rates for smallmouth bass and muskellunge from all rivers under three different conditions: falling water level (>15% drop in discharge over 3 days), flat water level (<15% change in discharge over 3 days), and rising water level (>15% increase in discharge over 3 days). Catch rates for smallmouth were significantly higher under flat water conditions compared to rising water (Figure 12). A similar pattern appears to be present for muskellunge, though it was not statistically significant.

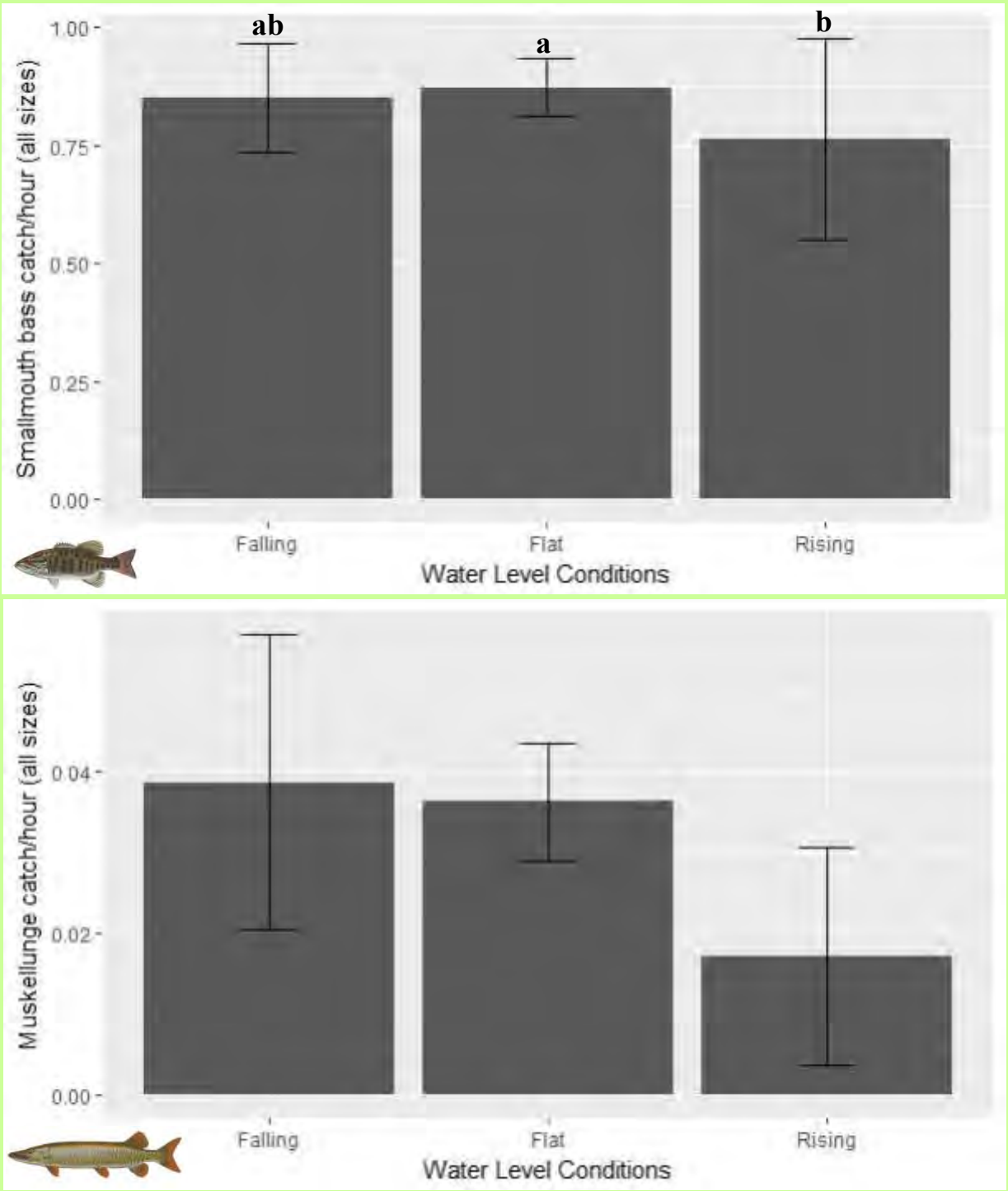


Figure 12. Skill level corrected catch rates of smallmouth bass (top panel) and muskellunge (bottom panel) under three different river conditions. Data was collected by in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings.

WDNR Comments

Catch Rates and Water Temperature

Water temperature is an important factor determining many aspects of fish behavior. Guides participating in this project collect daily water temperature data on-site at noon in a shaded area. We compared catch rates for smallmouth bass and muskellunge with water temperature across all rivers (Figure 13). Smallmouth bass demonstrated a significant positive relationship between water temperature and catch rate. This result matches the observed higher catch rates in peak summer months. There was no statistically significant trend between muskellunge catch rate and temperature, but there was an indication of higher catch between 50-70F.

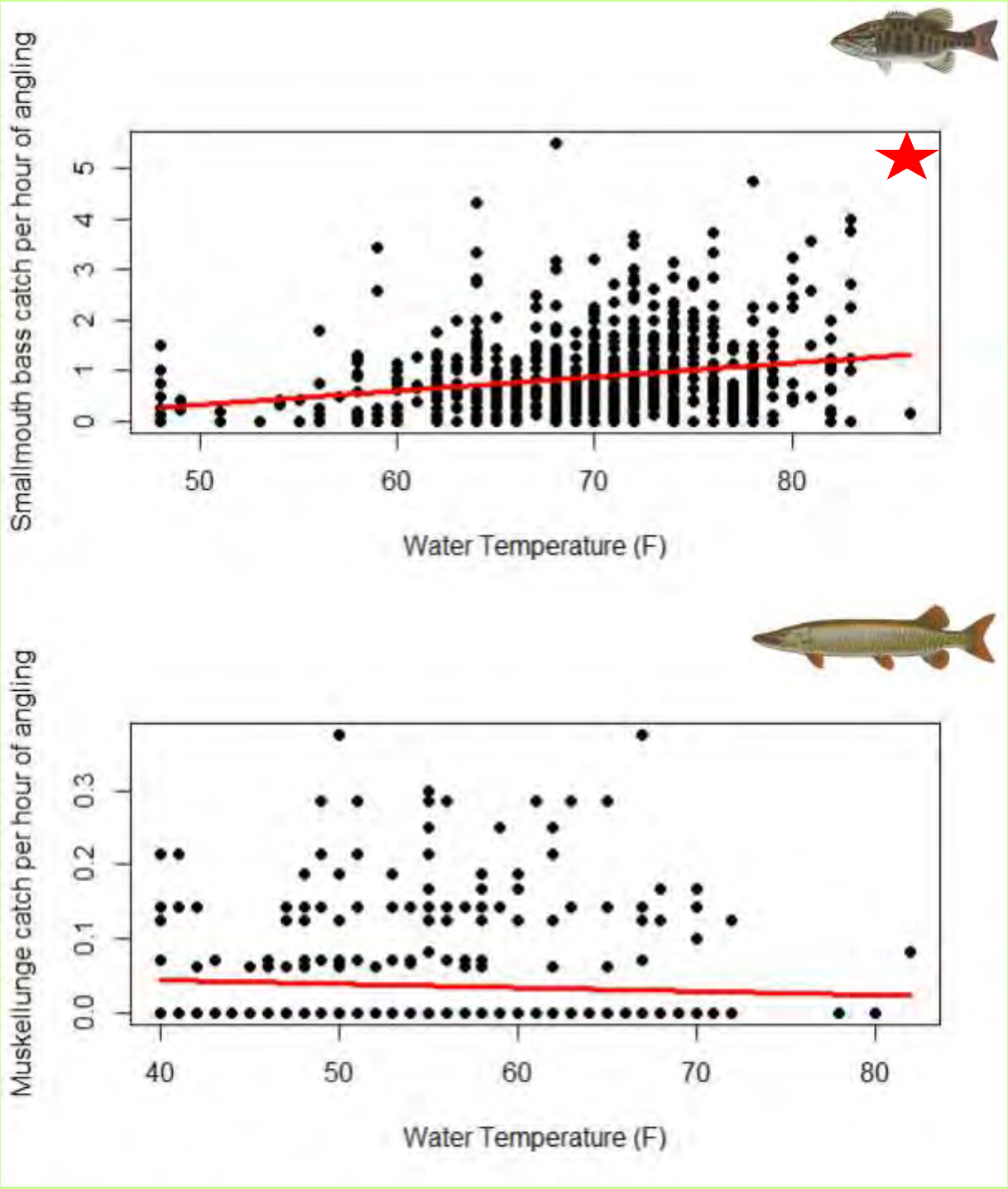
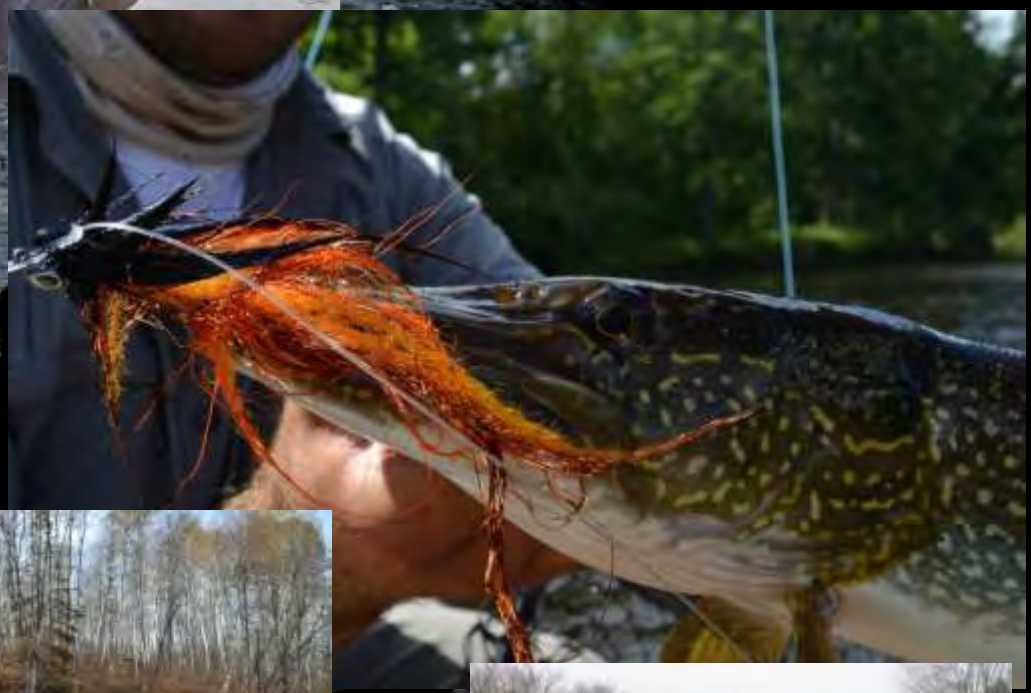


Figure 13. Comparison of skill level corrected catch rates for smallmouth bass (top panel) and muskellunge (bottom panel) with water temperature on the day of fishing for guided anglers on three northwestern Wisconsin rivers from 2012-2016. A red star in a panel demotes a statistically significant relationship (P<0.05).

WDNR Comments

CATCH RATES FOR OTHER SPECIES



WDNR Comments

Catch Rate of Northern Pike and Other Species

While smallmouth bass and muskellunge were the target species for all trips included in this project, other predator species were caught incidentally. Guides recorded all incidental catch which provided at least a limited amount of information on northern pike, walleye, and largemouth bass populations. Catch rates for northern pike were significantly higher on the Namekagon River in comparison to the Flambeau River, with the Chippewa River being intermediate (Figure 14). Overall, incidental catch rate of northern pike was similar to that of targeted catch rate for muskellunge. Northern pike density appears to be relatively low in these rivers in comparison to lakes in the area. Incidental catch of walleye and largemouth bass was rare. Only 22 walleye were caught in 1,486 angler days of fishing. Walleye are believed to be more common in these rivers than the low catch would indicate. As a result, we believe that fly fishing guide data may not be a representative way to sample walleye populations in rivers. Only 34 largemouth bass were captured incidentally as a part of this project. Based on their similarities to smallmouth bass we feel more confident that the low catch of largemouth bass is, in fact, representative of the populations in these rivers. Largemouth bass likely occur at a very low density in these fast, rocky rivers. Largemouth bass are generally considered to be better suited for lake environments.

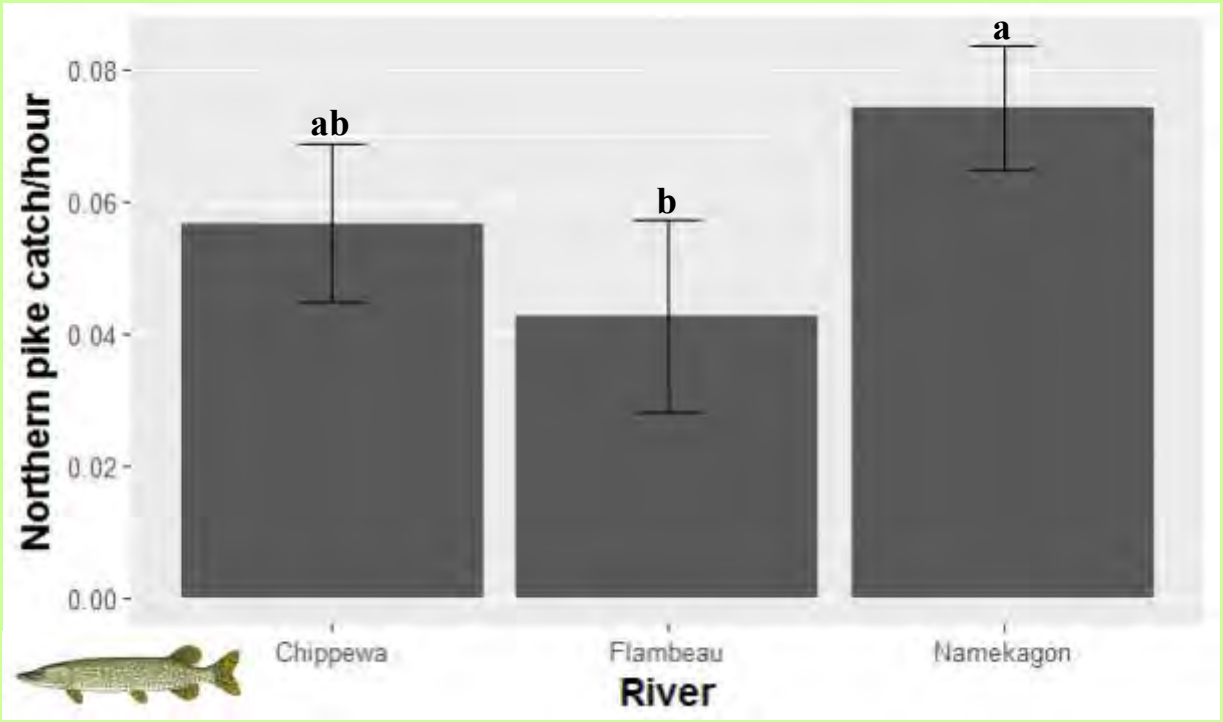


Figure 14. Northern pike incidental catch rates (number per hour of total angling) in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals.

WDNR Comments

WISCONSIN CONSERVATION DEPARTMENT
Madison, Wisconsin 53701

Fi-320

LIMNOLOGY

County Sawyer (1 5 2 8) Waters Hayward Lake (3 — 4 9 5 1 6)

Location: Section 26,27 Township 41N Range 9W (7)

Area (acres): 247.1 (8 9 10 11 12 13)

Type of Water: Lake ..... Stream ..... Impoundment x (14)

Dimensions: Length (miles and tenths) 1.80 (15 16 17 18) Width .33 (19 20 21 22)

Depth: Mean ..... Maximum (feet) 17 (23 24 25)
> 20 feet (percent) 0 (26 27)
< 3 feet (percent) 43 (28 29)

Shore Length (miles and tenths): 8.64 (30 31 32)

Littoral Bottom Types (percent): Sand 60 (33 34) Clay .....
Gravel 8 Hardpan ..... (35 36)
Bedrock ..... Boulder ..... (37 38)
Silt ..... Marl ..... Rubble ..... Detritus 32 (39 40)

Direct Drainage Area (square miles): 1.85 (41 42 43 44)

Watershed Land Cover (percent): Agriculture 60 (45 46)
Wetland ..... Wild 40 (47 48)

Watershed: Area (square miles) 93.51 (49 50 51 52)

Inlets: Number ..... Width (feet) ..... Navigability yes Volume (53)

Outlet: Width (feet) ..... Navigability yes Volume (54)

Landlocked: no (55)

Water Control Structure:
Owner ..... Height (feet) 17 Type ..... Purpose ..... (56 57)

Water Source: Drainage x Seepage ..... Spring ..... Drained ..... (58)

Flow of Outlet (cfs): 275.0 (59 60 61)

Water Chemistry:
Date July 1964 MPA Alkalinity (ppm) 69 (62 63 64)

pH: 8.2 (65 66)

Phosphates: Total ..... Dissolved ..... (67 68 69)

Conductance: C_t ..... C_{f77} 130 (70 71 72)

Watercolor: Lt. Brown ..... Med. Brown ..... Drk. Brown ..... Clear x Turbid ..... (73)

Secchi Disk (depth in feet): 15 (74 75)

Conditions .....

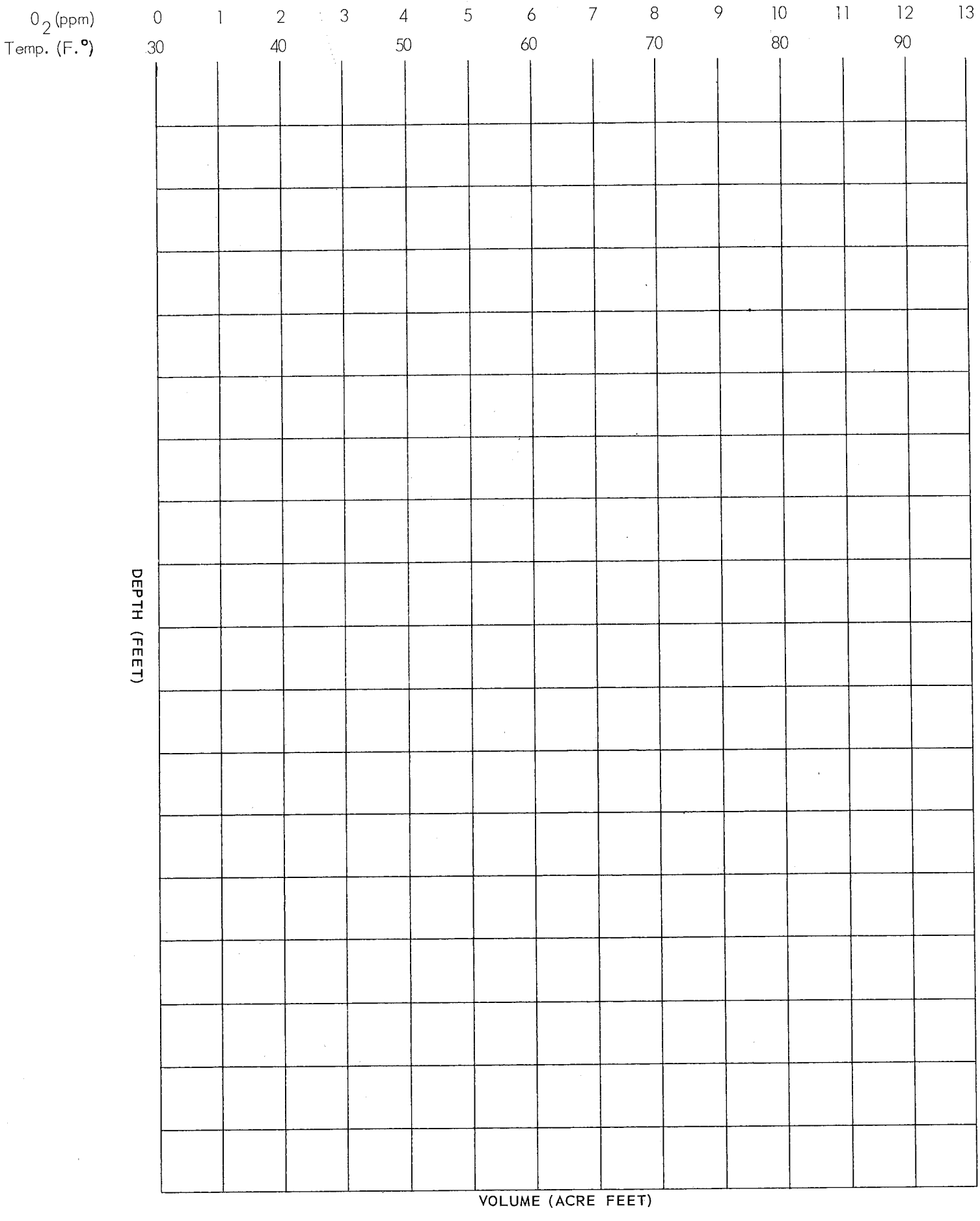
Upper Thermocline Depth (feet): ..... (76 77) Chloride (ppm) ..... (78 79)

Comments: .....

Signed M. Perkins (Compiler) Date July 1964

WDNR Comments

OXYGEN, TEMPERATURE, VOLUME PROFILE



Date of Collection .....

WDNR Comments

WISCONSIN CONSERVATION DEPARTMENT
Madison, Wisconsin 53701

Fi-321

FISH DATA

County ..... Sawyer ..... 5 8 Waters ..... Hayward Lake 9 1

Use Problems Sec. 26, 27, T41N, R9W

Winterkill: Yes ..... No ..... X ..... Frequency .....

Macrophytic Vegetation

Yes ..... No ..... X ..... Control Measures .....

Species	Abundance	Species	Abundance	Species	Abundance

Algae: Yes ..... No ..... X ..... Species .....

Carp: Yes ..... No ..... X ..... Comment on Condition .....

Stunted Panfish: Yes ..... No ..... X ..... Species .....

Pollution: Yes ..... No ..... X ..... Source .....

Fluctuating Water Levels: None ..... X ..... Man ..... Natural ..... Range .....

Basic Management: .....

Walleye, Northern Pike, Bass, and panfish.

Fish Species: Describe as Present (P), Common (C), or Abundant (A)

Esocidae

Muskellunge	P	15
Northern pike	A	16
Mud pickerel		17

Percidae

Walleye	C	18
Sauger		19
Perch	C	20

Centrarchidae

Largemouth bass	C	21
Smallmouth bass	P	22
Bluegill	A	23
Black crappie	C	24
White crappie		25
Rock bass	P	26
Pumpkinseed	C	27
Warmouth		28
Green sunfish		29

Serranidae

White bass		30
Yellow bass		31

Ameiuridae

Channel catfish		32
Flathead catfish		33
Black bullhead	C	34
Brown bullhead		35
Yellow bullhead		36

Salmonidae

Lake trout		37
Brook trout		38
Brown trout		39
Rainbow trout		40
Cisco		41
Whitefish		42
Carp		43

Catostomidae

White sucker	C	44
Buffalo		45
Spotted sucker		46
Quillback		47
Sturgeon sucker		48
Redhorse	P	49
Lake chub sucker		50

Lepisosteidae

Longnose gar		51
Shortnose gar		52
Bowfin		53
Mooneye		54
Gizzard shad		55

Burbot		56
Sheepshead		57

Acipens

Rock sturgeon		58
Shovelnose sturgeon		59

Cyprinidae

Bluntnose minnow		60
Common shiner		61
Golden shiner		62
Redbelly dace		63
Creek chub		64
Emerald shiner		65

Other species		66
		67
Johnny Darter	P	68
Bluntnose Minnow	P	69
		70
		71
		72
		73
		74
		75
		76
		77
		78
Crayfish		79

Signed ..... L. M. Sather ..... July 1964 ..... (Compiler) Data Source Area File & Gen. Lake Cond.

4-66

WDNR Comments

WISCONSIN CONSERVATION DEPARTMENT
Madison, Wisconsin 53701

Fi-326

PUBLIC ACCESS AND GAME ASSETS

County Sawyer (5 8) Waters Hayward Lake (9 1)
Sec. 26,27, T41N, R9W

ACCESS

Parks (name and number): Town 0 City 1
County 0 State 0 Federal 0
Access Roads With Parking (number):
Town 0 City 1 County 0 State 0 Federal 0
Access Roads Without Nearby Parking (number): NONE
Town City County State Federal
Navigable Water Access: Yes X No Name
Unimproved or Difficult Access: Yes No X
Wilderness (describe)
Commercial and Cottage Facilities (number): Resorts 7 Boat Rentals 7
Campgrounds 0 Cottages or Dwellings 26 9 Private Camps 1
Observations:

GAME RESOURCES

Type of Wetland Area of Adjoining Wetland (acres) 2 8
Percent Woody 5 0 Percent Nonwoody
Muskrat (significant ~~or insignificant~~): Yes No
Beaver ~~(presence or~~ absence): Yes No
Waterfowl:

Broods	Yes X No		Mallard	Yes X No	
Black	Yes No X		Teal	Yes X No	
Wood	Yes No X		Hooded Merganser	Yes No X	
Coot	Yes No		Loon	Yes No X	
			Heron Rookery	Yes No X	

Other

Migration:

	Puddle Ducks	Diving Ducks	Coot	Canada Geese	Other
Spring	10-100	10-100	1-10	0	0
Fall	~~10-100~~	~~10-100~~	1-10	0	0

Restrictions on Hunting (refuges, local ordinances): YES
Observations

OTHER DATA

Access Priority (describe): Important
Public Frontage (miles and hundredths): 0.2
Watershed Number: 5
Observations:
Park 0.22
(3) Undeveloped platted accesses .03

Signed L. M. Sather (Compiler) Date July 1964

4-66

WDNR Comments

Fi-264 NWA - Lakes

County Sawyer

Water Hayward Lake

Drainage system Namekagon

Lake types:

I. Water chemistry & source (X)

Hard water drainage	x
Soft water drainage	
Hard water seepage	
Soft water seepage	
Acid bog	
Alkaline bog	
Spring pond	

II Shoreline vegetation % species

Hardwood upland	± Mixed	
Conifer upland		
Grass upland		
Hardwood swamp		
Conifer swamp		
Shrub swamp	5	
Fresh meadow		

III. Shoreline type %

Firm upland	90
Soft marsh	10
Bog	

IV. Shore Use

		%
Wild or undeveloped		20
Pastured		
Cultivated	est.	
Developed		80

V. Aquatic vegetation - Predominant

Emergent: cattails

Floating: water lily

Submergent: Pondweeds, etc.

VI. Rearing pond potential: Yes - No x

Mapped previously: '64 Yes x No

Reliable: Yes x No

Map data - Acres:

Miles shoreline:

Maximum depth:

Shore development figure: 3.92

Conservation Area: Yes ___ No x

Name

Park Facilities: Yes x No ___

Name

Acres ___ Owner

	(X)
Swimming	x
Picnicking	x
Camping	
Access	x

Private hatchery: Yes x No ___

Lic. No.

Operator:

Pollution: Yes ___ No x

Source:

Boating conflict: Yes ___ No x

Regulation

Sources of data: (X)

	Fish	Winter kill
Dist. Manager		
Area file	x	x
Local		
Gen. lake condition		x
Observation		
Other		

Extent of winterkill: (X)

Annual complete	
Occasional complete	
Occasional partial	
None	x

D. O. = ___.___ ppm ___ 19 ___

Remarks:

Possible weed problem in future.

WDNR Comments

UNIT FISHING RECORD

FORM 3600–62

DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS
Sawyer	Lake Hayward - South shore
DATE	**TIME**
5-16-77 (First Night)	9:15 PM - 1:40 AM

SITE FISHED (STATION AND HABITAT)

Rt. 27 bridge along south shore to Rt. 77 bridge entire shoreline including one island.

GEAR

BOOM SHOCKER (HOURS)	DAYTIME	DARKNESS
2.2		X

VISUAL HOURS	TIME	HAUL SEINE (LENGTH)	AREA	MESH
ANGLING (HOURS)	TIME	TRAP NET (DIMENSIONS)	MESH	DEPTH
MINNOW SEINE (LENGTH)	DISTANCE	GILL NET (LENGTH)	MESH	DEPTH

OTHER

FISHING CONDITIONS (Describe)

Clear, calm, warm, buggy, Air 68°, H_2O 65°

FISHING RESULTS

SPECIES	NUMBER	ESTIMATED MODAL LENGTH	ESTIMATED SIZE RANGE	CPE No./hr.
Largemouth bass	9	15.0	7.0 - 18.6	4.1
Smallmouth bass	3	10.0	8.0 - 10.3	1.4
Northern pike	24	12.0,16.0,18.0	9.5 - 27.0	10.9
Muskellunge	1 seen	35"	35"	0.4
N. redhorse	134	5.0,8.0,13.0	3.5 - 18.4	Abundant
White sucker	15	6.0,14.0,17.5	4.0 - 18.9	Common
Walleye	4	11.0	10.0 - 12.3	1.8
Bluegill	268	1.6,2.8,5.2,6.0,7.2	0.9 - 8.2	121.8
Pumpkinseed	167	2.5,4.5,5.2,6.0	1.4 - 7.4	75.9
Rock bass	11	5.1,7.0	2.1 - 8.0	5.0
Bl. crappie	3	N/A	5.2 - 9.1	1.4
Y. perch	63	2.2,3.0,4.2,5.3,11.0	1.5 - 11.3	28.6

OBSERVATIONS Bob Kinney and son watched. A lot of panfish and redhorse. Gamefish don't seem to be in tonight. Warm water necessitated processing fish at frequent intervals. Rt. 77 bridge too low - couldn't sample basin just above dam. No minnow sample taken, scales not taken (no envelopes). (Must be done 5-17-77). Also common and golden shiners, johnny darters, one longear sunfish. Small creek chubs 1.5 - 2.0" common to abundant in upper river channel. Bay near Wilson Creek inlet very weedy and shallow. Slow going, but wall to wall sunfish. Hard water - drew 10-11 Amps at 230 volts, 6-8 Amps at next lower voltage.

Crew: Pratt, Kowalski, Libby	COMPILER'S SIGNATURE F. Pratt	DATE 5-17-77

REV. 2–71

RY . ISHING RECORD
3600-63

Spring Shocker Runs
Two Nights

DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS
Sawyer	Lake Hayward
SAMPLING OBJECTIVE	NUMBER AND LOCATION OF STATIONS (HABITAT)
Running Inventory	Entire shoreline except basin between Rt. 27 bridge and dam
PERIOD FISHED (DATES)	
5/16,17/77	

GEAR

BOOM SHOCKER (HOURS)	TIME
4.1 gamefish 2.8 panfish	X NIGHT _____ DAY

VISUAL HOURS	TIME OF DAY	HAUL SEINE (LENGTH)	MESH	AREA COVERED
ANGLING (HOURS)	TIME OF DAY	TRAP NET (NO. OF NET LIFTS)	MESH	DEPTH
MINNOW SEINE (NO. HAULS)	AREA COVERED	GILL NET (NO. OF FEET X NO. OF LIFTS)	MESH SIZE	DEPTH

OTHER (HOURS OR LIFTS)	CHARACTERISTICS
	Clear, calm, unseasonably warm air and water temps.

FISHING RESULTS

NO/hr.

SPECIES	NO.	MODAL SIZE(S)	SIZE RANGE	CATCH/UNIT
Largemouth bass	22	8.5,12.0,15.0, 17.0	7.0 - 20.5	5.4
Smallmouth bass	15	10.0,13.5	7.0 - 16.8	3.7
Northern pike	45	8.5,12.5,16.0	7.0 - 27.0	11.0
Muskellunge	1 seen and 1 found dead		35 - 51.5	0.3
Walleye	6	11.0	10.0 - 16.4	1.5
Bluegill	376	1.5,2.8,5.2, 6.0	0.9 - 8.3	134.3
Pumpkinseed	292	2.8,4.5,5.2	1.4 - 7.4	104.3
Rock bass	20	5.1,7.4	1.5 - 8.0	7.1
Black crappie	5	N/A	2.1 - 9.1	1.8
Yellow perch	92	2.2,3.0,4.6, 5.3,8.7,11.0	1.5 - 11.3	32.9

OBSERVATIONS

Redhorse and sunfish appear to dominate. Gamefish not inshore in large numbers either night. Bluegills already on spawning beds. Also shiners, lamprey, darters, mudminnows.

SIGNED (COMPILER)	DATE
F. Pratt	5-18-77

REV. 10-70

WDNR Comments

FISH LENGTH FREQUENCY

DEPARTMENT OF NATURAL RESOURCES

3600-65

Crew: Pratt, Kowalski, Libby

COUNTY	WATERS	DATE	GEAR
Sawyer	Lake Hayward - South shore	5-16-77	Vari volt boomshocker

Size Range	SPECIES							
	LMB	SMB	We	NP	Musky	Lamprey	NRH	WS
3.0- 3.4								
3.5- 3.9							2	
4.0- 4.4							3	1
4.5- 4.9							9	
5.0- 5.4							28	
5.5- 5.9							8	
6.0- 6.4							9	2
6.5- 6.9						2	4	
7.0- 7.4						Attached	5	
7.5- 7.9						to two	8	
8.0- 8.4		1				redhorse	13	
8.5- 8.9							4	1
9.0- 9.4							4	
9.5- 9.9				1			1	
10.0-10.4	1	2	1				2	
10.5-10.9				2			1	1
11.0-11.4			2	1			3	
11.5-11.9							1	
12.0-12.4	1		1	2			5	
12.5-12.9				1			4	
13.0-13.4	1			1			6	
13.5-13.9	1			2			2	1
14.0-14.4				1			3	2
14.5-14.9							3	1
15.0-15.4	2			1			2	
15.5-15.9				2			1	
16.0-16.4	1			2				
16.5-16.9								
17.0-17.4							1	1
17.5-17.9				3			1	2
18.0-18.4				2			1	2
18.5-18.9	1							1
19.0-19.4								
19.5-19.9							Very	Common
20.0-20.4							Abundant!	
20.5-20.9								
21.0-21.4								
21.5-21.9								
22.0-22.4				1				
22.5-22.9								
23.0-23.4								
23.5-23.9								
24.0-24.4								
24.5-24.9								
25.0-25.4								
25.5-25.9								
26.0-26.4								
26.5-26.9								
Total	9	3	4	23 subtotal		2	134	15

Size Range	SPECIES		
	WE	NP	Musky
27.0-27.4		1	
27.5-27.9			
28.0-28.4			
28.5-28.9			
29.0-29.4			
29.5-29.9			
30.0-30.4			
30.5-30.9			
31.0-31.4			
31.5-31.9			
32.0-32.4			
32.5-32.9			
33.0-33.4			
33.5-33.9			
34.0-34.4			
34.5-34.9			
35.0-35.4			1 seen
35.5-35.9			
36.0-36.4			
36.5-36.9			
37.0-37.4			
37.5-37.9			
38.0-38.4			
38.5-38.9			
39.0-39.4			
39.5-39.9			
40.0-40.4			
40.5-40.9			
41.0-41.4			
41.5-41.9			
42.0-42.4			
42.5-42.9			
43.0-43.4			
43.5-43.9			
44.0-44.4			
44.5-44.9			
45.0-45.4			
45.5-45.9			
46.0-46.4			
46.5-46.9			
47.0-47.4			
47.5-47.9			
48.0-48.4			
48.5-48.9			
49.0-49.4			
49.5-49.9			
	4	24 grand total	1 seen

REV. 1-70

WDNR Comments

SH LENGTH FREQUENCY

DEPARTMENT OF NATURAL RESOURCES

3600-64

2.2 hours

COUNTY	WATERS	DATE	GEAR
Sawyer	Lake Hayward - South shore	5-16-77	Vari volt boomshocker

Size Range	SPECIES						Size Range	SPECIES					
	BG	PS	YP	RB	BC	B1 BH		BG	PS	YP	RB	BC	B1 BH
<1	3						7.0	9			2		
1-1.4	2	1					7.1	3					
1.5-1.9	13		1				7.2	10					
2.0			2				7.3	1			1		
2.1			3	1			7.4	2	1				
2.2			8				7.5	5					
2.3			2				7.6	2					
2.4	1		2				7.7	2					
2.5		2	1				7.8	1					
2.6							7.9	1					
2.7							8.0	1			1		
2.8	3	1	1				8.1					1	1
2.9			3				8.2	1					
3.0	2		3				8.3						
3.1	1		3				8.4						
3.2	1						8.5						
3.3	2	2					8.6						
3.4							8.7						
3.5							8.8						1
3.6	1		3				8.9						
3.7			1				9.0						
3.8			1				9.1					1	
3.9			1				9.2						3
4.0	4	2	2				9.3						5
4.1	2	4	2				9.4						1
4.2	4	5	6				9.5						1
4.3	2	2	1				9.6						2
4.4	1	2	1				9.7						2
4.5	5	7	2				9.8						
4.6	5	6	2				9.9						2
4.7	4	6	2				10.0						
4.8	2	4					10.1						1
4.9	4	3					10.2			1			
5.0	21	14					10.3						
5.1	7	7	1	3			10.4						
5.2	25	22	1		1		10.5						
5.3	7	8	3				10.6						
5.4	10	4	1				10.7						
5.5	18	11		1			10.8						
5.6	10	3					10.9			1			
5.7	11	11					11.0			1			
5.8	1	6					11.1						
5.9	2	5					11.2			1			
6.0	17	16					11.3			1			
6.1	7	3					11.4						
6.2	6	3					11.5						
6.3	2	2					11.6						
6.4	3	1					11.7						
6.5	7	1					11.8						
6.6	10						11.9						
6.7	3	1		1			>12						
6.8	5	1											
6.9	1						Total	273	167	64	11	3	20

REV. 2-70 CS - 3.2,3.7 GS - 3.6 JD - 1.8,1.9 Les - 6.3

WDNR Comments

ARY FISHING RECORD

3600-63

DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS
Sawyer	Lake Hayward, North shore
SAMPLING OBJECTIVE	NUMBER AND LOCATION OF STATIONS (HABITAT)
	North shore from Rt 27 bridge to Namekagon river inlet channel
PERIOD FISHED (DATES)	
5-17-77	

GEAR

BOOM SHOCKER (HOURS)	TIME
0.6 hours - panfish 1.9 hours - gamefish	9:30 - 2:00 AM X NIGHT _____ DAY

VISUAL HOURS	TIME OF DAY	HAUL SEINE (LENGTH)	MESH	AREA COVERED
ANGLING (HOURS)	TIME OF DAY	TRAP NET (NO. OF NET LIFTS)	MESH	DEPTH
MINNOW SEINE (NO. HAULS)	AREA COVERED	GILL NET (NO. OF FEET X NO. OF LIFTS)	MESH SIZE	DEPTH

OTHER (HOURS OR LIFTS)	CHARACTERISTICS
	H_2O - 72° Air - 67°F Clear, calm, warm, Littoral weed growth moderate to heavy.

FISHING RESULTS

SPECIES	NO.	MODAL SIZE(S)	SIZE RANGE	CPE No/hr CATCH/ UNIT
Largemouth bass	13	8.5,12.0,17.0	7.5 - 20.5	6.8
Smallmouth bass	12	11.0,13.5	7.0 - 16.8	6.3
Northernpike	21	8.5,12.5,15.5, 19.5	7.0 - 25.0	11.1
Walleye	2	N/A	12.5 - 16.4	1.1
Bluegill	108	1.5,3.2,5.0,7.3	0.9 - 8.3	180.0
Pumpkinseed	125	2.8,4.0,5.0,5.5	2.3 - 6.7	208.3
Rock bass	9	5.8,7.4	1.5 - 7.4	15.0
Black crappie	2	N/A	2.1 - 8.7	3.3
Yellow Perch	29	3.0,4.6,8.7	2.2 - 11.3	48.3
Black Bullhead	11	8.7	3.6 - 9.7	18.3

OBSERVATIONS

Also common and golden shiners, lampreys, and mud minnows. Water extremely warm for so early in year. Bluegills and pumpkinseeds are already on their spawning beds, along most of north shore. Three other walleyes seen in deep water above Rt. 27 .

SIGNED (COMPILER)	DATE
F. Pratt	5-18-77

REV. 10-70

WDNR Comments

FISH LENGTH FREQUENCY

M 3600-65

DEPARTMENT OF NATURAL RESOURCES

Crew: Pratt, Ives, Kowalski

COUNTY	WATERS	DATE	GEAR
Sawyer	Lake Hayward - North shore	5-17-77	Vari volt Boomshocker

Size Range	SPECIES								Size Range	SPECIES		
	LMB	SMB	WE	NP	Musky	Lamprey	NRH	WS		WE	NP	M
3.0- 3.4									27.0-27.4			
3.5- 3.9									27.5-27.9			
4.0- 4.4									28.0-28.4			
4.5- 4.9									28.5-28.9			
5.0- 5.4									29.0-29.4			
5.5- 5.9									29.5-29.9			
6.0- 6.4									30.0-30.4			
6.5- 6.9						1	No pickup		30.5-30.9			
7.0- 7.4		1		1		1	effort on		31.0-31.4			
7.5- 7.9	1						suckers		31.5-31.9			
8.0- 8.4									32.0-32.4			
8.5- 8.9	3			1			Abundant		32.5-32.9			
9.0- 9.4	1			1					33.0-33.4			
9.5- 9.9									33.5-33.9			
10.0-10.4		1			None				34.0-34.4			
10.5-10.9					Seen				34.5-34.9			
11.0-11.4		2							35.0-35.4			
11.5-11.9									35.5-35.9			
12.0-12.4	1			2					36.0-36.4			
12.5-12.9	1	1	1	2					36.5-36.9			
13.0-13.4		1		2					37.0-37.4			
13.5-13.9		3		1					37.5-37.9			
14.0-14.4		2		1					38.0-38.4			
14.5-14.9									38.5-38.9			
15.0-15.4				2					39.0-39.4			
15.5-15.9	1			2					39.5-39.9			
16.0-16.4	1		1						40.0-40.4			
16.5-16.9	1	1		1					40.5- 40.9			
17.0-17.4	2								41.0-41.4			
17.5-17.9				1					41.5-41.9			
18.0-18.4									42.0-42.4			
18.5-18.9				1					42.5-42.9			
19.0-19.4									43.0-43.4			
19.5-19.9				2					43.5-43.9			
20.0-20.4									44.0-44.4			
20.5-20.9	1								44.5-44.9			
21.0-21.4									45.0-45.4			
21.5-21.9									45.5-45.9			
22.0-22.4									46.0-46.4			
22.5-22.9									46.5-46.9			
23.0-23.4									47.0-47.4			
23.5-23.9									47.5-47.9			
24.0-24.4									48.0-48.4			
24.5-24.9									48.5-48.9			
25.0-25.4				1					49.0-49.4			
25.5-25.9									49.5-49.9			
26.0-26.4										2	21	0
26.5-26.9												
Total	13	12	2	21		2						

REV. 1-70 Also - 51½" Musky found dead and brought into office. Just south of dam. Scales taken.

WDNR Comments

ISH LENGTH FREQUENCY

M 3600-64

DEPARTMENT OF NATURAL RESOURCES

COUNTY	WATERS	DATE	SEARI
Sawyer	Lake Hayward - North shore	5-17-77	Vari volt Boomshocker

Size Range	SPECIES					
	BG	RB	PS	BC	YP	BlBH
<1	1					
1-1.4	4					
1.5-1.9	8	1				
2.0						
2.1				1		
2.2					2	
2.3	1		2			
2.4						
2.5						
2.6						
2.7	1					
2.8	1		2		1	
2.9	2				1	
3.0	1				4	
3.1					1	
3.2	3				1	
3.3	1					
3.4			1			
3.5	1					
3.6	2		1			1
3.7						
3.8					1	
3.9					1	
4.0			3		2	
4.1						
4.2	1		4			
4.3			2			
4.4			3			
4.5	2		6			
4.6			3		2	
4.7	3		8			
4.8	4	1	16		1	
4.9			4			
5.0	8		16			1
5.1	2		5			
5.2	7		12			
5.3	3					
5.4			5			
5.5	7		13			
5.6	4		3			
5.7	3	1	6			
5.8	2	1	2			
5.9	2		3			
6.0	1		2			1
6.1	3					
6.2					1	
6.3						
6.4	1		1			
6.5	1	1	1			1
6.6	1					
6.7	1		1			1
6.8	6	1			1	
6.9	2					

Size Range	SPECIES					
	BG	PS	RB	BC	YP	BlBH
7.0	3		1			1
7.1						
7.2					1	
7.3	4					
7.4	2		2		1	
7.5	3					
7.6	1					
7.7	1					
7.8	1					
7.9	1					
8.0					1	
8.1	1					
8.2					1	1
8.3	1					
8.4						
8.5						
8.6					1	1
8.7				1	2	1
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5					1	
9.6						1
9.7						1
9.8						
9.9						
10.0						
10.1						
10.2						
10.3						
10.4						
10.5						
10.6						
10.7						
10.8						
10.9						
11.0						
11.1						
11.2						
11.3					1	
11.4						
11.5						
11.6						
11.7						
11.8						
11.9						
>12						
Total	108	125	9	2	28	11

WDNR Comments

PANFISH LENGTH FREQUENCY

FORM 3600-64

DEPARTMENT OF NATURAL RESOURCES

LFSF-5.2

R.B. - 2.17 - 6.0

1 CRAWFISH
3 TURTLES

COUNTY	WATERS	DATE	GEAR
SAWYER	HAYWARD L.	MAY 1981	3 FYKE NETS

Size Range	SPECIES BG	BC	PS	YP	Size Range	SPECIES BC	BBH	BG	PS
<1				7.9	7.0		6.5	IIII	III
1-1.4				7.0	7.1				
1.5-1.9				5.5	7.2		I	II	
2.0				3.8	7.3			I	
2.1				5.8	7.4		I	I	
2.2				6.0	7.5			III	
2.3				6.2	7.6				
2.4				5.2	7.7				
2.5			I	4.0	7.8				
2.6			I	5.4	7.9				
2.7			I	6.7	8.0				
2.8				5.5	8.1				
2.9				8.0	8.2		IIII		
3.0			I	4.7	8.3		I		
3.1				6.0	8.4		I		
3.2	I			5.0	8.5		II		
3.3				6.2	8.6	I			
3.4					8.7		III		
3.5					8.8		I		
3.6					8.9		I		
3.7					9.0		IIII		
3.8					9.1				
3.9					9.2				
4.0					9.3				
4.1					9.4				
4.2	I			I	9.5				
4.3					9.6				
4.4					9.7	I			
4.5					9.8				
4.6					9.9				
4.7					10.0	I			
4.8					10.1				
4.9					10.2	I	I		
5.0			II		10.3				
5.1					10.4				
5.2			IIII		10.5				
5.3					10.6				
5.4			II		10.7				
5.5	II		IIII		10.8				
5.6					10.9				
5.7	I		I		11.0		I		
5.8	I		III		11.1				
5.9					11.2				
6.0	IIIII		IIII		11.3				
6.1	I				11.4				
6.2	IIIII		IIII		11.5				
6.3					11.6				
6.4	I				11.7				
6.5	IIIII		IIII		11.8				
6.6	I				11.9				
6.7	I				>12				
6.8	III				Total				
6.9	III								

REV. 2-70

WDNR Comments

GAME FISH LENGTH FREQUENCY

FORM 3600-65

DEPARTMENT OF NATURAL RESOURCES

1-SNAPPER - 3"

PAINTED TURTLES-10, 4, 1, 1,

LAMPREY-1, 1,

CRAYFISH-1, 1

COUNTY	WATERS	DATE	GEAR
	Lake Haywood	1982	3 FN

Size Range	NORTHERN	B.G.	P. Perch	BRBA	PS
3.0- 3.4	1	5	1	1	3
3.5- 3.9	1	20	1	1	20
4.0- 4.4	1	15	3	6	15
4.5- 4.9		3			5
5.0- 5.4		3			5
5.5- 5.9		5			1
6.0- 6.4		6			8
6.5- 6.9		5			6
7.0- 7.4		1			5
7.5- 7.9		1			1
8.0- 8.4		1			
8.5- 8.9					
9.0- 9.4					
9.5- 9.9					
10.0-10.4					
10.5-10.9					
11.0-11.4					
11.5-11.9					
12.0-12.4					
12.5-12.9					
13.0-13.4					
13.5-13.9					
14.0-14.4					
14.5-14.9					
15.0-15.4					
15.5-15.9			B.C.	RB	
16.0-16.4					
16.5-16.9			2	1	
17.0-17.4				1	
17.5-17.9				2	
18.0-18.4	RH	WIE			
18.5-18.9					
19.0-19.4	2	1			
19.5-19.9	2	1			
20.0-20.4	1				
20.5-20.9	1				
21.0-21.4	1				
21.5-21.9					
22.0-22.4					
22.5-22.9					
23.0-23.4					
23.5-23.9					
24.0-24.4					
24.5-24.9					
25.0-25.4					
25.5-25.9					
26.0-26.4					
26.5-26.9					
Total					

Size Range	SPECIES BCBH	
27.0-27.4		
27.5-27.9	3	
28.0-28.4	1	
28.5-28.9	3	
29.0-29.4	1	
29.5-29.9	2	
30.0-30.4	5	
30.5-30.9	6	
31.0-31.4	20	
31.5-31.9	5	
32.0-32.4	5	
32.5-32.9		
33.0-33.4		
33.5-33.9		
34.0-34.4		
34.5-34.9		
35.0-35.4		
35.5-35.9		
36.0-36.4		
36.5-36.9		
37.0-37.4		
37.5-37.9		
38.0-38.4		
38.5-38.9		
39.0-39.4		
39.5-39.9		
40.0-40.4		
40.5-40.9		
41.0-41.4		
41.5-41.9		
42.0-42.4		
42.5-42.9		
43.0-43.4		
43.5-43.9		
44.0-44.4		
44.5-44.9		
45.0-45.4		
45.5-45.9		
46.0-46.4		
46.5-46.9		
47.0-47.4		
47.5-47.9		
48.0-48.4		
48.5-48.9		
49.0-49.4		
49.5-49.9		

REV. 1-70

WDNR Comments

GAME FISH LENGTH FREQUENCY

FORM 3600-65

DEPARTMENT OF NATURAL RESOURCES

1 - BROOK LAMPREY 5 - TURTLES - 1 POLLYWOG 1 CRAYFISH

COUNTY	WATERS	DATE	GEAR
Sawyer	Lake Hayward	5-19-81	FN

Size Range	N. Pike	SMB	SMB B.C.	LMB	R.B.	B.G.	BBH
3.0- 3.4		7.0	10.5	7.0	6.4	6.2	9.2
3.5- 3.9	22.5				6.8	6.2	9.4
4.0- 4.4	12.2				6.2	6.0	9.2
4.5- 4.9						6.6	7.8
5.0- 5.4						6.4	7.1
5.5- 5.9						6.7	
6.0- 6.4						6.0	
6.5- 6.9						6.2	
7.0- 7.4						6.4	
7.5- 7.9						6.0	
8.0- 8.4						6.2	
8.5- 8.9						2.8	
9.0- 9.4						2.9	
9.5- 9.9						6.4	
10.0-10.4						7.2	
10.5-10.9						7.3	
11.0-11.4						6.5	
11.5-11.9						5.5	
12.0-12.4						6.2	
12.5-12.9						6.6	
13.0-13.4						6.5	
13.5-13.9						6.2	
14.0-14.4						7.2	
14.5-14.9						5.0	
15.0-15.4						6.1	
15.5-15.9						7.2	
16.0-16.4						5.2	
16.5-16.9						2.9	
17.0-17.4						6.6	
17.5-17.9						6.1	
18.0-18.4						6.2	
18.5-18.9						6.0	
19.0-19.4						6.5	
19.5-19.9						5.7	
20.0-20.4						5.8	
20.5-20.9						6.8	
21.0-21.4						6.2	
21.5-21.9						6.6	
22.0-22.4						7.0	
22.5-22.9						5.7	
23.0-23.4						5.7	
23.5-23.9						2.7	
24.0-24.4							
24.5-24.9							
25.0-25.4							
25.5-25.9							
26.0-26.4							
26.5-26.9							
Total							

Size Range	SPECIES P.S.	SPECIES Y.P.
27.0-27.4	5.2	4.2
27.5-27.9	6.3	7.1
28.0-28.4	6.4	5.7
28.5-28.9	6.1	3.5
29.0-29.4	6.2	4.2
29.5-29.9	6.0	5.5
30.0-30.4	4.2	5.5
30.5-30.9	6.1	4.0
31.0-31.4	6.1	5.2
31.5-31.9	5.2	6.2
32.0-32.4	5.2	7.0
32.5-32.9	4.6	4.8
33.0-33.4	5.2	4.2
33.5-33.9	6.2	6.6
34.0-34.4	6.4	4.9
34.5-34.9	4.7	5.7
35.0-35.4	6.1	
35.5-35.9	5.0	
36.0-36.4	4.9	
36.5-36.9	4.7	
37.0-37.4	6.2	
37.5-37.9		
38.0-38.4		
38.5-38.9		
39.0-39.4		
39.5-39.9		
40.0-40.4		
40.5-40.9		
41.0-41.4		
41.5-41.9		
42.0-42.4		
42.5-42.9		
43.0-43.4		
43.5-43.9		
44.0-44.4		
44.5-44.9		
45.0-45.4		
45.5-45.9		
46.0-46.4		
46.5-46.9		
47.0-47.4		
47.5-47.9		
48.0-48.4		
48.5-48.9		
49.0-49.4		
49.5-49.9		

REV. 1-70

WDNR Comments

PANFISH LENGTH FREQUENCY

FORM 3600-64

DEPARTMENT OF NATURAL RESOURCES

→ NFW FHF

COUNTY	WATERS	DATE	GEAR
Sawyer	Lake Hayward	4-28-80	VV BE

Size Range	SPECIES YP	BG	RH	BS.	Size Range	SPECIES SMB	LMB	NP	WS.
<1					7.0				
1-1.4	3.2	7.0	10.2	4.2	7.1				
1.5-1.9	3.2	6.5	11.5	6.5	7.2				
2.0	6.5	6.0	9.0	5.0	7.3				
2.1	5.0	6.0	8.0	6.0	7.4				
2.2	6.0	6.0	4.5		7.5				
2.3	6.0	4.8	11.0	4	7.6				
2.4	7.0	5.0	13.5		7.7	SMB	LMB	NP	WS.
2.5	6.8		9.5		7.8				
2.6	7.8	7	12.5		7.9	13.5	17.0	22.5	20.2
2.7	5.5		11.0		8.0	12.5	17.0	14.0	19.0
2.8	6.5		13.5		8.1		10.0	16.0	6.8
2.9					8.2	2		22.5	16.5
3.0	4		11		8.3		3	15.5	
3.1					8.4			6.5	4
3.2					8.5			10.5	
3.3					8.6				
3.4					8.7			7	
3.5					8.8				
3.6					8.9				
3.7					9.0				
3.8					9.1				
3.9					9.2				
4.0					9.3				
4.1					9.4				
4.2					9.5				
4.3					9.6				
4.4					9.7				
4.5					9.8				
4.6					9.9				
4.7					10.0				
4.8					10.1	G.B.H.			
4.9					10.2				
5.0					10.3	7.5			
5.1					10.4	8.5			
5.2					10.5	8.5			
5.3					10.6	7.5			
5.4					10.7	7.0			
5.5					10.8				
5.6					10.9	6			
5.7					11.0				
5.8					11.1				
5.9					11.2				
6.0					11.3				
6.1					11.4				
6.2					11.5				
6.3					11.6				
6.4					11.7				
6.5					11.8				
6.6					11.9				
6.7					>12				
6.8									
6.9					Total				

Day [illegible]

REV. 2-70

WDNR Comments

DEPARTMENT OF NATURAL RESOURCES

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 5-78

INCHES

COUNTY	WATERS	DATE	GEAR
	Hayward	May 81	3 FN

Size Range	SPECIES					Size Range	SPECIES		
	RH	NP	MUSKY						
3.0- 3.4	~~1~~	~~1~~ 8.5	11.0			27.0-27.4			
3.5- 3.9	1F	9.0				27.5-27.9			
4.0- 4.4		8.5				28.0-28.4			
4.5- 4.9		9.0				28.5-28.9			
5.0- 5.4						29.0-29.4			
5.5- 5.9						29.5-29.9			
6.0- 6.4						30.0-30.4			
6.5- 6.9						30.5-30.9			
7.0- 7.4						31.0-31.4			
7.5- 7.9						31.5-31.9			
8.0- 8.4						32.0-32.4			
8.5- 8.9						32.5-32.9			
9.0- 9.4						33.0-33.4			
9.5- 9.9						33.5-33.9			
10.0-10.4						34.0-34.4			
10.5-10.9						34.5-34.9			
11.0-11.4	1					35.0-35.4			
11.5-11.9	1					35.5-35.9			
12.0-12.4						36.0-36.4			
12.5-12.9						36.5-36.9			
13.0-13.4						37.0-37.4			
13.5-13.9						37.5-37.9			
14.0-14.4						38.0-38.4			
14.5-14.9						38.5-38.9			
15.0-15.4						39.0-39.4			
15.5-15.9						39.5-39.9			
16.0-16.4						40.0-40.4			
16.5-16.9						40.5-40.9			
17.0-17.4						41.0-41.4			
17.5-17.9	1					41.5-41.9			
18.0-18.4						42.0-42.4			
18.5-18.9						42.5-42.9			
19.0-19.4						43.0-43.4			
19.5-19.9						43.5-43.9			
20.0-20.4						44.0-44.4			
20.5-20.9						44.5-44.9			
21.0-21.4						45.0-45.4			
21.5-21.9						45.5-45.9			
22.0-22.4						46.0-46.4			
22.5-22.9						46.5-46.9			
23.0-23.4						47.0-47.4			
23.5-23.9						47.5-47.9			
24.0-24.4						48.0-48.4			
24.5-24.9						48.5-48.9			
25.0-25.4						49.0-49.4			
25.5-25.9						49.5-49.9			
26.0-26.4									
26.5-26.9									
Total									

WDNR Comments

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE 5 8	Hayward WATER CODE	9/21/82	Varivolt AC Boom-shocker

SIZE RANGE INCHES	SPECIES					SIZE RANGE INCHES	SPECIES			
	WE	LMB	SMB	NP	Mu		WE	NP	Mu	
<3.0		1				27.0-27.4				
3.0- 3.4						27.5-27.9				
3.5- 3.9						28.0-28.4				
4.0- 4.4	3					28.5-28.9				
4.5- 4.9	6					29.0-29.4				
5.0- 5.4	12					29.5-29.9				
5.5- 5.9	3					30.0-30.4				
6.0- 6.4	2			1		30.5-30.9				
6.5- 6.9	1			1	1	31.0-31.4				
7.0- 7.4	1			1	1	31.5-31.9				
7.5- 7.9				1	1	32.0-32.4				
8.0- 8.4						32.5-32.9				
8.5- 8.9						33.0-33.4				
9.0- 9.4				1	1	33.5-33.9				
9.5- 9.9					1	34.0-34.4				
10.0-10.4						34.5-34.9				
10.5-10.9						35.0-35.4				
11.0-11.4						35.5-35.9				
11.5-11.9				1		36.0-36.4				
12.0-12.4		1				36.5-36.9				
12.5-12.9	1			1		37.0-37.4	5 Chesnut lampreys			
13.0-13.4				2		37.5-37.9	on suckers and redhorse.			
13.5-13.9	1	1		1		38.0-38.4				
14.0-14.4	2			2		38.5-38.9				
14.5-14.9		1		2		39.0-39.4	One 30+" walleye			
15.0-15.4						39.5-39.9	seen.			
15.5-15.9						40.0-40.9				
16.0-16.4		1		1		41.0-41.9				
16.5-16.9		1				42.0-42.9				
17.0-17.4						43.0-43.9				
17.5-17.9					1	44.0-44.9	Bass/panfish have			
18.0-18.4						45.0-45.9	left shallows.			
18.5-18.9	1	1				46.0-46.9				
19.0-19.4				3		47.0-47.9				
19.5-19.9						48.0-48.9				
20.0-20.4						49.0-49.9				
20.5-20.9				1		50.0-50.9				
21.0-21.4						51.0-51.9				
21.5-21.9						52.0-52.9				
22.0-22.4	1					53.0-53.9				
22.5-22.9						54.0-54.9				
23.0-23.4						55.0-55.9				
23.5-23.9						56.0-56.9				
24.0-24.4						57.0-57.9				
24.5-24.9						58.0-58.9				
25.0-25.4						59.0-59.9				
25.5-25.9						60.0+				
26.0-26.4					1					
26.5-26.9										
TOTAL	34	7	0	19	7	TOTAL				

Redhorse 15" spp. - A+ WS - 14.0
WS - C 17.5-19.7

WDNR Comments

LENGTH FREQUENCY

DEPARTMENT OF NATURAL RESOURCES

54

Sawyer (58)	WATERS Lake Hayward	DATE 9/22/82	GEAR BS

Length	SPECIES BG	PS	YP	BC	BBH	Size Range	SPECIES BG	YP	BC	CS
-1					9.2	7.0	3			4.2
-1.4					9.8	7.1	1			5.0
1.5-1.9					9.0	7.2	4	1		2.8
2.0						7.3				3.5
2.1						7.4		1		3.5
2.2						7.5				7
2.3						7.6				
2.4						7.7				
2.5	1					7.8	1		1	
2.6						7.9	1	1		
2.7						8.0	1			
2.8						8.1				
2.9						8.2		1		
3.0	1		1			8.3		1		
3.1						8.4		1		
3.2			1			8.5		2	1	
3.3						8.6				
3.4						8.7				
3.5	1					8.8				
3.6	1					8.9		1		
3.7	1					9.0		1		
3.8	2					9.1				
3.9	1					9.2		1		
4.0	1	1				9.3				
4.1						9.4		1	1	
4.2						9.5				
4.3			1			9.6				
4.4						9.7			1	
4.5	3					9.8				
4.6	1					9.9				
4.7	1					10.0			1	
4.8						10.1				
4.9			1			10.2		1	1	
5.0			2			10.3				
5.1						10.4				
5.2		1	1			10.5				
5.3						10.6				
5.4		1				10.7		2		
5.5	1					10.8				
5.6			1			10.9				
5.7		3	1			11.0				
5.8	2	1				11.1				
5.9	1					11.2				
6.0	5					11.3				
6.1						11.4				
6.2	1	1	1			11.5		1	1	
6.3	1					11.6				
6.4	1	2				11.7				
6.5	7		1			11.8				
6.6	2					11.9				
6.7	4	1	1			>12				
6.8	2		1							
6.9			1	1		Total	52	30	8	12
Total:	11		3							

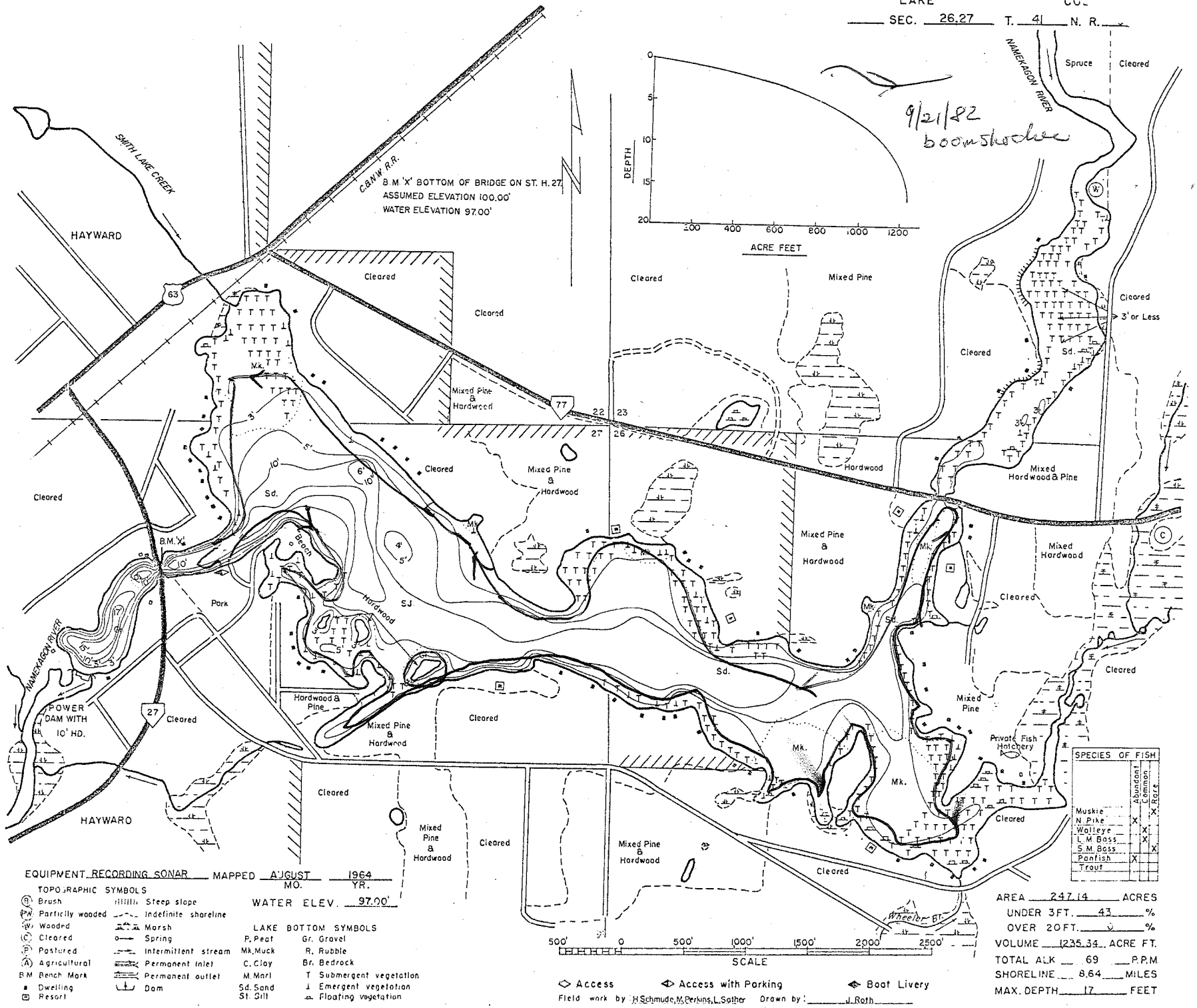
REV. 2-70

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE ____ CO.

SEC. 26,27 T. 41 N. R. ____



SPECIES OF FISH	Abundant	Common	Rare
Muskie			
N. Pike	X		
Walleye		X	
L.M. Bass		X	
S.M. Bass			X
Panfish	X		
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation

SCALE 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◇ Access with Parking ◇ Boat Livery

Field work by H. Schmude, M. Perkins, L. Sother Drawn by: J. Roth

AREA 247.14 ACRES

UNDER 3FT. 43 %

OVER 20FT. ____ %

VOLUME 1235.34 ACRE FT.

TOTAL ALK. 69 P.P.M.

SHORELINE 8.64 MILES

MAX. DEPTH 17 FEET

WDNR Comments

A-161

WDNR Comments

49

Lake Hayward, Sawyer Co.

DEPARTMENT OF NATURAL RESOURCES

Fish from Research's shocking Fall of 1986 9-28-86 Thru 11-2-86

L.M.B & We. Were picked up 7 of the 12 nights

Large-Mouth Bass	Walleye	Larger Muskies	Musky Hybrid
14.3"	6.5"	47.0 Male	10.6 78 grams
17.0	6.0	36.0 Male	10.6 80
13.4	5.2	32.7 Male	6.5 21
4.5	6.5	15.7 —	
9.5	5.0	29.3 Female	
7.7	5.0	14.5 —	
15.1	5.1	29.5 —	
4.0	5.3	15.7 —	
3.1	5.0	17.6 Male	
2.4	5.5		
18.9	6.0		
20.1	5.0		
13.9	5.4		Small Native Muskies
13.5	9.9		7.5
15.9	5.2		10.3 73 grams
7.6	6.9		7.7 26
12.9	6.0		10.3 82
14.2	5.4		9.0 46
10.0	6.0		8.8 42
12.2	5.8		9.2 31
3.3	17.9		9.3 53
7.1	6.0		
3.2	18.0		
3.6	17.4		
13.0	13.2		
8.9	5.2		
11.5	5.3		
12.0	5.8		
10.1	5.9		Brown Trout
12.4	6.0		6.0
11.8	5.7		
13.0	6.0		
12.5			
6.2			
5.4			
13.8			
9.4			
12.1			

REV. 3-71

WDNR Comments

SUMMARY FISHING RECORD
FORM 3600-63

DEPARTMENT OF NATURAL RESOURCES

COUNTY: Sawyer (58)	WATERS: Lake Hayward
SAMPLING OBJECTIVE: Field transfer to NFWFHF	NUMBER AND LOCATION OF STATIONS (HABITAT): Back bays, points.
PERIOD FISHED (DATES): 5/18-22/87	

GEAR

BOOM SHOCKER (HOURS)		TIME: _____ NIGHT _____ DAY		
VISUAL HOURS	TIME OF DAY	HAUL SEINE (LENGTH)	MESH	AREA COVERED
ANGLING (HOURS)	TIME OF DAY	TRAP NET (NO. OF NET LIFTS): 20	MESH: 1/2"	DEPTH: 4'
MINNOW SEINE (NO. HAULS)	AREA COVERED	GILL NET (NO. OF FEET X NO. OF LIFTS)	MESH SIZE	DEPTH
OTHER (HOURS OR LIFTS)		CHARACTERISTICS: H_2O - 64° (prespawn)		

FISHING RESULTS

SPECIES	NO.	MODAL SIZE(S)	SIZE RANGE	CATCH/UNIT
Walleye	3	--	9.0-26.5	0.15
N. Pike	14	10.0,12.5,17.0	8.0-29.6	0.70
Largemouth Bass	1	15.5	15.5	0.05
Shorthead Redhorse	9	18.0	7.0-18.9	0.45
White Sucker	3	--	16.4-20.0	0.15
Bluegill	280	5.6,6.6,7.0	4.0-8.3	14.00
Pumpkinseed	143	5.0	2.4-7.1	7.15
Black Crappie	11	8.2	6.8-10.6	0.55
Rock Bass	2	--	5.3-6.6	0.10
Y. Perch	34	7.0, 9.3	4.5-11.6	1.70

OBSERVATIONS

Bluegills just starting to move into shallows. Also 105 asst. bullheads (all 3 spp.). One walleye and 4 northern pike kept for mercury analysis. Other fish field transferred to NFWHF display ponds.

SIGNED (COMPILER)	DATE
F. B. Pratt	5-30-87

REV. 10-70

WDNR Comments

WISCONSIN
NATURAL RESOURCES

PANFISH LENGTH FREQUENCY

FORM 3600-64 REV. 3-81

COUNTY Sawyer COUNTY CODE 58	WATER Lake Hayward WATER CODE ____	DATE 5/18/87-5/22/87	GEAR 5, ½" fyke nets

SIZE RANGE INCHES	SPECIES					SIZE RANGE INCHES	SPECIES			
	BG	BC	PS	YP	RB		BG	BC	YP	PS
1.0-1.4						7.0	10		6	
1.5-2.0						7.1	8		3	1
2.1						7.2	5		2	
2.2						7.3	6		1	
2.3						7.4	1			
2.4			1			7.5			2	
2.5						7.6	2			
2.6						7.7	1			
2.7						7.8				
2.8						7.9				
2.9						8.0	3	2	1	
3.0						8.1				
3.1						8.2		2	1	
3.2						8.3	1		1	
3.3			1			8.4				
3.4						8.5			1	
3.5						8.6				
3.6						8.7		1		
3.7			2			8.8				
3.8						8.9				
3.9						9.0		1	1	
4.0	1		2			9.1				
4.1			4			9.2		2		
4.2			3			9.3			2	
4.3	1		6			9.4				
4.4	3		12			9.5			1	
4.5	1		9	1		9.6				
4.6	1		6			9.7		1	1	
4.7			5			9.8				
4.8			13			9.9				
4.9			2			10.0			1	
5.0	6		21			10.2			1	
5.1	4		4			10.4				
5.2	2		11			10.6		1		
5.3	4		8		1	10.8				
5.4	9		8			11.0				
5.5	13		5	1		11.2				
5.6	18		2			11.4				
5.7	4		3			11.6			1	
5.8	8		2			11.8				
5.9	3		2			12.0				
6.0	29		2			12.2				
6.1	17		1	2		12.4				
6.2	19		2			12.6				
6.3	17		1			12.8				
6.4	17					13.0				
6.5	23		1			13.2				
6.6	32		1	2	1	13.4				
6.7	4			1		13.6				
6.8	5	1	1	1		13.8				
6.9	2		1			14.0+				
TOTALS	243 Sub.	1 Sub.	142	8 Sub.	2	TOTALS	280	11	34	143

57 Black bullheads - 7.9-11.1"; 18 Yellow bullheads - 7.4-10.8"; 30 Brown bullheads - 8.0-11.2"

WDNR Comments

...te of Wisconsin
...ient of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

...IES

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE 5 8	Lake Hayward WATER CODE — — — —	5/18-22/87	5½" fyke nets

SIZE RANGE — INCHES	SPECIES				SIZE RANGE — INCHES	SPECIES		
	WE	NP	LMB	SHRH		NP		
<3.0					27.0-27.4			
3.0- 3.4					27.5-27.9			
3.5- 3.9					28.0-28.4			
4.0- 4.4					28.5-28.9			
4.5- 4.9					29.0-29.4			
5.0- 5.4					29.5-29.9	1		
5.5- 5.9					30.0-30.4			
6.0- 6.4					30.5-30.9			
6.5- 6.9					31.0-31.4			
7.0- 7.4				1	31.5-31.9			
7.5- 7.9					32.0-32.4			
8.0- 8.4		1			32.5-32.9			
8.5- 8.9				1	33.0-33.4			
9.0- 9.4	1				33.5-33.9			
9.5- 9.9					34.0-34.4			
10.0-10.4		2			34.5-34.9			
10.5-10.9		1			35.0-35.4			
11.0-11.4				1	35.5-35.9			
11.5-11.9					36.0-36.4			
12.0-12.4		1			36.5-36.9			
12.5-12.9		2			37.0-37.4			
13.0-13.4					37.5-37.9			
13.5-13.9					38.0-38.4			
14.0-14.4					38.5-38.9			
14.5-14.9		1			39.0-39.4			
15.0-15.4		1		1	39.5-39.9			
15.5-15.9		1	1		40.0-40.9			
16.0-16.4					41.0-41.9			
16.5-16.9				1	42.0-42.9			
17.0-17.4		2			43.0-43.9			
17.5-17.9				1	44.0-44.9			
18.0-18.4	1 (Mercury sample)			2	45.0-45.9			
18.5-18.9				1	46.0-46.9			
19.0-19.4					47.0-47.9			
19.5-19.9					48.0-48.9			
20.0-20.4					49.0-49.9			
20.5-20.9					50.0-50.9			
21.0-21.4					51.0-51.9			
21.5-21.9					52.0-52.9			
22.0-22.4					53.0-53.9			
22.5-22.9					54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9					56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9					58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9					60.0+			
26.0-26.4								
26.5-26.9	1	1						
TOTAL	3	13 Sub.	1	9	TOTAL	14		

3 WS - 20.0", 19.0", and 16.4"

WDNR Comments ...s. are floy-tagged fish

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

H_2O Temp - 66° Thundershowers

INCHES Gen. start - 62.0; Stop - 64.1

Entire shoreline.

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE 5 8	Lake Hayward WATER CODE — — — —	June 4, 1987	VVBS

SIZE RANGE — INCHES	SPECIES				SIZE RANGE — INCHES	SPECIES		
	LMB	NP	SMB	WE		NP		
<3.0					27.0-27.4			
3.0- 3.4					27.5-27.9			
3.5- 3.9					28.0-28.4			
4.0- 4.4					28.5-28.9			
4.5- 4.9					29.0-29.4			
5.0- 5.4				1	29.5-29.9			
5.5- 5.9					30.0-30.4	1		
6.0- 6.4				4	30.5-30.9			
6.5- 6.9		1		1	31.0-31.4			
7.0- 7.4	1	3			31.5-31.9			
7.5- 7.9					32.0-32.4			
8.0- 8.4		1			32.5-32.9			
8.5- 8.9		2			33.0-33.4			
9.0- 9.4		1	1		33.5-33.9			
9.5- 9.9	1				34.0-34.4		6 suckers with	
10.0-10.4			9812	1	34.5-34.9		lampreys attached.	
10.5-10.9					35.0-35.4		4 other lamprey seen.	
11.0-11.4	*9804	2			35.5-35.9			
11.5-11.9	9611	1	9606		36.0-36.4		Many suckers, YP, BG,	
12.0-12.4		1			36.5-36.9		PS, and BH.	
12.5-12.9	9609	1			37.0-37.4			
13.0-13.4	9351				37.5-37.9			
13.5-13.9	9608, 1				38.0-38.4			
14.0-14.4	9352				38.5-38.9			
14.5-14.9	9613	1	9614		39.0-39.4			
15.0-15.4	9610, 9605				39.5-39.9			
15.5-15.9					40.0-40.9			
16.0-16.4			0602	1	41.0-41.9			
16.5-16.9		1			42.0-42.9			
17.0-17.4				1	43.0-43.9		MU	
17.5-17.9					44.0-44.9		17.2 LV	
18.0-18.4					45.0-45.9			
18.5-18.9					46.0-46.9			
19.0-19.4					47.0-47.9			
19.5-19.9		1			48.0-48.9			
20.0-20.4					49.0-49.9			
20.5-20.9	9607	1			50.0-50.9			
21.0-21.4					51.0-51.9			
21.5-21.9					52.0-52.9			
22.0-22.4		1			53.0-53.9			
22.5-22.9					54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9					56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9					58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9					60.0+			
26.0-26.4								
26.5-26.9				1				
TOTAL	13	18 Sub.	5	10	TOTAL	19	1	

9603 - void.

WDNR Comments

SUMMARY FISHING RECORD

FORM 3600-63

DEPARTMENT OF NATURAL RESOURCES

COUNTY: Sawyer	WATERS: Lake Hayward
SAMPLING OBJECTIVE: FERC & Field Transfer	NUMBER AND LOCATION OF STATIONS (HABITAT): Bartz Bay and points vic. public bathing beach
PERIOD FISHED (DATES): 5/23/89 to 5/25/89	

GEAR

BOOM SHOCKER (HOURS):

TIME: _____ NIGHT _____ DAY

VISUAL HOURS	TIME OF DAY	HAUL SEINE (LENGTH)	MESH	AREA COVERED
ANGLING (HOURS): 1.5 (Bass)*	TIME OF DAY	TRAP NET (NO. OF NET LIFTS): 15	MESH: 1/2"	DEPTH: 4'
MINNOW SEINE (NO. HAULS)	AREA COVERED	GILL NET (NO. OF FEET X NO. OF LIFTS)	MESH SIZE	DEPTH

OTHER (HOURS OR LIFTS):

CHARACTERISTICS: Water temp. 69°-70°F. Warming rapidly. Air temps. low 80's.

FISHING RESULTS

SPECIES	NO.	MODAL SIZE(S)	SIZE RANGE	CATCH/UNIT NO/LIFT
Northern Pike	24	12.0	9.5-19.5	1.6
White Sucker	1	18.0	18.0	0.1
Shorthead Redhorse	5	-	9.7-17.5	0.3
Bluegill	556	6.7	2.5-8.4	37.1
Pumpkinseed	329	5.2	3.5-7.4	21.9
Black Crappie	26	-	7.8-11.2	1.7
Rock Bass	4	5.5	5.0-5.9	0.3
Yellow Perch	101	7.0, 9.0	5.0-9.5	6.7
Largemouth Bass*	3	11.5	9.5-12.0	0/lift (2.0/hr.*)
Black Bullhead	319	10.2	4.0-11.9	21.3

OBSERVATIONS

Most of these fish were field transferred to Shue's Pond and Fame ponds. Last days sample measured for LF; first two days only counted, by spp. Lake continues to have a very nice panfish population. Crappies and perch - post-spawn. Bluegills - pre-spawn. Due to timing and location of sets this effort should be considered a good representation of panfish community, but a poor index of gamefish status.

*Bass were caught hook & line to supplement gamefish sample.

SIGNED (COMPILER)	DATE
F. Pratt	5/27/89

REV. 10-70

WDNR Comments

LF Sample

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-86

INCHES

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE 5 8	Lake Hayward WATER CODE — — — —	5/23/88 to 5/25/89	5 - 1/2" mesh fyke nets.

SIZE RANGE INCHES	SPECIES						SIZE RANGE INCHES	SPECIES		
	BG	PS	RB	BLBH	NP	YP		BC	BRBH	SHRH
<3.0	2.5						27.0-27.4	7.8	9.3	17.5
3.0- 3.4	1						27.5-27.9	10.4	9.2	9.7
3.5- 3.9		3					28.0-28.4	11.2	10.2	
4.0- 4.4		9		2			28.5-28.9		9.5	+ 3 others
4.5- 4.9	3	9		2			29.0-29.4	+ 23	9.4	
5.0- 5.4	1	13	2			3	29.5-29.9	others	9.4	
5.5- 5.9		10	2	5		3	30.0-30.4		10.0	
6.0- 6.4	10	19		5		5	30.5-30.9		10.5	
6.5- 6.9	29	10		2		5	31.0-31.4		6.4	
7.0- 7.4	30	2		7		6	31.5-31.9		9.8	
7.5- 7.9	22			3		2	32.0-32.4		9.8	
8.0- 8.4	1			6		3	32.5-32.9		9.5	
8.5- 8.9				4		1	33.0-33.4		10.6	
9.0- 9.4				6		3	33.5-33.9		9.1	
9.5- 9.9				10		1	34.0-34.4		9.8	
10.0-10.4				14	1		34.5-34.9		11.8	
10.5-10.9				6		+ 69	35.0-35.4		9.0	
11.0-11.4				3	1	others	35.5-35.9		10.5	
11.5-11.9				5	2		36.0-36.4		9.2	
12.0-12.4					2		36.5-36.9		8.1	
12.5-12.9					2		37.0-37.4		9.4	
13.0-13.4							37.5-37.9		9.5	
13.5-13.9	+ 458 others			+239	+16 others		38.0-38.4		10.2	
14.0-14.4		+254		others			38.5-38.9		10.1	
14.5-14.9		others					39.0-39.4		10.3	
15.0-15.4							39.5-39.9		10.3	
15.5-15.9							40.0-40.9		10.0	
16.0-16.4							41.0-41.9			
16.5-16.9							42.0-42.9			
17.0-17.4							43.0-43.9			
17.5-17.9							44.0-44.9	Also 3 LMB and 1 WS		
18.0-18.4							45.0-45.9			
18.5-18.9	Length frequency from last day netting.						46.0-46.9			
19.0-19.4	Two days before fish only counted prior to						47.0-47.9			
19.5-19.9	local field transfer. H_2O - 69°F.						48.0-48.9			
20.0-20.4							49.0-49.9			
20.5-20.9							50.0-50.9			
21.0-21.4							51.0-51.9			
21.5-21.9							52.0-52.9			
22.0-22.4							53.0-53.9			
22.5-22.9							54.0-54.9			
23.0-23.4							55.0-55.9			
23.5-23.9							56.0-56.9			
24.0-24.4							57.0-57.9			
24.5-24.9							58.0-58.9			
25.0-25.4							59.0-59.9			
25.5-25.9							60.0+			
26.0-26.4										
26.5-26.9										
TOTAL	556	329	4	319	24	101	TOTAL	26	27	5

WDNR Comments

FISH TRANSFERRED TO FISHING HALL OF FAME

May 23, 1989; May 24, 1989

B.G.	B.C.	P.S.	Y.P.	BLBN	N.P.	W.S.	LMB
390	22	207	57	291	12	1	3

TOTAL - 983

FISH TRANSFERRED TO SHUE'S POND IN TOWN

B.G.	P.S.	Y.P.	BLBH	B.C.	N.P.	R.B.	SHR
68	47	12	48	1	4	2	3

TOTAL - 185

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County Sawyer	**Waters** Lake Hayward MWB 2725500
Sampling Objective FERC Survey mark gamefish for P.E.S.	**Number and Location of Stations (Habitat)** Entire shoreline boomshocked, 5X Fyke net stations - see map 8-10 nets moved between 17 different sites
Period Fished (Dates) 4/05 - 4/17/91 nets 4/10, 17, 18, 21, 25/91 Boomshocker	

GEAR

Boom Shocker (Hours) 10.1 hrs; 330V AC 2 dippers - emphasis gamefish	**Time** shocker _____ **Night** nets _____ **Day**

Visual Hours	**Time of Day**	**Haul Seine (Length)**	**Mesh**	**Area Covered**
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)** 102	**Mesh** ½"	**Depth** 4'
Minnow Seine (No. Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)	**Characteristics** walleye/N. pike spawn and immediate post spawn H_2 0-40F-53F

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit no./hr	Catch/Unit no./lift
northern pike	260	14.0, 18.0, 22.0, 27.5	7.0 - 33.4	(113) 11.1	(147) 1.4
Largemouth bass	130	16.5 11.0, 14.0,	5.5 - 20.4	(114) 11.2	(16) 0.2
Walleye	48	5.0, 10.4 12.5, 18.5	5.0 - 29.5	(24) 2.1	(24) 0.2
Muskellunge	24	12.0, 33.5	7.5 - 42.0	(19) 1.9	(5) 0.04
Smallmouth bass	3	13.5	13.0 - 17.5	(3) 0.3	(3) ____
Yellow perch	1329	4.6, 6.0, 7.0 8.5, 10.0	2.9 - 13.0	____	13.0
Bluegill	293	5.5, 6.1, 7.0 8.0, 9.1	3.0 - 10.8	____	2.9
Bullhead (3 spp)	2073	5.5,7.5, 10.2	2.4 - 11.2	____	20.3
Black Crappie	43	4.4,9.5, 10.4	4.3 - 13.2	____	0.4
Rock Bass	32	3.9, 6.0	3.4 - 6.8	____	0.3

Observations

Walleye may have run early into Namekagon River and missed by sampling effort.

Nets were set at upper end of flowage while lower 2/3 of lake was still iced in.

Slow warm-up and cool weather kept fish out of shallows and depressed catch rates,

Rev. 10-70

Signed (Compiler) Frank Pratt	**Date** 5-15-91

WDNR Comments

especially for netting. Beautiful panfish (bluegill and perch) and considerable pre-season panfishing pressure, which was not covered by creel census. All gamefish were given a TC clip for P.E.s and exploitation monitoring in the creel census.

and May creel as recap

Mark-recapture P.E.s do date, based on last shocker run as recap., as follows:

N. Pike — m= 235 c= 25+1 R= 4
N= ~~1469~~ 1269 (~~5.9~~ 5.1/acre; 95% C.I. (895 – 1941)
585 ≥ 15"

LMB — m= 112 c= 18+21 = 39 R= 4
N= ~~403~~ 879; 3.5/acre (1.6/acre); 95% C.I. (~~333 – 1370~~) ( )
752 ≥ 12"

Walleye — m= 46 c= 4+5 R=1
N= ~~184~~ 230 (0.9/acre); 95% C.I. (~~98 – 252~~) ( )
120 ≥ 15"

Musky — m= 18 c= 6+2 R= 1
N= ~~63~~ 81 (0.3/acre); 95% C.I. (23 – 262)
34 ≥ 32"

(These should be revised at end of May based on May creel and any additional shocking.)

Revised above by added fish in other creel hours

Most of the larger panfish were field transferred to stock Shues Pond and display pond at National Freshwater Fishing Hall of Fame.

Other species sampled: 2 chestnut lamprey; 2 creek chub; 1 common shiner; 12 northern hogsucker; 4 white sucker, 10 shorthead redhorse; 2 golden redhorse.

21

WDNR Comments

...e of Wisconsin
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Bullhead/Suckers

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

...NTY
COUNTY CODE 58

WATER Lake Hayward
WATER CODE 2725500

DATE 4/04 - 17/91

GEAR Nets - 102 lifts

SIZE RANGE INCHES	SPECIES: Bullhead black	Bullhead yellow	Bullhead Brown	N. Hog Sucker
<3.0 (2.5)	3			
3.0- 3.4	4			
3.5- 3.9				
4.0- 4.4		2		
4.5- 4.9				
5.0- 5.4		1		
5.5- 5.9	3	1		
6.0- 6.4	3	4		
6.5- 6.9		1		
7.0- 7.4	10	17	1	
7.5- 7.9	18	12	6	
8.0- 8.4	26	13	9	2
8.5- 8.9	12	1	2	
9.0- 9.4	7	4	2	1
9.5- 9.9	7	1	1	4
10.0-10.4	3	2	6	1
10.5-10.9			3	1
11.0-11.4			2	1
11.5-11.9				1
12.0-12.4				1
12.5-12.9				
13.0-13.4	Count	Count	Count	
13.5-13.9	1600	212	61	
14.0-14.4				
14.5-14.9				
15.0-15.4				
15.5-15.9				
16.0-16.4				
16.5-16.9				
17.0-17.4				
17.5-17.9				
18.0-18.4				
18.5-18.9				
19.0-19.4				
19.5-19.9				
20.0-20.4				
20.5-20.9				
21.0-21.4				
21.5-21.9				
22.0-22.4				
22.5-22.9				
23.0-23.4				
23.5-23.9				
24.0-24.4				
24.5-24.9				
25.0-25.4				
25.5-25.9				
26.0-26.4				
26.5-26.9				
TOTAL	1696	271	93	12

SIZE RANGE INCHES	SPECIES
27.0-27.4	
27.5-27.9	
28.0-28.4	
28.5-28.9	
29.0-29.4	
29.5-29.9	
30.0-30.4	
30.5-30.9	
31.0-31.4	
31.5-31.9	
32.0-32.4	
32.5-32.9	
33.0-33.4	
33.5-33.9	
34.0-34.4	
34.5-34.9	
35.0-35.4	
35.5-35.9	
36.0-36.4	
36.5-36.9	
37.0-37.4	
37.5-37.9	
38.0-38.4	
38.5-38.9	
39.0-39.4	
39.5-39.9	
40.0-40.9	2 creek chub
41.0-41.9	1 Common Shiner
42.0-42.9	2 Chestnut Lamprey
43.0-43.9	
44.0-44.9	
45.0-45.9	
46.0-46.9	
47.0-47.9	
48.0-48.9	
49.0-49.9	
50.0-50.9	
51.0-51.9	
52.0-52.9	
53.0-53.9	
54.0-54.9	
55.0-55.9	
56.0-56.9	
57.0-57.9	
58.0-58.9	
59.0-59.9	
60.0+	
TOTAL	

Also 4 white Suckers - 9.5, 10.0, 10.1, 13.0
10 Shorthead redhorse 2 Golden redhorse

A-172

WDNR Comments

OF WISCONSIN
OF NATURAL RESOURCES

PANFISH LENGTH FREQUENCY
FORM 3600-64 REV. 3-81

COUNTY Sawyer COUNTY CODE 58	WATER Lk. Hayward WATER CODE 2725500	DATE 4/05 - 17/91	GEAR 102 Fyke Net Lifts

SIZE RANGE INCHES	SPECIES					SIZE RANGE INCHES	SPECIES			
	Bluegill	YP	PS	RB	BC		BG	YP	PS	BC
1.0-1.4						7.0	15	10		
1.5-2.0	52 Count	922 Count				7.1	8	6	1	1
2.1						7.2	8	2		
2.2						7.3	8	2		
2.3						7.4	5	2		
2.4						7.5	16	1		
2.5						7.6	13	5		
2.6						7.7	5	1		1
2.7						7.8		1		
2.8						7.9	1	2		
2.9		1				8.0	20	2		2
3.0	1	4				8.1	2			
3.1		1				8.2	3	1		
3.2	1	1	1			8.3	2			
3.3		1				8.4	1	4		
3.4		2		1		8.5	2	5		1
3.5	1	2	1	1		8.6		1		
3.6	1	1	1	1		8.7		1		1
3.7		1				8.8		2		
3.8		2	1	1		8.9		2		
3.9		14		2		9.0	2	3		2
4.0	2	12	3	1		9.1	2			2
4.1	1	2		2		9.2	1			2
4.2	2	9				9.3	1			
4.3	2	4	1		1	9.4	1	1		1
4.4	1	3	4		2	9.5	1	1		5
4.5	2	19	1	1	2	9.6				
4.6	1	19		1	1	9.7				
4.7		5				9.8				
4.8	1	4	1			9.9		1		
4.9	1	13	1	2		10.0		4		4
5.0	3	16	3	1		10.2		1		1
5.1	1	11	1	1		10.4				4
5.2	1	16	3	1		10.6				1
5.3	2	15	2	1		10.8	1	1		
5.4	2	13	2	2		11.0				1
5.5	0	19	5	1		11.2				
5.6	7	6	2	1		11.4		1		
5.7	4	11	1			11.6		1		1
5.8	2	13	1			11.8				1
5.9	2	17	2			12.0				1
6.0	11	20	10	5	1	12.2				1
6.1	15	10	3	1		12.4		1		
6.2	5	13	3			12.6				
6.3	4	10	1			12.8		1		
6.4	13	13	4			13.0		1		
6.5	15	17	1			13.2				1
6.6	7	2	1	1		13.4				
6.7	5	4		3		13.6				
6.8	5	6		1		13.8				
6.9	1	5	1			14.0+				
TOTALS		1279 Sub	61 Sub	32 Tot	7 Sub	TOTALS	293	1329 tot.	71 tot. 62	43 Tot.

WDNR Comments

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GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

S

NTY Sawyer COUNTY CODE 58 | WATER Lake Hayward WATER CODE 2725500 | DATE 4/05 - 4/17 4/10,17,18,21,25 | GEAR Fyke nets Varivolt AC boom shocker

SIZE RANGE INCHES	SPECIES N. Pike	LMB	Walleye	Musky
<3.0				
3.0- 3.4				
3.5- 3.9				
4.0- 4.4				
4.5- 4.9				
5.0- 5.4			2	
5.5- 5.9		1		
6.0- 6.4				
6.5- 6.9				
7.0- 7.4	1			
7.5- 7.9	1			1 (hybrid)
8.0- 8.4	2			
8.5- 8.9	2			
9.0- 9.4	2	2		1
9.5- 9.9			1	
10.0-10.4	4	3	3	
10.5-10.9	4	1	3	
11.0-11.4	12	8		1
11.5-11.9	6	3	2	
12.0-12.4	9	2		3
12.5-12.9	13	5	4	3
13.0-13.4	11	9	3	
13.5-13.9	4	15		
14.0-14.4	14	16	3	
14.5-14.9	10	9	1	
15.0-15.4	13	10	3	
15.5-15.9	3	6	2	
16.0-16.4	13	8		
16.5-16.9	7	9	1	1
17.0-17.4	6	7	2	
17.5-17.9	9	3	1	1
18.0-18.4	19	3	2	
18.5-18.9	6	4	2	
19.0-19.4	4	2		
19.5-19.9	9	3	1	
20.0-20.4	7	1	1	
20.5-20.9	2			
21.0-21.4	3		1	
21.5-21.9	8		2	
22.0-22.4	9			
22.5-22.9	9			
23.0-23.4	4			
23.5-23.9	7			
24.0-24.4	1			
24.5-24.9	2			1
25.0-25.4	4		1	
25.5-25.9	2		1	
26.0-26.4	2		1	
26.5-26.9	2		2	
TOTAL	245 sub.	130	48 sub.	12 sub.

SIZE RANGE INCHES	SPECIES N. Pike	WE	Musky
27.0-27.4	1		1
27.5-27.9	3		
28.0-28.4	21		
28.5-28.9	2		
29.0-29.4			
29.5-29.9	2	1	
30.0-30.4	2		1
30.5-30.9			
31.0-31.4	2		
31.5-31.9			
32.0-32.4			2
32.5-32.9			1
33.0-33.4	1		1
33.5-33.9			3
34.0-34.4			
34.5-34.9			
35.0-35.4			1
35.5-35.9			1
36.0-36.4			
36.5-36.9			
37.0-37.4			
37.5-37.9			
38.0-38.4			
38.5-38.9			
39.0-39.4			
39.5-39.9			
40.0-40.9			
41.0-41.9			
42.0-42.9			1
43.0-43.9			
44.0-44.9			
45.0-45.9			
46.0-46.9			
47.0-47.9			
48.0-48.9			
49.0-49.9			
50.0-50.9			
51.0-51.9			
52.0-52.9			
53.0-53.9			
54.0-54.9			
55.0-55.9			
56.0-56.9			
57.0-57.9			
58.0-58.9			
59.0-59.9			
60.0+			
TOTAL	260 tot.	49 tot.	24 tot.

3 SMB - 13.0, 14.0, 17.5

10 Shorthead redhorse
2 Golden redhorse

A-1744

WDNR Comments

WDNR Comments

WDNR Comments

WDNR Comments

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County Sawyer County	**Waters** Lake Hayward
Sampling Objective Juvenile fishes/recruitment	**Number and Location of Stations (Habltat)** 15 stations - 19 hauls
Perlod Fished (Dates) 08/15 - 16/91	

GEAR

Boom Shocker (Hours)	**Time** ____ Night X ____ Day

Visual Hours	**Time of Day**	**Haul Seine (Length)** 30'	**Mesh** 3/8"	**Area Covered** 19 hauls 0.57 acres total
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh**	**Depth**
Minnow Selne (No. Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)	**Characteristics** H_2O 72 - 74° F Seinable areas - cover rich areas not well sampled.

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Largemouth bass (LMB)	84	2.2	1.0 - 12.0	4.4
Northern Pike (NP)	7	6.0	5.5 - 15.5	0.4
Bluegill	598	1.7	1.0 - 6.5	31.4
Pumpkinseed	53	5.0	2.5 - 6.0	2.8
Black Crappie	76	1.7	1.5 - 2.0	4.0
Yellow perch	34	2.5, 4.0	1.5 - 7.0	1.8
Common Shiner	294	2.5	1.0 - 3.0	15.5
Bluntnose minnow	3	2.4	2.1 - 2.4	0.2
Iowa darter	3	2.2	2.1 - 2.4	0.2

Observatlons
Apparently strong 1991 year class of largemouth bass and bluegill.

Bass and bluegills most widely distributed, occuring in n=17 and n=14 hauls respectively; followed by common shiner at n=11.

Signed (Compiler)	**Date**

Rev. 10-70

Also - 10.5" black bullhead
2.4" hornyhead chub

WDNR Comments

Number and Location of ... 19 hauls

STATE OF WISCONSIN
DEPT OF NATURAL RESOURCES

PANFISH LENGTH FREQUENCY

FORM 3600-64 REV. 3-81

COUNTY Sawyer (COUNTY CODE __)	WATER Lake Haywood (WATER CODE _____)	DATE 8/15 - 16/91	GEAR 30' Seine

SIZE RANGE INCHES	SPECIES LMB	SPECIES NP	SIZE RANGE INCHES	SPECIES LMB	SPECIES NP
1.0-1.4	2		7.0		
1.5-2.0	21		7.1		
2.1			7.2		
2.2	31		7.3		
2.3			7.4		
2.4			7.5		1
2.5			7.6		
2.6	14		7.7		
2.7			7.8		
2.8			7.9		
2.9			8.0		
3.0			8.1		
3.1			8.2		
3.2	7		8.3		
3.3			8.4		
3.4			8.5		
3.5			8.6		
3.6			8.7		
3.7	4		8.8		
3.8			8.9		
3.9			9.0		
4.0			9.1		
4.1			9.2		
4.2			9.3		
4.3			9.4		
4.4			9.5		
4.5			9.6		
4.6			9.7		
4.7			9.8		
4.8			9.9		
4.9			10.0		
5.0	1		10.2		
5.1			10.4		
5.2			10.6		
5.3			10.8		
5.4			11.0		
5.5	1		11.2		
5.6		2	11.4		
5.7			11.6		
5.8			11.8		
5.9			12.0		
6.0	1		12.2		
6.1		2	12.4		
6.2			12.6		
6.3			12.8		
6.4			13.0		
6.5			13.2		
6.6	1	1	13.4		
6.7			13.6		
6.8			13.8		
6.9			14.0+		
TOTALS			TOTALS	84	15.5 / 8

WDNR Comments

WISCONSIN
NATURAL RESOURCES

PANFISH LENGTH FREQUENCY

FORM 3600-64 REV. 3-81

COUNTY CODE	WATER / WATER CODE	DATE	GEAR
Sawyer 58	Lake Hayward	8/15 - 16/91	30' Seine

SIZE RANGE INCHES	SPECIES					SIZE RANGE INCHES	SPECIES				
	Bluegill	Pumpkinseed	BC	YP	CS		YP				
1.0-1.4	63				10	7.0	1				
1.5-2.0	158		36	5	9	7.1					
2.1						7.2					
2.2						7.3					
2.3						7.4					
2.4						7.5					
2.5	26	1		5	92	7.6					
2.6						7.7					
2.7						7.8					
2.8						7.9					
2.9						8.0					
3.0	13	5		4	20	8.1					
3.1						8.2					
3.2						8.3					
3.3						8.4					
3.4						8.5					
3.5	10	8		6		8.6					
3.6						8.7					
3.7						8.8	Non-fish present:				
3.8						8.9					
3.9						9.0	~~Tadpoles - P~~				
4.0	1	9		6		9.1	~~Snails - C~~				
4.1						9.2	~~Bryzoan 1~~				
4.2						9.3					
4.3						9.4	~~(No crayfish sampled)~~				
4.4						9.5					
4.5	2	10		3		9.6					
4.6						9.7					
4.7						9.8					
4.8						9.9					
4.9						10.0					
5.0	1	11		1		10.2					
5.1						10.4					
5.2						10.6					
5.3						10.8					
5.4						11.0					
5.5	1	6		1		11.2					
5.6						11.4					
5.7						11.6					
5.8						11.8					
5.9						12.0					
6.0		3		1		12.2					
6.1						12.4					
6.2						12.6					
6.3						12.8					
6.4						13.0					
6.5						13.2					
6.6						13.4					
6.7	Ct. -322		Ct.- 40		Ct. - 163	13.6					
6.8						13.8					
6.9				1		14.0+					
TOTALS	598	53	76	33 Sub	294	TOTALS					

Bluntnose minnow - 2.1, 2.4, 2.4
Iowa darter - 2.1, 2.4, 2.2
Black bullhead - 10.5
Horneyhead chub- 2.4

WDNR Comments

WDNR Comments

WDNR Comments

WDNR Comments

SUMMARY FISHING RECORD

WI Department of Natural Resources

County: Sawyer	Waters: Lake Hayward
Sampling Objective: Walleye recruitment	Number/Location of Stations: Main-lake shoreline
Dates Fished: 09/23/94	Water Temperature: 61 F
Boomshocker Hours: 1.7 game (0.5 pan)	Time: 19:45
Fyke Net Days:	Angling Hours:

Species	Number	Modes	Size Range	C.P.E.
Walleye tot.	12	7.0,13.5	4.0-21.4	7.1
Walleye yoy	8	7.0	4.0-7.4	4.7
LMB	21	15.5,17.0	6.5-19.5	12.4
Northern pike	23	11.5, 14.0	7.5-27.9	13.5
Muskellunge	1	16.5	16.5	0.6
Bluegill	78	6.5	4.0-7.9	156.0
Black crappie	9	9.0	8.5-11.9	18.0
Yellow perch	27	5.5, 8.0	2.5-9.4	54.0
Pumpkinseed	4	5.0	4.5-7.4	8.0

Observations: Cool drizzle. Water high from recent rains. Very heavy vegetation inhibited manuverability in all the back bays and some of the main-lake areas. Suckers and yoy yellow perch abundant. Redhorse and bullheads present. Good largemouth and a nice run of panfish.

WDNR Comments

Wisconsin
of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

ES 1-7 hrs 61°F (2)

COUNTY COUNTY CODE ___ ___

WATER Elc Hayward WATER CODE ___ ___ ___ ___

DATE 9-23-94

GEAR VV AE

SIZE RANGE INCHES	SPECIES YP	BG	BC	PS	SIZE RANGE INCHES	SPECIES		
<3.0	11 2.5				27.0-27.4			
3.0- 3.4					27.5-27.9			
3.5- 3.9					28.0-28.4			
4.0- 4.4	IIII	I			28.5-28.9			
4.5- 4.9	I			I	29.0-29.4			
5.0- 5.4	II	IIII		I	29.5-29.9			
5.5- 5.9	IIIII	IIIIIII		I	30.0-30.4			
6.0- 6.4	III	IIIIIIIIIIII			30.5-30.9			
6.5- 6.9		IIIIIIIIIIII			31.0-31.4			
7.0- 7.4	II	IIIIIIIIIII		I	31.5-31.9			
7.5- 7.9	I	III			32.0-32.4			
8.0- 8.4	IIII				32.5-32.9			
8.5- 8.9	I		I		33.0-33.4			
9.0- 9.4	III		IIII		33.5-33.9			
9.5- 9.9			I		34.0-34.4			
10.0-10.4			I		34.5-34.9			
10.5-10.9					35.0-35.4			
11.0-11.4			I		35.5-35.9			
11.5-11.9			I		36.0-36.4			
12.0-12.4					36.5-36.9			
12.5-12.9					37.0-37.4			
13.0-13.4					37.5-37.9			
13.5-13.9					38.0-38.4			
14.0-14.4					38.5-38.9			
14.5-14.9					39.0-39.4			
15.0-15.4					39.5-39.9			
15.5-15.9					40.0-40.9			
16.0-16.4					41.0-41.9			
16.5-16.9					42.0-42.9			
17.0-17.4					43.0-43.9			
17.5-17.9					44.0-44.9			
18.0-18.4					45.0-45.9			
18.5-18.9					46.0-46.9			
19.0-19.4					47.0-47.9			
19.5-19.9					48.0-48.9			
20.0-20.4					49.0-49.9			
20.5-20.9					50.0-50.9			
21.0-21.4					51.0-51.9			
21.5-21.9					52.0-52.9			
22.0-22.4					53.0-53.9			
22.5-22.9					54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9					56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9					58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9					60.0+			
26.0-26.4								
26.5-26.9								
TOTAL	27			4	TOTAL			

Y04 YP-A

WDNR Comments

A: Hay 994 Rec Disc

...onsin
...atural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

Start - 146.7 to 148.4 End H_2O - 61°F

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE 58	Lake Hayward WATER CODE — — — —	9-23-94	W A C

SIZE RANGE INCHES	SPECIES				SIZE RANGE INCHES	SPECIES		
	WE	LmB	NP	Mu		NP	Mu	WE
<3.0					27.0-27.4			
3.0- 3.4					27.5-27.9	1		
3.5- 3.9					28.0-28.4			
4.0- 4.4					28.5-28.9			
4.5- 4.9	1				29.0-29.4			
5.0- 5.4	2				29.5-29.9			
5.5- 5.9					30.0-30.4			
6.0- 6.4					30.5-30.9			
6.5- 6.9	1	1			31.0-31.4			
7.0- 7.4	3				31.5-31.9			
7.5- 7.9			1		32.0-32.4			
8.0- 8.4			1		32.5-32.9			
8.5- 8.9			1		33.0-33.4			
9.0- 9.4					33.5-33.9			
9.5- 9.9					34.0-34.4			
10.0-10.4			1		34.5-34.9			
10.5-10.9			2		35.0-35.4			
11.0-11.4	1		2		35.5-35.9			
11.5-11.9			3		36.0-36.4			
12.0-12.4		1			36.5-36.9			
12.5-12.9		2			37.0-37.4			
13.0-13.4		2			37.5-37.9			
13.5-13.9	1	1			38.0-38.4			
14.0-14.4	1	1	2		38.5-38.9			
14.5-14.9		2	1		39.0-39.4			
15.0-15.4		1			39.5-39.9			
15.5-15.9		3			40.0-40.9			
16.0-16.4		1			41.0-41.9			
16.5-16.9				1	42.0-42.9			
17.0-17.4		4			43.0-43.9			
17.5-17.9		1			44.0-44.9			
18.0-18.4					45.0-45.9			
18.5-18.9					46.0-46.9			
19.0-19.4			1		47.0-47.9			
19.5-19.9		1			48.0-48.9			
20.0-20.4					49.0-49.9			
20.5-20.9					50.0-50.9			
21.0-21.4	1		1		51.0-51.9			
21.5-21.9					52.0-52.9			
22.0-22.4			1		53.0-53.9			
22.5-22.9			1		54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9			1		56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9					58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9					60.0+			
26.0-26.4								
26.5-26.9								
TOTAL	12	21	23	1	TOTAL			

BH - P WS - A RH - P YOY YP - A

WDNR Comments

Waters	MWB Code	County
HAYWARD LAKE	2725500	SAWYER

Sampling Objective	Number and Locations of Stations (Habitat)
1) YOY WALLEYE CPE 2) GAMEFISH LF	PORTION OF SHORELINE = 5.0 MILES (SEE MAP)
Period Fished (Dates) 23 SEP 94	

GEAR

Boomshocker	Time
Hours: 1.7	X Night Day

Visual (Hours)	Time of Day	Haul Seine (Length)	Mesh	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet X No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)	Characteristics	
	Walleye Recruitment Code:	C-ST
	Water Temperature:	61 F

FISHING RESULTS

Species	No.	Modal Sizes(s)	Size Range	Catch/Unit	
WALLEYE (AGE 0+)	8	NONE	4.5-7.4	1.6/MI	4.7/HR
WALLEYE (AGE >0+)	4	NONE	11.0-21.4	0.8/MI	2.4/HR
NORTHERN PIKE	23	10.5-11.9	7.5-27.9	4.6/MI	13.5/HR
MUSKELLUNGE	1	NONE	16.5-16.9	0.2/MI	0.6/HR
LARGEMOUTH BASS	21	NONE	6.5-19.9	4.2/MI	12.4/HR

Observations

Wisconsin Department of Natural Resources	Signed (Compiler)	Da
	SDP- RMK	

WDNR Comments

of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET

Form 3600-186 4-92

Lake: HAYWARD MWB Code: 2725500 Date: 09/23/94 County: SAWYER Collecter: PRATT

Target Fish: YOY walleye Survey Type: recruitment Mark Given: none H_2O Temp: 61 °F Time 19:45

Adverse Conditions: _____ H_2O Conduct: _____ Station: shoreline

Volts: _____ Amps: ___ Current Type ([X] AC [ ] DC [ ] Pulsed DC) Pulse Rate: _____ Duty Cycle: _____

Gear Type: AC boomshocker Total Time: 1.7 hrs Distance Shocked: 5.0 miles

# of Dippers ([ ] 1 [X] 2) Entire Shoreline Shocked: ([ ] Y [X] N [ ] I) Dip net size: 1/4" to 3/8"

H_2O Clarity: ([X] Clear [ ] Turbid [ ] Very Turbid)

Size Range (inches)	WALLEYE	N. PIKE	MUSKY	LMB	SMB	Size Range	WALLEYE	N. PIKE	LMB
< 3.0						19.5 - 19.9			1
3.0 - 3.4						20.0 - 20.4			
3.5 - 3.9						20.5 - 20.9			
4.0 - 4.4						21.0 - 21.4	1	1	
4.5 - 4.9	1					21.5 - 21.9			
5.0 - 5.4	2					22.0 - 22.4		1	
5.5 - 5.9						22.5 - 22.9		1	
6.0 - 6.4						23.0 - 23.4			
6.5 - 6.9	1			1		23.5 - 23.9		1	
7.0 - 7.4	4					24.0 - 24.4			
7.5 - 7.9		1				24.5 - 24.9			
8.0 - 8.4		1				25.0 - 25.4			
8.5 - 8.9		1				25.5 - 25.9			
9.0 - 9.4						26.0 - 26.4			
9.5 - 9.9						26.5 - 26.9			
10.0 - 10.4		1				27.0 - 27.4			
10.5 - 10.9		3				27.5 - 27.9			
11.0 - 11.4	1	3				28.0 - 28.4			
11.5 - 11.9		4				28.5 - 28.9			
12.0 - 12.4				1		29.0 - 29.4			
12.5 - 12.9				2		29.5 - 29.9			
13.0 - 13.4				1		30.0 - 30.9			
13.5 - 13.9	1			1		31.0 - 31.9			
14.0 - 14.4	1	2		1		32.0 - 32.9			
14.5 - 14.9		1		2		33.0 - 33.9			
15.0 - 15.4				1		34.0 - 34.9			
15.5 - 15.9				4		35.0 - 35.9			
16.0 - 16.4				1		36.0 - 36.9			
16.5 - 16.9			1			37.0 - 37.9			
17.0 - 17.4				4		38.0 - 38.9			
17.5 - 17.9				1		39.0 - 39.9			
18.0 - 18.4						40.0 - 40.9			
18.5 - 18.9						41.0 - 41.9			
19.0 - 19.4		1				42.0 +			
TOTAL	12	23	1	21					

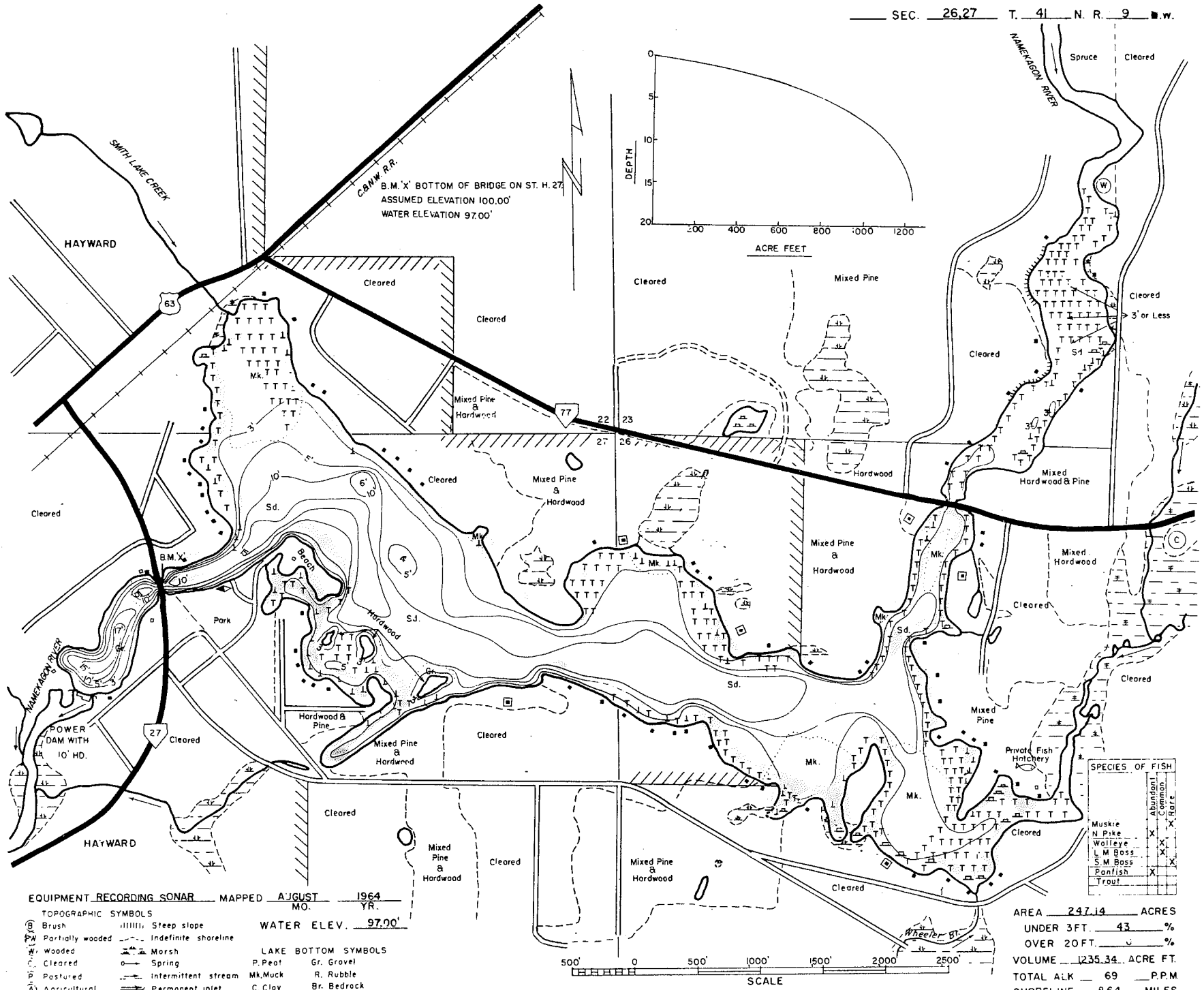
Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



SPECIES OF FISH

	Abundant	Common	Rare
Muskie			X
N. Pike	X		
Walleye		X	
L.M. Boss		X	
S.M. Boss			X
Panfish	X		
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation

SCALE: 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmude, M. Perkins, L. Sather Drawn by: J. Roth

AREA 247.14 ACRES

UNDER 3FT. 43 %

OVER 20FT. 0 %

VOLUME 1235.34 ACRE FT.

TOTAL ALK. 69 P.P.M.

SHORELINE 8.64 MILES

MAX. DEPTH 17 FEET

WDNR Comments

WDNR Comments

SUMMARY FISHING RECORD
WI Department of Natural Resources

County: Sawyer	Waters: Lake Hayward
Sampling Objective: FERC- fall juveniles	Number/Location of Stations: Entire accessible shoreline
Dates Fished: 10/25/95	Water Temperature: 40 F
Boomshocker Hours: 2.2 (2 dippers-gamefish)	Time: 7:15 PM
Fyke Net Days:	Angling Hours:

Species	Number	Modes	Size Range	C.P.E.
Walleye	5	11.0	6.5-11.4	2.27
Muskellunge	6	NA	8.0-51.0	2.72
LMB	6	15.4	10.5-19.5	2.72
Northern pike	102	7.0, 11.0, 15.0	6.0-30.5	46.36
WS, BG, CS	observed common			
YP, BLBH, RH,PS,MM,BC	observed present			

~6.0 miles
CPE walleye yoy = 0.15 after [illegible] stocking

Observations: Looking for acclerated growth stocked walleyes- only ones sampled were in river channel just below STH "77" bridge. Couldn't access above STH "77" or below STH "27/70" bridges- so sample was centered in main basin. Also looking for juvenile esocids- yoy and yearling northern pike were found to be abundant and widely distributed. We sampled one wild yoy and one hybrid musky. Other species (especially perch, sunfish, and bass) were not particularly abundant in shallows and have probably already moved off-shore into deeper water. Weed growth still heavy but has died back enough that even the back bay areas like Bartz and Laska Bays were easilly accessible to the boomshocker. Realtively high conductivity allowed us to shock effectively at a mid-range (240 V) voltage setting, without sacrificing any obvious sampling efficiency. Young common shiners were found massed up in giant clumps, right at the dge of the drop-off, in 3-4 areas. Crew- Sande, Pratt, Sorensen. FBP 10/25/95.

WDNR Comments

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES 40° - H2O 184.5 - 186.7 (2.2 hrs)

COUNTY	WATER	DATE	GEAR
Sawyer 58 COUNTY CODE __ __	Hayward Lk. WATER CODE __ __ __ __	10/26	VU AC (3 BPU)

SIZE RANGE INCHES	NP	LMB	MU	WE
<3.0				
3.0- 3.4				
3.5- 3.9				
4.0- 4.4				6.6 miles
4.5- 4.9				
5.0- 5.4				10%
5.5- 5.9				
6.0- 6.4	|||| (4)			
6.5- 6.9	|||| (4)			
7.0- 7.4	|||||| (6)			
7.5- 7.9	||| (3)			
8.0- 8.4	||| (3)		1 (Native)	
8.5- 8.9	| (1)			|
9.0- 9.4	|| (2)			
9.5- 9.9	| (1)			
10.0-10.4	|||| (4)			
10.5-10.9	|| (2)	|	Hyb-1	|
11.0-11.4	||||||||| (9)			||
11.5-11.9	||||| (5)			
12.0-12.4	|||||||||||| (12)			
12.5-12.9	||||| (5)			
13.0-13.4	||| (3)			
13.5-13.9	||| (3)			
14.0-14.4	|| (2)	|		
14.5-14.9	||| (3)	|		
15.0-15.4	|||||| (6)	|		
15.5-15.9	|| (2)	|		
16.0-16.4	|| (2)			
16.5-16.9	||| (3)			
17.0-17.4	|| (2)			
17.5-17.9				
18.0-18.4	|| (2)			
18.5-18.9	| (1)			
19.0-19.4	| (1)		|	
19.5-19.9	| (1)	|		
20.0-20.4				
20.5-20.9	| (1)			
21.0-21.4	|| (2)			
21.5-21.9			|	
22.0-22.4				
22.5-22.9				
23.0-23.4				
23.5-23.9	|			
24.0-24.4				
24.5-24.9	|			
25.0-25.4				
25.5-25.9	||| (3)			
26.0-26.4	| (1)			
26.5-26.9	| (1)			
TOTAL	98 NP	5 LMB	2 MU	5 WE

SIZE RANGE INCHES	NP	MU	
27.0-27.4	|| (2)		
27.5-27.9	| (1)		
28.0-28.4			
28.5-28.9			
29.0-29.4			
29.5-29.9			
30.0-30.4			
30.5-30.9	| (1)		
31.0-31.4			
31.5-31.9			
32.0-32.4			
32.5-32.9			Observed
33.0-33.4			BG - C
33.5-33.9			BC - P
34.0-34.4			YP - P
34.5-34.9			CS - C
35.0-35.4			BlBh - P
35.5-35.9			WS - C
36.0-36.4			RH - P
36.5-36.9			MM - P
37.0-37.4			PS - P
37.5-37.9		|	
38.0-38.4			
38.5-38.9			
39.0-39.4			
39.5-39.9			
40.0-40.9			
41.0-41.9			
42.0-42.9			
43.0-43.9			
44.0-44.9			
45.0-45.9			
46.0-46.9			
47.0-47.9			
48.0-48.9			
49.0-49.9			
50.0-50.9			
51.0-51.9		|	
52.0-52.9			
53.0-53.9			
54.0-54.9			
55.0-55.9			
56.0-56.9			
57.0-57.9			
58.0-58.9			
59.0-59.9			
60.0+			
TOTAL	102 NP	6 Mu	

WDNR Comments

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES 40°-H2O 184.5-186.7 (2.3 hr) 2 dippers

COUNTY Sawyer COUNTY CODE 58 | WATER Hayward Ck. WATER CODE ____ | DATE 10/26 | GEAR VU AC - RS (330V)

SIZE RANGE INCHES	VP	LMB	MU	WE
<3.0				
3.0- 3.4				
3.5- 3.9				
4.0- 4.4				
4.5- 4.9				
5.0- 5.4				
5.5- 5.9				
6.0- 6.4	|||| (4)			
6.5- 6.9	|||| (4)			|
7.0- 7.4	|||||| (6)			
7.5- 7.9	||| (3)			
8.0- 8.4	||| (3)		| (Native)	
8.5- 8.9	| 1			|
9.0- 9.4	|| 2			
9.5- 9.9	| 1			
10.0-10.4	|||| 4			
10.5-10.9	|| 2	|	Hyb-1	|
11.0-11.4	||||||||| (9)			||
11.5-11.9	||||| (5)			
12.0-12.4	|||||||| [illegible]			
12.5-12.9	||||| (5)			
13.0-13.4	||| (3)			
13.5-13.9	||| (3)			
14.0-14.4	|| (2)	|		
14.5-14.9	||| (3)	|		
15.0-15.4	|||||| (6)	|		
15.5-15.9	||	|		
16.0-16.4	||			
16.5-16.9	|||			
17.0-17.4	||			
17.5-17.9				
18.0-18.4	||			
18.5-18.9	|			
19.0-19.4	|		|	
19.5-19.9	|	|		
20.0-20.4				
20.5-20.9	|			
21.0-21.4	|| (2)			
21.5-21.9			|	
22.0-22.4				
22.5-22.9				
23.0-23.4				
23.5-23.9	|			
24.0-24.4				
24.5-24.9	|			
25.0-25.4				
25.5-25.9	||| (3)			
26.0-26.4	| (1)			
26.5-26.9	| (1)			
TOTAL	92 [illegible]	5 LMB		5 WE

SIZE RANGE INCHES	NP	MU	
27.0-27.4	|| (2)		
27.5-27.9	| (1)		
28.0-28.4			
28.5-28.9			
29.0-29.4			
29.5-29.9			
30.0-30.4			
30.5-30.9	| (1)		
31.0-31.4			
31.5-31.9			
32.0-32.4			
32.5-32.9			Observed
33.0-33.4			BG - C
33.5-33.9			BC - P
34.0-34.4			YP - P
34.5-34.9			CS - C
35.0-35.4			BIBH - P
35.5-35.9			WS - C
36.0-36.4			RH - P
36.5-36.9			MM - P
37.0-37.4			PS - P
37.5-37.9		|	
38.0-38.4			
38.5-38.9			
39.0-39.4			
39.5-39.9			
40.0-40.9			
41.0-41.9			
42.0-42.9			
43.0-43.9			
44.0-44.9			
45.0-45.9			
46.0-46.9			
47.0-47.9			
48.0-48.9			
49.0-49.9			
50.0-50.9			
51.0-51.9		|	
52.0-52.9			
53.0-53.9			
54.0-54.9			
55.0-55.9			
56.0-56.9			
57.0-57.9			
58.0-58.9			
59.0-59.9			
60.0+			
TOTAL	[illegible] NP	3 Mu	

WDNR Comments

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PANFISH LENGTH FREQUENCY

FORM 3600-64 REV. 3-81

INCHES

Lake Hayward 8/03/95 Seine Hauls

COUNTY | COUNTY CODE — — | WATER | WATER CODE — — — — | DATE | GEAR

SIZE RANGE INCHES	SPECIES			
	Site 2 Pull 1			
1.0-1.4	CS	LMB		
1.5-2.0	2.1 2.1 2.2	2.0		
2.1	2.2 2.0 2.1	1.9		
2.2	2.2 2.3 2.2			
2.3	2.1 2.0 1.0			
2.4	2.1			
2.5				
2.6	Pull 2			
2.7	LMB			
2.8	2.8			
2.9				
3.0	Site 1 Pull 1			
3.1				
3.2	CS	LMB		
3.3	+6	3.0 2.5		
3.4	less than 1"	2.0 1.9 2.0		
3.5		2.5 1.7		
3.6				
3.7				
3.8				
3.9		NP		
4.0		6.0		
4.1	BG			
4.2	+2 +1 under 1"	YP		
4.3	+1 +1 +1 +1 BG	1.5 1.7	2.0 1.5 1.9	
4.4	YP	2.1 2.2 1.8	1.7 1.6 2.0	
4.5	21 under 1"	1.8 1.9 1.5	1.5 1.5 2.0	
4.6		1.5 1.5 1.8	1.5 1.5 1.5	
4.7	RBD	Lost		
4.8	2.0	BNM		
4.9		2.0 1.8 1.7		
5.0				
5.1		Pull 2		
5.2				
5.3	SH RH	CL	LMB	Crappie
5.4	10.0	2.5 7.0 6.8	2.0 6.5 2.5	2.5
5.5		6.2 7.5 6.5	2.8 5.5 1.7	
5.6	RBD	3.0 6.0 5.7	1.9 2.0 2.9	
5.7	1.5 1.5	4.5 5.8 4.1	2.1 3.1 1.6	
5.8		4.2 5.0 3.8	2.1 1.9 1.9 1.7	
5.9	JD	5.5 3.8 3.5	1.7	
6.0	1.5 1.5	4.5 4.1 3.8	BG	
6.1		3.1 3.5 3.5	+3 less than 1"	
6.2		2.6 4.1 3.2		
6.3		1.9 3.0 3.9		
6.4		3.1 4.0 3.6	1.9 2.0 2.0	
6.5		3.7 1.7 3.3	2.0 1.9 1.7	
6.6		2.1 1.7 2.0	2.0 2.0 1.9	
6.7		2.1 1.7 2.0	1.9 1.6 1.8	
6.8		1.5 1.7 1.9	1.8 2.0 1.8	
6.9		1.7 1.9 1.9	1.6 1.5 1.8	
TOTALS		1.7 4.2 1.9		

SIZE RANGE INCHES	SPECIES			
	Site 3			
7.0	NP	LMB	PS	YP
7.1	11.0	7.0	3.0 5.3	1.8 1.5
7.2	5.2	6.8	3.7	2.0 2.0
7.3	4.1	1.6 1.7		2.2 5.3
7.4	5.3	1.5		1.8 4.9
7.5	4.0			4.7 1.7
7.6	5.0			1.9 1.7
7.7				2.3 1.6
7.8				2.0 1.5
7.9			BG	1.9 2.7
8.0			+62	
8.1			less than 1"	
8.2				
8.3				+31
8.4				
8.5				
8.6				
8.7				
8.8				
8.9		CS	BC	BG
9.0		1.7 1.8	1.3 1.5	1.0
9.1		1.0 1.5 1.5	1.7	1.0
9.2		2.5 2.0 1.9		
9.3		2.0 2.0		
9.4		1.5 2.0		
9.5		2.5 1.7		
9.6		1.5 1.9		
9.7		2 1 1 5 3	BNM	
9.8		1.3 2.0	1.7	
9.9		1.2 2.7		
10.0		1.8 1.0		
10.2		1.9 2.0		
10.4		1.5 2.0		
10.6		1.6 1.0 1.0		
10.8		1.5 1.6		
11.0		2.1 1.0		
11.2		1.0 1.5		
11.4		2.5 2.5		
11.6		2.0 1.9		
11.8		2.0 2.3		
12.0		2.1 2.0		
12.2		2.0 2.0		
12.4		2.0 2.2		
12.6		2.1 1.7		
12.8		2.1 1.7		
13.0		+		
13.2				
13.4				
13.6				
13.8				
14.0+				
TOTALS				

WDNR Comments

PANFISH LENGTH FREQUENCY

CENTIMETERS

COUNTY	WATER	DATE	GEAR
COUNTY CODE	WATER CODE		

SIZE RANGE CM.	SPECIES: Site 4	CS		
2.0-3.4	YP +1		DNM	
3.5-5.0		2.0 2.0	2.0	
5.2		1.9 2.1	2.2	
5.4		2.0 1.1		
5.6		1.2 2.0		
5.8		2.1 1.6		
6.0		1.2 2.1		
6.2		2.1		
6.4				
6.6				
6.8				
7.0	Site 5			
7.2				
7.4	NP	CS	PS	1
7.6	6.0 4.5	1.5 1.5 1.0	1.7	
7.8	11.0	+1 less than 1"		
8.0		1.2 1.3 2.2		
8.2		2.2 2.0 2.2		
8.4		1.5 2.0 1.5		
8.6	BC	BG 1.0 1.5		
8.8	1.5 1.2	+1 1.0 1.3		
9.0		1.4 1.0		
9.2		1.0		
9.4				
9.6				
9.8				
10.0	BG			
10.2	~~+11~~			
10.4	12 less than 1"	RBD		
10.6		1.5 2.3		
10.8		1.1		
11.0				
11.2	LMB			
11.4	2.2 2.3 2.0	YP		
11.6	2.2	5 17		
11.8		+6		
12.0				
12.2				
12.4		RB		
12.6		1.0		
12.8				
13.0				
13.2				
13.4				
13.6				
13.8				
14.0				
14.2				
14.4				
14.6				
14.8				
15.0				
15.2				
15.4				
15.6				
15.8				
TOTALS				

SIZE RANGE CM.	SPECIES	Site 6		
16.0	PS	YP	LMB	BC
16.2	7.5	+11	1.8	2.0
16.4	7.5		2.2	1.2
16.6			1.6 2.2	
16.8			2.2 2.0	
17.0			2.5 1.5	
17.2			1.8 1.5	
17.4			1.7 1.7	
17.6				
17.8			NP	
18.0			4.2	
18.2				
18.4		BG		
18.6		2.1		
18.8				
19.0				
19.2				
19.4				
19.6				
19.8				
20.0		CS		
20.2		2.0 2.0		
20.4		2.0 2.1		
20.6		2.0 1.9		
20.8		2.1 2.1		
21.0		1.5 2.0		
21.2		2.0 2.1		
21.4		1.0 ~~1.8~~		
21.6		2.0 1.9		
21.8		1.8 1.7		
22.0		2.0 1.9		
22.2		1.9 1.7		
22.4		2.0 2.0		
22.6		2.0 1.7		
22.8				
23.0				
23.5				
24.0				
24.5				
25.0				
25.5	Site 10			
26.0	DNM	BC	CS	CC
26.5	1.0 1.5	1.5	+70	1.0
27.0	2.5			
27.5				
28.0				
28.5				
29.0				
29.5				
30.0				
30.5				
31.0				
31.5				
32.0				
32.5				
33.0+				
TOTALS				

WDNR Comments

SUMMARY FISHING RECORD

WI Department of Natural Resources

County: Sawyer	Waters: Lake Hayward
Sampling Objective: EG Walleye Evaluation	Number/Location of Stations: Entire shoreline between STH bridges
Dates Fished: 10/06/96	Water Temperature: 50.7 F
Boomshocker Hours: 2.1 (2 dippers)	Time: 19:00
Fyke Net Days	Angling Hours

6.0 miles
1.8/mile

Species	Number	Modes	Size Range	C.P.E.
Walleye EG yoy	11	8.5	6.0-9.5	5.2
Walleye tot	16	8.5, 14.5	6.0-17.4	7.6
Largemouth	19	12.0	8.0-16.9	9.0
Northern pike	26	10.0	5.5-33.0	12.3
Muskellunge	7	11.5	10.5-45.0	3.3
Black crappie	26	6.5	2.5-10.9	11.9
Bluegill	78	7.0	4.0-8.5	37.1
Yellow perch	29	7.0	4.5-10.9	13.8
Pumpkinseed	5	5.5	4.5-7.0	2.4

Observations: About 2600 EG walleyes were stocked here at STH "77" bridge, one week ago. Those that we sampled were mostly downstream along mid-lake shorelines. Nice bluegills- exceptional condition factor. All the centrarchids seem to be in shallows more this week than two weeks ago. One large musky netted and two others seen in vicinity of old railroad pier. Recently stocked muskies show up at 10.5-12". Common shiners were seen sporadically in very dense clouds, mostly in Bartz's Bay. White suckers and redhorse common. Un;ike two weeks ago, when maybe 10% of the large non-game fish carried chestnut lampreys- none were observed on any fish tonight. Inshore weed growth starting to die back significantly, but still very thick in Bartz's Bay and Laska Bay. We had a problem with pulsing/dimming lights which is believed to be a malfunction in the charging system. it didn't effect the actually stunning of fish but made for poorer visibility. Diane, the front-desk secretary, helped dip for the first third of the run, and I relieved her for the second third. Crew- Frank/Diane/Jack/Russ.
FBP 10/07/96

Second of two shoreline surveys - This one was AFTER EG stocked. 9/18/96 was before CPE's 1.8 vs. 0.3

WDNR Comments

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES Hours 1975 to 1996 Temp 50-.7 °F

COUNTY Sawyer COUNTY CODE 58 | WATER Lake Hayward WATER CODE ____ | DATE 10/06/96 | GEAR VVAC (230V)

SIZE RANGE INCHES	SPECIES								SPECIES	
	WE	NP	WS	LMB	BG	BG	BC	YP	OTH SPP.	# TL in "
<3.0		28.0	45.0				11-25		PS	
3.0- 3.4		33.0								
3.5- 3.9										
4.0- 4.4										
4.5- 4.9										
5.0- 5.4										
5.5- 5.9										
6.0- 6.4										
6.5- 6.9										
7.0- 7.4										
7.5- 7.9	(HEG)									
8.0- 8.4										
8.5- 8.9									5PS	
9.0- 9.4						78				
9.5- 9.9						BG total				
10.0-10.4										
10.5-10.9										
11.0-11.4								29 YP		
11.5-11.9							25 BC			CS-C
12.0-12.4										RH SPP-C
12.5-12.9										WS-C
13.0-13.4										
13.5-13.9										
14.0-14.4										
14.5-14.9										
15.0-15.4										
15.5-15.9										
16.0-16.4										
16.5-16.9										
17.0-17.4										
17.5-17.9										
18.0-18.4				19 LMB						
18.5-18.9										
19.0-19.4	16 tot WE									
19.5-19.9										
20.0-20.4										
20.5-20.9										
21.0-21.4										
21.5-21.9										
22.0-22.4										
22.5-22.9										
23.0-23.4										
23.5-23.9										
24.0-24.4										
24.5-24.9										
25.0-25.4		26 NP								
25.5-25.9										
26.0-26.4										
26.5-26.9										
TOTAL	16 tot WE	26	7	19		78BG	25 BC	29 YP	5 PS	

RH, WS, CS-C

WDNR Comments

SUMMARY FISHING RECORD

WI Department of Natural Resources

County Sawyer	Waters Lake Hayward
Sampling Objective FERC- walleye recruitment (pre-stocking)	Number/Location of Stations Entire shoreline between STH bridges
Dates Fished 09/18/96	Water Temperature 59.6 F
Boomshocker Hours 1.9 (0.5 pan) 1 dipper	Time 20:30
Fyke Net Days	Angling Hours

Species	Number	Modes	Size Range	C.P.E.
Walleye yoy	2	6.0	5.5-6.4	1.05 (0.33)
Walleye tot.	10	9.5	5.5-17.9	5.3
Largemouth	5	10.0	8.5-16.9	2.6
Northern pike	28	9.0, 15.5	5.5-28.0	14.7
Muskellunge	5	NA	23.5-45.0	2.6
Bluegill	42	5.5, 7.5	1.0-9.5	84.0
Black crappie	32	6.5, 12.0	1.5-12.4	64.0
Yellow perch	27	8.0	1.5-10.9	54.0
White sucker	72 count	NA	NA	37.9

Observations:Pre walleye stocking survey showing small amount of reproduction in 1996. Young northerns from 1995 and 1996 year classes very abundant and widely distributed. Forage minnows and adult bullheads appear to be way down. Water very murky and dingy in Laska's Bay. Bartz's Bay had fewer fish than normal too, and an even denser than usual weed growth. Large bass conspicuously absent- Have they retreated to deeper water already ? Or- has the LMB population crashed? Big muskies- several more seen but not netted. Operating speed too slow and too weedy to effectively run them down. This year the bluegills seem especially well-conditioned for their size. Strong population of young crappie coming on and just on the verge of recruiting into the spots fishery. White suckers appeared to be much more abundant than redhorse. Three of the suckers had chestnut lampreys attached. Three car-trailer units at access site when we launched - the heaviest usage that I have ever seen at this site. At least one boat was musky fishing. Also sampled 1 common shiner, 7 pumpkinseed, and 1 yellow bullhead. CPE figures are in no./hour of target effort, except for second walleye yoy CPE which is expressed as no./shoreline mile. Crew- Pratt and Warwick. FBP 12/18/96.

WDNR Comments

Pan – 0.5 hrs.
Game – entire

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

Hours 194.0 to __.__ 19 hrs 60 min Temp 59.6 °F

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE __ __	Lk. Hayward WATER CODE __ __ __ __	09/17/96	VV AC 230 V

SIZE RANGE INCHES	WE	NP	Mu	LMB	SMB	BG	BC	YP	OTHER SPP.	TL in "
<3.0						3 - 2.0	2.0	1		
3.0- 3.4						1 2.5 - 2	2.5			
3.5- 3.9							1.5			
4.0- 4.4						1				
4.5- 4.9						3				
5.0- 5.4						5		1		
5.5- 5.9	1 natural yoy	1				2		3		
6.0- 6.4	1	1				2	3			
6.5- 6.9						5	8	4		
7.0- 7.4						7	4	1		
7.5- 7.9						9	5	3		
8.0- 8.4		2					4	5		
8.5- 8.9	1	2		1				1		
9.0- 9.4		5		1		1	1	2		
9.5- 9.9	3			2			1	4		
10.0-10.4							1	1		
10.5-10.9		1						1		
11.0-11.4		2								
11.5-11.9							2			
12.0-12.4	1					42				
12.5-12.9		1								
13.0-13.4		2								
13.5-13.9							32			
14.0-14.4	1	2								
14.5-14.9	1									
15.0-15.4										
15.5-15.9		2		o						
16.0-16.4		1								
16.5-16.9		1		1						
17.0-17.4		1								
17.5-17.9	1									
18.0-18.4		1								
18.5-18.9		1								
19.0-19.4										
19.5-19.9										
20.0-20.4										
20.5-20.9										
21.0-21.4										
21.5-21.9				5						
22.0-22.4										
22.5-22.9										
23.0-23.4			1							
23.5-23.9										
24.0-24.4										
24.5-24.9										
25.0-25.4		1								
25.5-25.9										
26.0-26.4										
26.5-26.9			5 Mu							
TOTAL	10 tot	28	27.0	5 LMB		42				
		28.0	45.0 Mu	42.0 m		44.0 u				

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters
Sawyer	Hayward Lake MWBC: 2725500
Sampling Objective Walleye Recruitment Survey	**Number and Locations of Stations (Habitat)**
Period Fished (Dates) 09/18/96	Miles Actually Shocked = 6.0 (Source: LM) Acres = 247 (LM) Total Miles of Shoreline = 8.6 (LM) Total Miles of Shockable Shoreline = 6.0 (LM)

GEAR

Boomshocker (Hours)	Time
1.9	✓ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh Size**	**Depth**
Minnow Seine (No. of Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)	Characteristics
Boomshocker(s): 1 Mini-boomshocker(s): 0 Dip Netter(s): 1 Dip Netter(s): 0	Walleye Recruitment Code: C-ST

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	2	None	5.5 - 6.4	1.05 / hour 0.33 / mile
Serns Index NA YOY / acre				
Walleye (Age 1+)	4	9.5 - 9.9	8.5 - 9.9	2.11 / hour 0.67 / mile
Walleye (Other)	4	None	12.0 - 17.9	2.11 / hour 0.67 / mile
Smallmouth Bass	0		-	0.00 / hour 0.00 / mile
Largemouth Bass	5	None	8.5 - 16.9	2.63 / hour 0.83 / mile
Muskellunge	5	None	23.0 - 45.4	2.63 / hour 0.83 / mile
Northern Pike	28	9.0 - 9.4	5.5 - 28.4	14.74 / hour 4.67 / mile

Observations

1) Tank Mortality: None

2) Weather:

3) Stocking: No walleye stocked prior to this survey; 247 muskellunge (10.8") on 09/09/96

4) Reliabilty: High

Rev. 10-70	Signed (Compiler)	Date 11/15/96

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/18/96 County: Sawyer Collector(s): Warwick, Pratt

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 60 °F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 230 Amps: Not available Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:30 Shocking End Time: Not available Generator Start Hour: 194.0 Generator End Hour: 195.9

Number of Dippers: [X] 1 [ ] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] I Dip Net Mesh Size: 1/4 inch bar H2O Clarity: Not available

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4		
3.5-3.9			17.5-17.9	1	
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4		
5.5-5.9	1		19.5-19.9		
6.0-6.4	1		20.0-20.4		
6.5-6.9			20.5-20.9		
7.0-7.4			21.0-21.4		
7.5-7.9			21.5-21.9		
8.0-8.4			22.0-22.4		
8.5-8.9	1		22.5-22.9		
9.0-9.4			23.0-23.4		
9.5-9.9	3		23.5-23.9		
10.0-10.4			24.0-24.4		
10.5-10.9			24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9			25.5-25.9		
12.0-12.4	1		26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4			27.0-27.4		
13.5-13.9			27.5-27.9		
14.0-14.4	1		28.0-28.4		
14.5-14.9	1		28.5-28.9		
15.0-15.4			29.0-29.4		
15.5-15.9			29.5-29.9		
16.0-16.4			30.0 +		
Totals:	10	0			

WDNR Comments

Department of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/18/96 County: Sawyer Collector(s): Warwick, Pratt

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 60 °F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 230 Amps: Not available Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:30 Shocking End Time: Not available Generator Start Hour: 194.0 Generator End Hour: 195.9

Number of Dippers: [X] 1 [ ] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] I Dip Net Mesh Size: 1/4 inch bar H2O Clarity: Not available

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.0-24.4				
1.5-1.9									24.5-24.9				
2.0-2.4									25.0-25.4	1			
2.5-2.9									25.5-25.9				
3.0-3.4									26.0-26.4				
3.5-3.9									26.5-26.9				
4.0-4.4									27.0-27.4			1	
4.5-4.9									27.5-27.9				
5.0-5.4									28.0-28.4	1			
5.5-5.9	1								28.5-28.9				
6.0-6.4	1								29.0-29.4				
6.5-6.9									29.5-29.9				
7.0-7.4									30.0-30.4				
7.5-7.9									30.5-30.9				
8.0-8.4	2								31.0-31.4				
8.5-8.9	2				1				31.5-31.9				
9.0-9.4	5				1				32.0-32.4				
9.5-9.9					2				32.5-32.9				
10.0-10.4									33.0-33.4				
10.5-10.9	1								33.5-33.9				
11.0-11.4	2								34.0-34.4				
11.5-11.9									34.5-34.9				
12.0-12.4									35.0-35.4				
12.5-12.9	1								35.5-35.9				
13.0-13.4	2								36.0-36.4				
13.5-13.9									36.5-36.9				
14.0-14.4	2								37.0-37.4				
14.5-14.9									37.5-37.9				
15.0-15.4									38.0-38.4				
15.5-15.9	2								38.5-38.9				
16.0-16.4	1								40.0-40.4				
16.5-16.9	1				1				40.5-40.9				
17.0-17.4	1								41.0-41.4				
17.5-17.9									41.5-41.9				
18.0-18.4	1								42.0-42.4			1	
18.5-18.9	1								42.5-42.9				
19.0-19.4									43.0-43.4				
19.5-19.9									43.5-43.9				
20.0-20.4									44.0-44.4			1	
20.5-20.9									44.5-44.9				
21.0-21.4									45.0-45.4			1	
21.5-21.9									45.5-45.9				
22.0-22.4									46.0-46.9				
22.5-22.9									47.0-47.9				
23.0-23.4			1						48.0-48.9				
23.5-23.9									49.0-49.9				
Totals:	28	0	5	0	5	0	0	0	50.0+				

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County: Sawyer	Waters: Hayward Lake MWBC: 2725500
Sampling Objective: Walleye Recruitment Survey	Number and Locations of Stations (Habitat)
Period Fished (Dates): 10/06/96	Miles Actually Shocked = 6.0 (Source: LM) Acres = 247 (LM) Total Miles of Shoreline = 8.6 (LM) Total Miles of Shockable Shoreline = 6.0 (LM)

GEAR

Boomshocker (Hours): 2.1	Time: ✓ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts) Boomshocker(s): 1 Mini-boomshocker(s): 0 Dip Netter(s): 2 Dip Netter(s): 0	Characteristics Walleye Recruitment Code: C-ST

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	11	None	6.0 - 6.4	0.48 / hour 1.8 ~~0.17~~ / mile
Serns Index NA YOY / acre				
Walleye (EG Age 0+ or Age 1+)	10	8.5 - 8.9	6.5 - 9.9	4.76 / hour 1.67 / mile
Walleye (Other)	5	None	12.0 - 17.4	2.38 / hour 0.83 / mile
Smallmouth Bass	0		-	0.00 / hour 0.00 / mile
Largemouth Bass	19	None	7.5 - 16.9	9.05 / hour 3.17 / mile
Muskellunge	7	None	10.5 - 45.4	3.33 / hour 1.17 / mile
Northern Pike	26	9.0 - 9.4	5.5 - 33.4	12.38 / hour 4.33 / mile

Observations

1) Tank Mortality: None

2) Weather:

3) Stocking: 2470 walleye (7.4") on 09/25/96; 247 muskellunge (10.8") on 09/09/96 note error MOT one but 11 (eleven) young walleye in catch. CPE = 1.8/hr/be

4) Reliabilty: Medium

5) Comments: Extended growth Age0+ walleye and Age1+ walleye length ranges overlap; no ageing was done

Rev. 10-70	Signed (Compiler)	Date: 11/15/96

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 10/06/96 County: Sawyer Collector(s): Sande, Pratt

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 51 °F Station: Portion of Shoreline

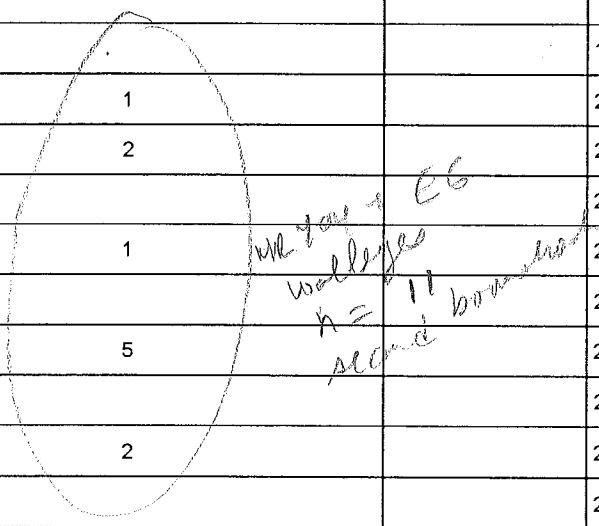
Adverse Conditions: Lights malfunctioning Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 230 Amps: Not available Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:00 Shocking End Time: Not available Generator Start Hour: 197.5 Generator End Hour: 199.6

Number of Dippers: [ ] 1 [X] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] I Dip Net Mesh Size: 1/4 inch bar H2O Clarity: Not available

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4	1	
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4		
5.5-5.9			19.5-19.9		
6.0-6.4	1		20.0-20.4		
6.5-6.9	2		20.5-20.9		
7.0-7.4			21.0-21.4		
7.5-7.9	1		21.5-21.9		
8.0-8.4			22.0-22.4		
8.5-8.9	5		22.5-22.9		
9.0-9.4			23.0-23.4		
9.5-9.9	2		23.5-23.9		
10.0-10.4			24.0-24.4		
10.5-10.9			24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9			25.5-25.9		
12.0-12.4	1		26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4	1		27.0-27.4		
13.5-13.9			27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9	1		28.5-28.9		
15.0-15.4	1		29.0-29.4		
15.5-15.9			29.5-29.9		
16.0-16.4			30.0 +		
Totals:	16	0			



WDNR Comments

Department of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 10/06/96 County: Sawyer Collector(s): Sande, Pratt

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 51 °F Station: Portion of Shoreline

Adverse Conditions: Lights malfunctioning Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 230 Amps: Not available Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:00 Shocking End Time: Not available Generator Start Hour: 197.5 Generator End Hour: 199.6

Number of Dippers: [ ] 1 [X] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] I Dip Net Mesh Size: 1/4 inch bar H2O Clarity: Not available

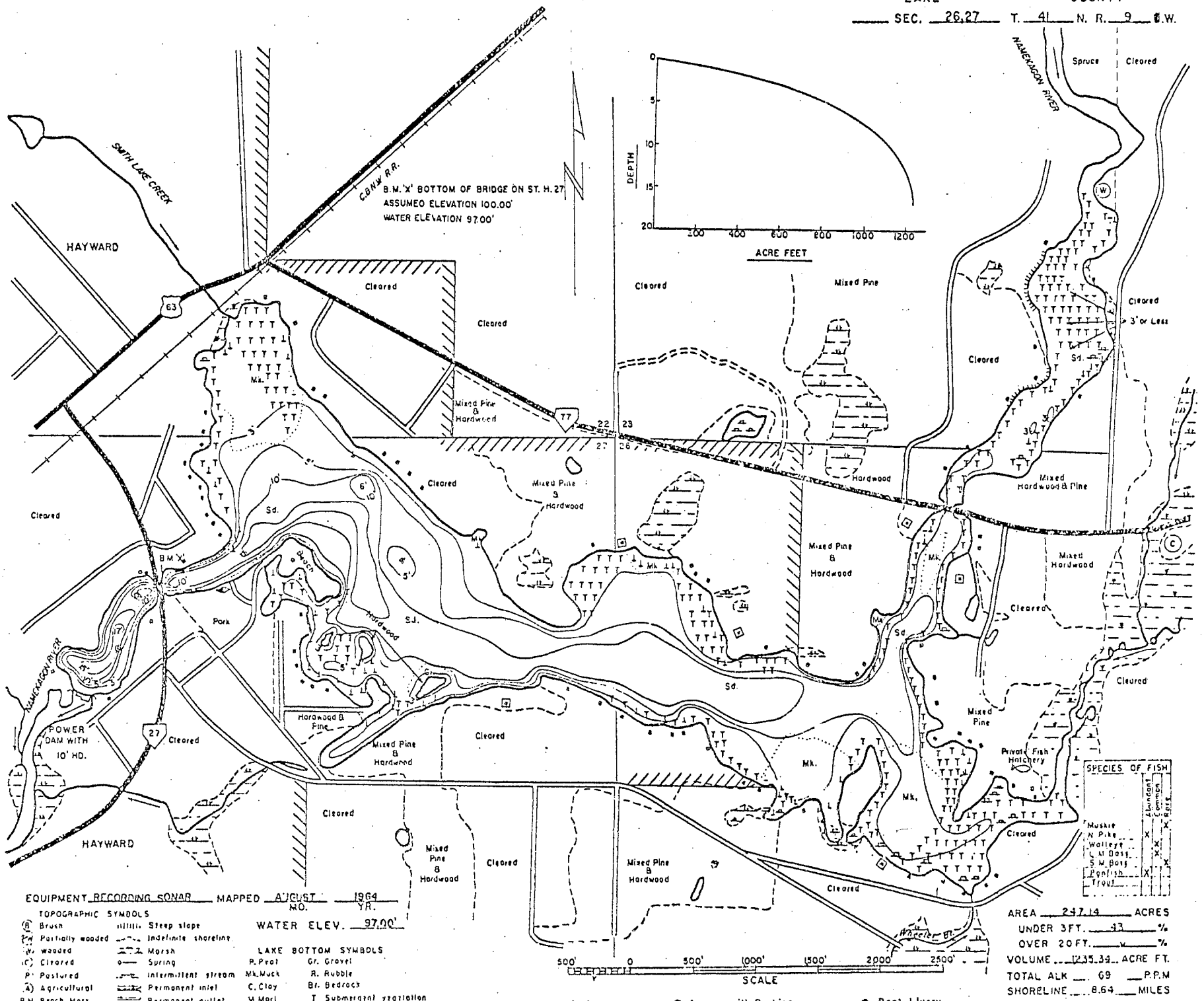
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.0-24.4	1			
1.5-1.9									24.5-24.9				
2.0-2.4									25.0-25.4				
2.5-2.9									25.5-25.9				
3.0-3.4									26.0-26.4			1	
3.5-3.9									26.5-26.9				
4.0-4.4									27.0-27.4				
4.5-4.9									27.5-27.9				
5.0-5.4									28.0-28.4	1			
5.5-5.9	1								28.5-28.9				
6.0-6.4									29.0-29.4				
6.5-6.9									29.5-29.9				
7.0-7.4	2								30.0-30.4				
7.5-7.9	3				1				30.5-30.9				
8.0-8.4					2				31.0-31.4				
8.5-8.9					1				31.5-31.9				
9.0-9.4	4				1				32.0-32.4				
9.5-9.9	2				2				32.5-32.9				
10.0-10.4	2				1				33.0-33.4	1			
10.5-10.9	1		1		1				33.5-33.9				
11.0-11.4			1		1				34.0-34.4				
11.5-11.9	2		2		3				34.5-34.9				
12.0-12.4	1		1		2				35.0-35.4				
12.5-12.9									35.5-35.9				
13.0-13.4									36.0-36.4				
13.5-13.9	1								36.5-36.9				
14.0-14.4					1				37.0-37.4				
14.5-14.9					1				37.5-37.9				
15.0-15.4					1				38.0-38.4				
15.5-15.9									38.5-38.9				
16.0-16.4	1								40.0-40.4				
16.5-16.9					1				40.5-40.9				
17.0-17.4									41.0-41.4				
17.5-17.9									41.5-41.9				
18.0-18.4	1								42.0-42.4				
18.5-18.9									42.5-42.9				
19.0-19.4									43.0-43.4				
19.5-19.9									43.5-43.9				
20.0-20.4									44.0-44.4				
20.5-20.9	2								44.5-44.9				
21.0-21.4									45.0-45.4			1	
21.5-21.9									45.5-45.9				
22.0-22.4									46.0-46.9				
22.5-22.9									47.0-47.9				
23.0-23.4									48.0-48.9				
23.5-23.9									49.0-49.9				
Totals:	26	0	7	0	19	0	0	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (P-W) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation

Field work by: H. Schmudt, M. Perkins, L. Sather — Drawn by: J. Roth

AREA	247.14 ACRES
UNDER 3FT.	43 %
OVER 20FT.	%
VOLUME	1235.34 ACRE FT.
TOTAL ALK.	69 P.P.M.
SHORELINE	8.64 MILES
MAX. DEPTH	17 FEET

WDNR Comments

A-206

WDNR Comments

haul	BG	BC	RB	YP	PS	BH	LMB	JD	NP	WE	WS	CS	BNM	RH	TP
1A	1	0	0	0				0	0			0			
1B	22	16	0	10				0	1	1	1	189	1	2	
2A	0	0	0	9			2	3	0		3	262			
2B	17	0	0	33			5	28	3		9	166			
3A	35	9	0	9	1		1	1	2		1	120			
3B	16	3	0	21	3	1	0	1	0						
4A	0	12	0	8	1		2		0			8	1		31
4B	0	0	0	32	2		15		0			131	1		2
5A	2	31	0	1	1		0		1			105	1		
5B	176	74	1	16			2		1	1	8	215		11	

Lake Hayward; 8/22/97 Seine hauls- juvenile fishes and recruitment. FERC..

Other species-

Species No. Station/Haul

Creek Chub- 17; stations 3-5
R darter- 1; station 1
Log perch- 3; stations 2,5
Johnny darter- 33; stations 2, 3

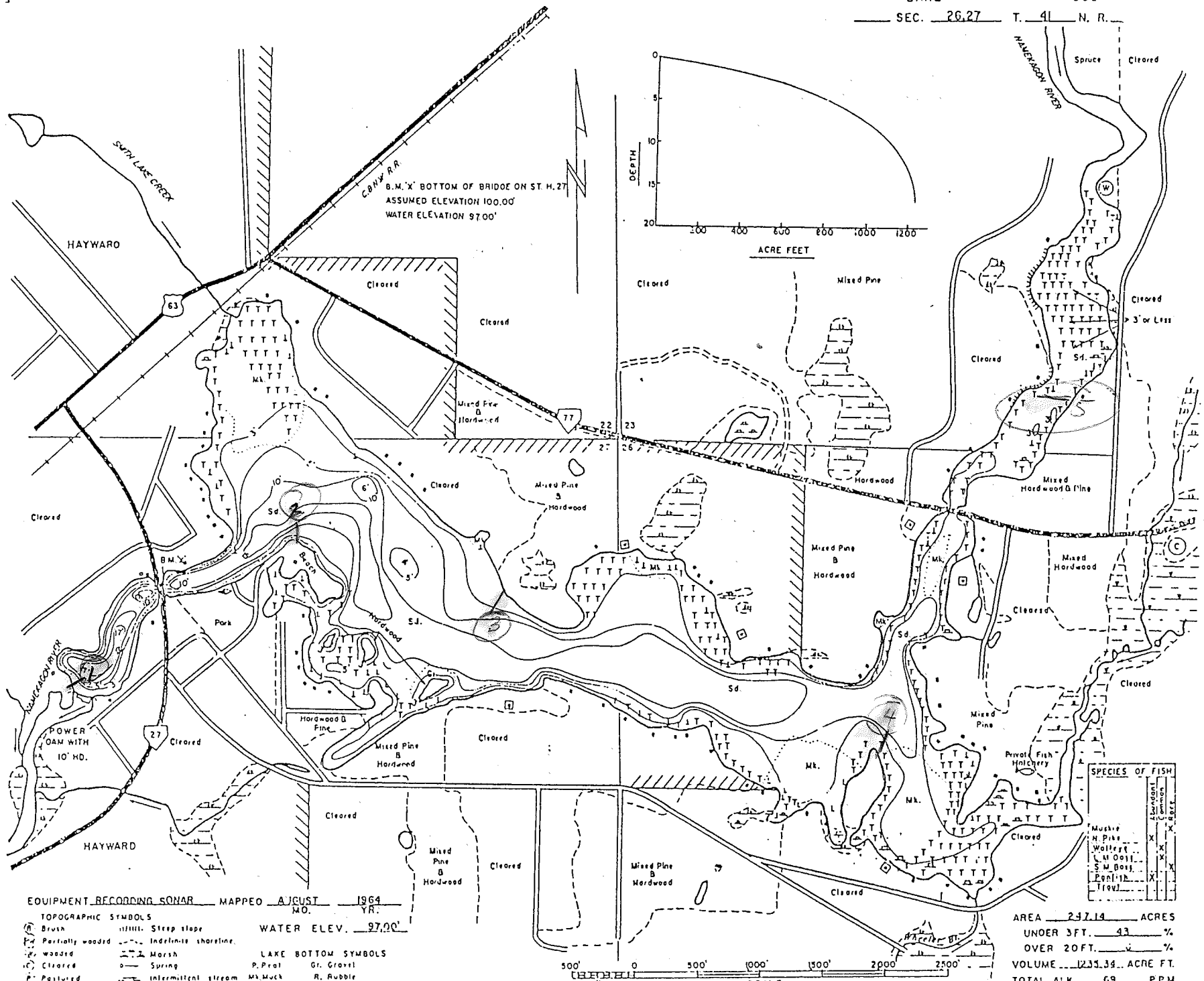
LF- measure 50 per spp.

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — COL

SEC. 26,27 T. 41 N. R.



WDNR Comments

A-208

WDNR Comments

Start - 211.2
End - 212.7
Temp 52.0

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES

COUNTY	WATER	DATE	GEAR
Sawyer COUNTY CODE ___ ___	Hayward N/tW Shore WATER CODE ___ ___ ___	5-19-97	VV BS 200 V / 3 A

SIZE RANGE INCHES	SPECIES					SIZE RANGE INCHES	SPECIES		
	WE-AG	WE other	NP	SMB	LMB		NP	MU	
<3.0						27.0-27.4			
3.0- 3.4						27.5-27.9			
3.5- 3.9						28.0-28.4			
4.0- 4.4						28.5-28.9			
4.5- 4.9						29.0-29.4			
5.0- 5.4						29.5-29.9			
5.5- 5.9						30.0-30.4			
6.0- 6.4						30.5-30.9			
6.5- 6.9	11					31.0-31.4			
7.0- 7.4	11					31.5-31.9			
7.5- 7.9	11					32.0-32.4			
8.0- 8.4	1				1	32.5-32.9			
8.5- 8.9						33.0-33.4			
9.0- 9.4						33.5-33.9			
9.5- 9.9	1		1			34.0-34.4			
10.0-10.4	1				1	34.5-34.9		1	
10.5-10.9					1	35.0-35.4			
11.0-11.4			1			35.5-35.9			
11.5-11.9			1			36.0-36.4			
12.0-12.4					1	36.5-36.9			
12.5-12.9			1			37.0-37.4			
13.0-13.4			1			37.5-37.9			
13.5-13.9						38.0-38.4			
14.0-14.4						38.5-38.9			
14.5-14.9						39.0-39.4			
15.0-15.4						39.5-39.9			
15.5-15.9						40.0-40.9			
16.0-16.4						41.0-41.9			
16.5-16.9		1				42.0-42.9			
17.0-17.4						43.0-43.9			
17.5-17.9			1			44.0-44.9			
18.0-18.4						45.0-45.9			
18.5-18.9			1			46.0-46.9			
19.0-19.4						47.0-47.9			
19.5-19.9						48.0-48.9			
20.0-20.4						49.0-49.9			
20.5-20.9						50.0-50.9			
21.0-21.4						51.0-51.9			
21.5-21.9			111			52.0-52.9			
22.0-22.4						53.0-53.9			
22.5-22.9						54.0-54.9			
23.0-23.4						55.0-55.9			
23.5-23.9						56.0-56.9			
24.0-24.4						57.0-57.9			
24.5-24.9						58.0-58.9			
25.0-25.4						59.0-59.9			
25.5-25.9			1			60.0+			
26.0-26.4									
26.5-26.9									
TOTAL	9 AG-WE	1 other WE	10 NP	0	4 LMB	TOTAL		1 MU	

WDNR Comments

WDNR Comments

State of Wisconsin
Department of Natural Resources

49.6°F cloudy, windy, cold
1.2 hrs / 3.2 miles (E/NE)

INCHES

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

COUNTY Sawyer COUNTY CODE 58

WATER Lake Hayward WATER CODE ____

DATE 05/08/97

GEAR Boomshocker 200 V – 3 Amps

SIZE RANGE INCHES	SPECIES				SIZE RANGE INCHES	SPECIES		
	Walleye-AG	Walleye-other	LMB	NP		Musky	Species	Abund.
<3.0					27.0-27.4		WS	C
3.0- 3.4					27.5-27.9		RH	P
3.5- 3.9					28.0-28.4		BG	P
4.0- 4.4					28.5-28.9		BC	C
4.5- 4.9					29.0-29.4		YP	P
5.0- 5.4					29.5-29.9			
5.5- 5.9					30.0-30.4			
6.0- 6.4					30.5-30.9			
6.5- 6.9	2				31.0-31.4	1		
7.0- 7.4	2				31.5-31.9			
7.5- 7.9	2				32.0-32.4			
8.0- 8.4	1				32.5-32.9	Only one		
8.5- 8.9	2		1		33.0-33.4	seen		
9.0- 9.4	5				33.5-33.9			
9.5- 9.9	1				34.0-34.4			
10.0-10.4	3			1	34.5-34.9			
10.5-10.9	2				35.0-35.4			
11.0-11.4					35.5-35.9			
11.5-11.9					36.0-36.4			
12.0-12.4		1	1	Several	36.5-36.9			
12.5-12.9				other larger	37.0-37.4			
13.0-13.4		1		seen but	37.5-37.9			
13.5-13.9				not netted	38.0-38.4			
14.0-14.4					38.5-38.9			
14.5-14.9					39.0-39.4			
15.0-15.4					39.5-39.9			
15.5-15.9			1		40.0-40.9			
16.0-16.4					41.0-41.9			
16.5-16.9					42.0-42.9			
17.0-17.4					43.0-43.9			
17.5-17.9					44.0-44.9			
18.0-18.4		1			45.0-45.9			
18.5-18.9					46.0-46.9			
19.0-19.4			1		47.0-47.9			
19.5-19.9					48.0-48.9			
20.0-20.4					49.0-49.9			
20.5-20.9					50.0-50.9			
21.0-21.4					51.0-51.9			
21.5-21.9					52.0-52.9			
22.0-22.4					53.0-53.9			
22.5-22.9					54.0-54.9			
23.0-23.4					55.0-55.9			
23.5-23.9					56.0-56.9			
24.0-24.4					57.0-57.9			
24.5-24.9					58.0-58.9			
25.0-25.4					59.0-59.9			
25.5-25.9		1			60.0+			
26.0-26.4								
26.5-26.9								
TOTAL	20 AG-WE	4 other WE	5 LMB	1 NP	TOTAL	1 Mu		

WDNR Comments

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

Start - 12hr
End
H_2O Temp 49.6 °F
3.2 miles
S/E shore to STH '77'

HES

COUNTY: Sawyer COUNTY CODE: 58

WATER: LK Hayward WATER CODE: ____

DATE: 05/08/97

GEAR: Boomshocker

SIZE RANGE INCHES	Walleye	LMB	NP	Mu
<3.0				
3.0- 3.4				
3.5- 3.9				
4.0- 4.4				
4.5- 4.9				
5.0- 5.4				
5.5- 5.9				
6.0- 6.4				
6.5- 6.9	||			
7.0- 7.4	||			
7.5- 7.9	||			
8.0- 8.4	| 20			
8.5- 8.9	|| A6	|		
9.0- 9.4	|||||	|		
9.5- 9.9	|		||	
10.0-10.4	|||			
10.5-10.9	||			
11.0-11.4				
11.5-11.9				
12.0-12.4	|	|		
12.5-12.9				
13.0-13.4	|			
13.5-13.9				
14.0-14.4				
14.5-14.9				
15.0-15.4				
15.5-15.9		|		
16.0-16.4				
16.5-16.9				
17.0-17.4				
17.5-17.9				
18.0-18.4	|			
18.5-18.9				
19.0-19.4		|		
19.5-19.9				
20.0-20.4				
20.5-20.9				
21.0-21.4				
21.5-21.9				
22.0-22.4				
22.5-22.9				
23.0-23.4				
23.5-23.9				
24.0-24.4				
24.5-24.9				
25.0-25.4				
25.5-25.9	|			
26.0-26.4				
26.5-26.9				
TOTAL	24 tot	5 LMB	1 NP	

SIZE RANGE INCHES	WG	NP	Mu
27.0-27.4			
27.5-27.9			
28.0-28.4			
28.5-28.9			
29.0-29.4			
29.5-29.9			
30.0-30.4		Conn	
30.5-30.9		Russ	
31.0-31.4		Park	|
31.5-31.9			
32.0-32.4		target	- A6 W.G.
32.5-32.9			
33.0-33.4			
33.5-33.9		BC	- C
34.0-34.4		BG	- P
34.5-34.9		WS	- C
35.0-35.4		RH	- R
35.5-35.9		YP	- P
36.0-36.4			
36.5-36.9			
37.0-37.4			
37.5-37.9			
38.0-38.4			
38.5-38.9			
39.0-39.4			
39.5-39.9			
40.0-40.9	Cold		
41.0-41.9	Windy		
42.0-42.9	Rainy		
43.0-43.9			
44.0-44.9			
45.0-45.9	DIC		
46.0-46.9			
47.0-47.9			
48.0-48.9			
49.0-49.9			
50.0-50.9			
51.0-51.9			
52.0-52.9			
53.0-53.9			
54.0-54.9			
55.0-55.9			
56.0-56.9			
57.0-57.9			
58.0-58.9			
59.0-59.9			
60.0+			
TOTAL			1 Mu

1/2 mile because of so wet + lake was miserable

SMB - 13.5

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.

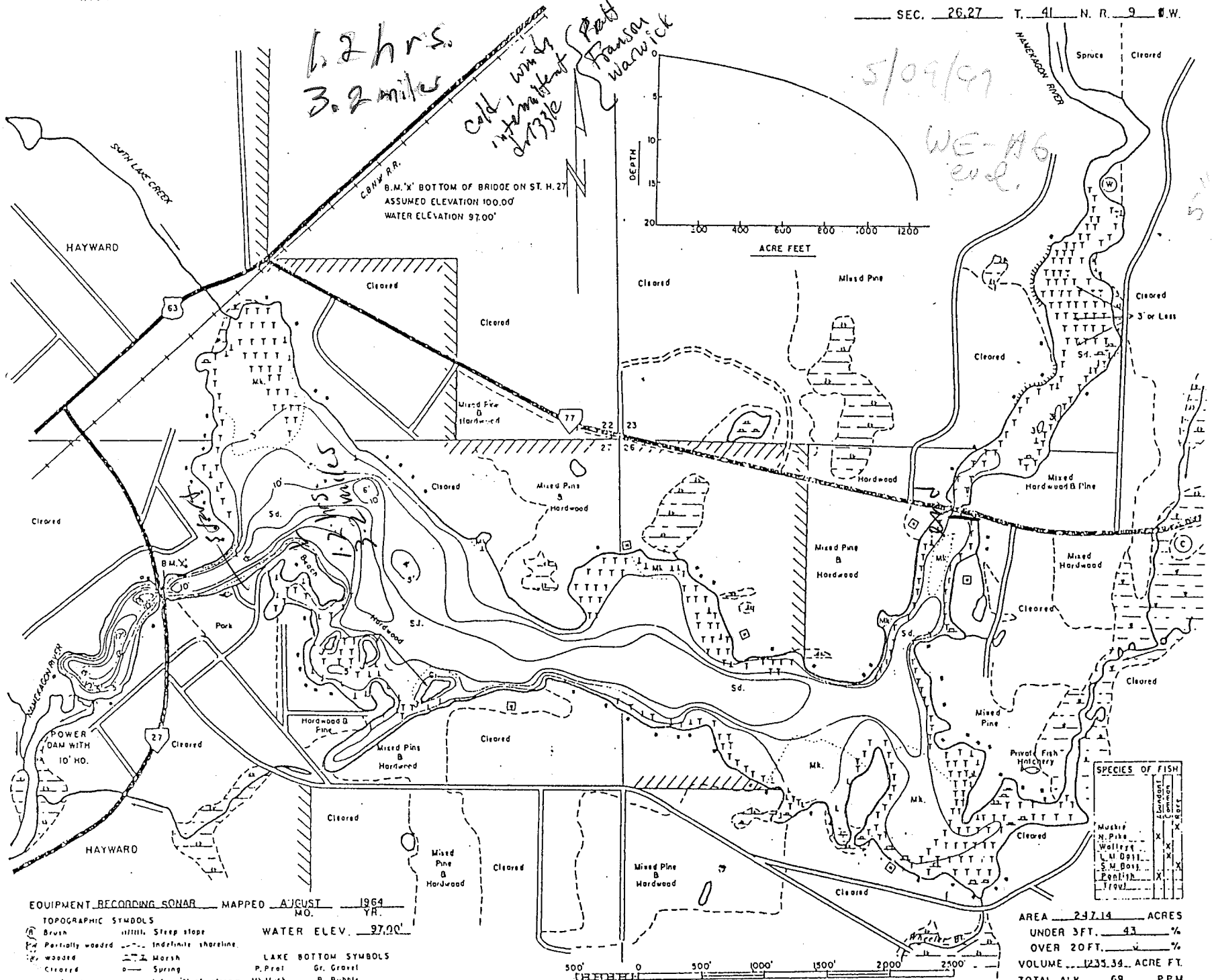
1.2 hrs.
3.2 miles

cold, warm intermittent drizzle

Pat Ransom Warwick

5/09/97

WE-#6 end



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

Brush; Partially wooded; Wooded; Cleared; Steep slope; Indefinite shoreline; Marsh; Spring; Intermittent stream; Permanent inlet; Permanent outlet; Dam

LAKE BOTTOM SYMBOLS

P. Peat; Mk. Muck; C. Clay; M. Marl; Sd. Sand; Sl. Silt; Gr. Gravel; R. Rubble; Br. Bedrock; Submergent vegetation; Emergent vegetation; Floating vegetation

SCALE 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schnyder, M. Prince, L. Sather Drawn by: J. Rath

AREA 247.14 ACRES
UNDER 3FT. 43 %
OVER 20FT. — %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

A-213

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County: Sawyer	Waters: Hayward Lake MWBC: 2725500
Sampling Objective: Walleye Recruitment Survey	Number and Locations of Stations (Habitat)
Period Fished (Dates): 09/21/98	Miles Actually Shocked = 6.8 (Source: LM) Acres = 247 (LM) Total Miles of Shoreline = 8.6 (LM) Total Miles of Shockable Shoreline = 6.8 (LM)

GEAR

Boomshocker (Hours): 2.3		Time: ✓ Night / Day		
Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth
Other (Hours or Lifts) Boomshocker(s): 1 Dip Netter(s): 2		Mini-boomshocker(s): 0 Dip Netter(s): 0	Characteristics Walleye Recruitment Code: C-ST	

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	44	7.0-7.9	6.5 - 10.9*	19.13 / hour 6.47 / mile
Serns Index 1.51 YOY / acre				
Walleye (Age 1+)	0	None	-	0.00 / hour 0.00 / mile
Walleye (Other)	7	None	13.0 - 21.9	3.04 / hour 1.03 / mile
Smallmouth Bass	5	None	4.0 - 12.9	2.17 / hour 0.74 / mile
Largemouth Bass	18	None	2.5 - 15.4	7.83 / hour 2.65 / mile
Muskellunge	4	None	10.5 - 47.9	1.74 / hour 0.59 / mile
Northern Pike	34	9.0-10.4	6.5 - 32.4	14.78 / hour 5.00 / mile

Observations

1) Tank Mortality: None

2) Weather: Mostly Cloudy, Cold

3) Stocking: 2,470 Walleye, 8.3", 09/17/98, DNR; 247 Muskellunge, 11.7", 09/04/98, DNR

4) Reliabilty: Medium

5)Comments: *Extended growth YOY walleye stocked ~1 week before survey.

Rev. 10-70	Signed (Compiler)	Date 12/09/98

WDNR Comments

Sheet 1 of 1

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — GAMEFISH — Wisconsin Department of Natural Resources

Waterbody Name: Lake Hayward
MWB Code/WBIC:
Waterbody Type:
County:
Date (MM/DD/YY): 09/21/98
Station:
X Start Time: 8:20 PM
X End Time: 11:00 PM
Collectors: Pratt, Warwick, Blinkwolf

Target Fish: Juvenile Walleye
Mark(s) Given: None
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: Cloudy, cold
X Adverse Conditions:
X Water Temperature:
X Water Conductivity:
Water Level: [HI] (circled: [NORM]) [LOW]
✓ Water Clarity:

X Generator Start Time:
X Generator End Time:
X Volts:
X Amps:
~~Pulse Rate:~~
~~Duty Cycle:~~
Current Type: (circled: [AC]) [DC] [PDC]
Distance Shocked: X
Entire Shoreline Shocked: [Y] (circled: [N]) *
Number of Dippers: [1] (circled: [2])
Dipnet Mesh Size: 3/8

inches	W.E.	NP	Muskellunge	Largemouth Bass	Smallmouth Bass	inches	Northern Pike	Muskellunge	W.E
<1.5						24.5-24.9			
1.5-1.9						25.0-25.4			
2.0-2.4						25.5-25.9			
2.5-2.9						26.0-26.4			
3.0-3.4						26.5-26.9			
3.5-3.9						27.0-27.4			
4.0-4.4						27.5-27.9			
4.5-4.9						28.0-28.4			
5.0-5.4						28.5-28.9			
5.5-5.9						29.0-29.4			
6.0-6.4						29.5-29.9			
6.5-6.9						30.0-30.4			
7.0-7.4						30.5-30.9			
7.5-7.9						31.0-31.4			
8.0-8.4						31.5-31.9			
8.5-8.9						32.0-32.4			
9.0-9.4						32.5-32.9			
9.5-9.9						33.0-33.4			
10.0-10.4						33.5-33.9			
10.5-10.9						34.0-34.4			
11.0-11.4						34.5-34.9			
11.5-11.9						35.0-35.4			
12.0-12.4						35.5-35.9			
12.5-12.9						36.0-36.4			
13.0-13.4						36.5-36.9			
13.5-13.9						37.0-37.4			
14.0-14.4						37.5-37.9			
14.5-14.9						38.0-38.4			
15.0-15.4						38.5-38.9			
15.5-15.9						39.0-39.4			
16.0-16.4						39.5-39.9			
16.5-16.9						40.0-40.4			
17.0-17.4						40.5-40.9			
17.5-17.9						41.0-41.4			
18.0-18.4						41.5-41.9			
18.5-18.9						42.0-42.4			
19.0-19.4						42.5-42.9			
19.5-19.9						43.0-43.4			
20.0-20.4						43.5-43.9			
20.5-20.9						44.0-44.4			
21.0-21.4						44.5-44.9			
21.5-21.9						45.0-45.4			
22.0-22.4						45.5-45.9			
22.5-22.9						46.0-46.9			
23.0-23.4						47.0-47.9			
23.5-23.9						48.0-48.9			
24.0-24.4						49.0-49.9			
TOTALS:						50.0+			

* Does not include shoreline south of STH '27' or north STH '77' bridges – [illegible] shore is

WDNR Comments

Sheet_____of_____

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — WALLEYE — Wisconsin Department of Natural Resources

Waterbody Name: _____
MWB Code/WBIC: _____
Waterbody Type: _____
County: _____
Date (MM/DD/YY): _____
Station: _____
Start Time: _____
End Time: _____
Collectors: _____
_____

Target Fish: Juvenile Walleye
Mark(s) Given: None
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: _____
Adverse Conditions: _____
Water Temperature: _____
Water Conductivity: _____
Water Level: [HI] [NORM] [LOW]
Water Clarity: _____

Generator Start Time: _____
Generator End Time: _____
Volts: _____
Amps: _____
Pulse Rate: _____
Duty Cycle: _____
Current Type: [AC] [DC] [PDC]
Distance Shocked: _____
Entire Shoreline Shocked: [Y] [N] [I]
Number of Dippers: [1] [2]
Dipnet Mesh Size: _____

inches		inches		inches	
<3.0		7.1		11.4	
3.0		7.2		11.5	
3.1		7.3		11.6	
3.2		7.4		11.7	
3.3		7.5		11.8	
3.4		7.6		11.9	
3.5		7.7	1	12.0-12.4	1
3.6		7.8		12.5-12.9	1
3.7		7.9		13.0-13.4	1
3.8	11	8.0		13.5-13.9	
3.9		8.1		14.0-14.4	1
4.0		8.2		14.5-14.9	
4.1		8.3		15.0-15.4	
4.2	1	8.4		15.5-15.9	1
4.3		8.5		16.0-16.4	
4.4		8.6	1	16.5-16.9	
4.5		8.7		17.0-17.4	
4.6		8.8		17.5-17.9	
4.7	1	8.9	1	18.0-18.4	
4.8		9.0		18.5-18.9	
4.9		9.1		19.0-19.4	
5.0		9.2		19.5-19.9	
5.1		9.3		20.0-20.4	
5.2		9.4		20.5-20.9	
5.3	1	9.5		21.0-21.4	
5.4		9.6		21.5-21.9	
5.5		9.7		22.0-22.4	
5.6		9.8		22.5-22.9	
5.7	1	9.9		23.0-23.4	
5.8		10.0		23.5-23.9	
5.9		10.1	1	24.0-24.4	
6.0		10.2		24.5-24.9	
6.1		10.3		25.0-25.4	
6.2		10.4		25.5-25.9	
6.3		10.5		26.0-26.4	
6.4		10.6		26.5-26.9	
6.5		10.7		27.0-27.4	
6.6		10.8		27.5-27.9	
6.7		10.9	1	28.0-28.4	
6.8		11.0		28.5-28.9	
6.9		11.1		29.0-29.4	
7.0		11.2		29.5-29.9	
TOTALS:		11.3		30.0 +	

WDNR Comments

Sheet ___ of ___

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — GAMEFISH — Wisconsin Department of Natural Resources

Waterbody Name:	Lake Hayward	Target Fish:	Juvenile Walleye	X Generator Start Time:	272.0
MWB Code/WBIC:	2725500	Mark(s) Given:	None	X Generator End Time:	274.3
Waterbody Type:	Imp.	Survey Type:	CPE (Fall Shoreline)	X Volts:	250
County:	Sawyer	Gear Type:	Boomshocker	X Amps:	5
Date (MM/DD/YY):	09/21/98	Weather:	Cloudy, cold	~~Pulse Rate:~~	—
Station:	Main Lake	X Adverse Conditions:	Weedy	~~Duty Cycle:~~	—
X Start Time:	8:20 PM	X Water Temperature:	58.1	Current Type:	(AC) [DC] [PDC]
X End Time:	11:00 PM	X Water Conductivity:	Mod - Hi	Distance Shocked:	6.84 X
Collectors:	Pratt, Warwick, Blinkwolf	Water Level:	[HI] (NORM) [LOW]	Entire Shoreline Shocked:	[Y] (N) X [I]
		X Water Clarity:	Clear 6.9'	Number of Dippers:	[1] (2)
			6.8	Dipnet Mesh Size:	3/8

PS-53 YP-10.2, 8.3, 8.1, ... [illegible]

inches	W.E.	NP	Muskellunge	Largemouth Bass	Smallmouth Bass
<1.5					
1.5-1.9					
2.0-2.4					
2.5-2.9				||	
3.0-3.4				|	
3.5-3.9				|	
4.0-4.4					
4.5-4.9					|
5.0-5.4					
5.5-5.9					|
6.0-6.4					
6.5-6.9	|||| 4			|	
7.0-7.4	13			|||	
7.5-7.9	14				|
8.0-8.4	||| 3	| 1			
8.5-8.9	||| 3	|| 2		|	
9.0-9.4	|| 2	|||| 5			
9.5-9.9	|| 2	||| 3			
10.0-10.4	|| 2	5			
10.5-10.9	| 1	|| 2	|		
11.0-11.4	44	|| 2		|	
11.5-11.9	A-0	|| 2	|	|	
12.0-12.4		|| 2		||||	
12.5-12.9				||	
13.0-13.4	|	|| 2			||
13.5-13.9	||| 4/5	| 1		|	
14.0-14.4	A-6	| 1			
14.5-14.9		| 1			
15.0-15.4				|	
15.5-15.9	|| 2	| 1			
16.0-16.4					
16.5-16.9		| 1			
17.0-17.4					
17.5-17.9					
18.0-18.4					
18.5-18.9					
19.0-19.4					
19.5-19.9					
20.0-20.4					
20.5-20.9					
21.0-21.4					
21.5-21.9	| 1				
22.0-22.4					
22.5-22.9					
23.0-23.4					
23.5-23.9					
24.0-24.4		sub			
TOTALS:	53	30	2 subtot.	19	5

inches	Northern Pike	Muskellunge
24.5-24.9		
25.0-25.4		
25.5-25.9		
26.0-26.4		
26.5-26.9		
27.0-27.4		
27.5-27.9		
28.0-28.4		WE-A
28.5-28.9		RH-P
29.0-29.4		YP-C
29.5-29.9		PS-C
30.0-30.4		BG-P
30.5-30.9		LB-P
31.0-31.4		
31.5-31.9		
32.0-32.4	|	
32.5-32.9		
33.0-33.4		
33.5-33.9		
34.0-34.4		
34.5-34.9		
35.0-35.4		
35.5-35.9		
36.0-36.4		
36.5-36.9		
37.0-37.4		
37.5-37.9		
38.0-38.4		
38.5-38.9		
39.0-39.4		
39.5-39.9		
40.0-40.4		
40.5-40.9		
41.0-41.4		
41.5-41.9		|
42.0-42.4		
42.5-42.9		
43.0-43.4		
43.5-43.9		
44.0-44.4		
44.5-44.9		
45.0-45.4		
45.5-45.9		
46.0-46.9		
47.0-47.9		|
48.0-48.9		
49.0-49.9		
50.0+	31 sub.	4 TOT.

* Does not include shoreline south of STH '27' or north of STH '77' bridges — inaccessible to boomshocker due to low clearance. All the mainlake shore is

GAMEFISH

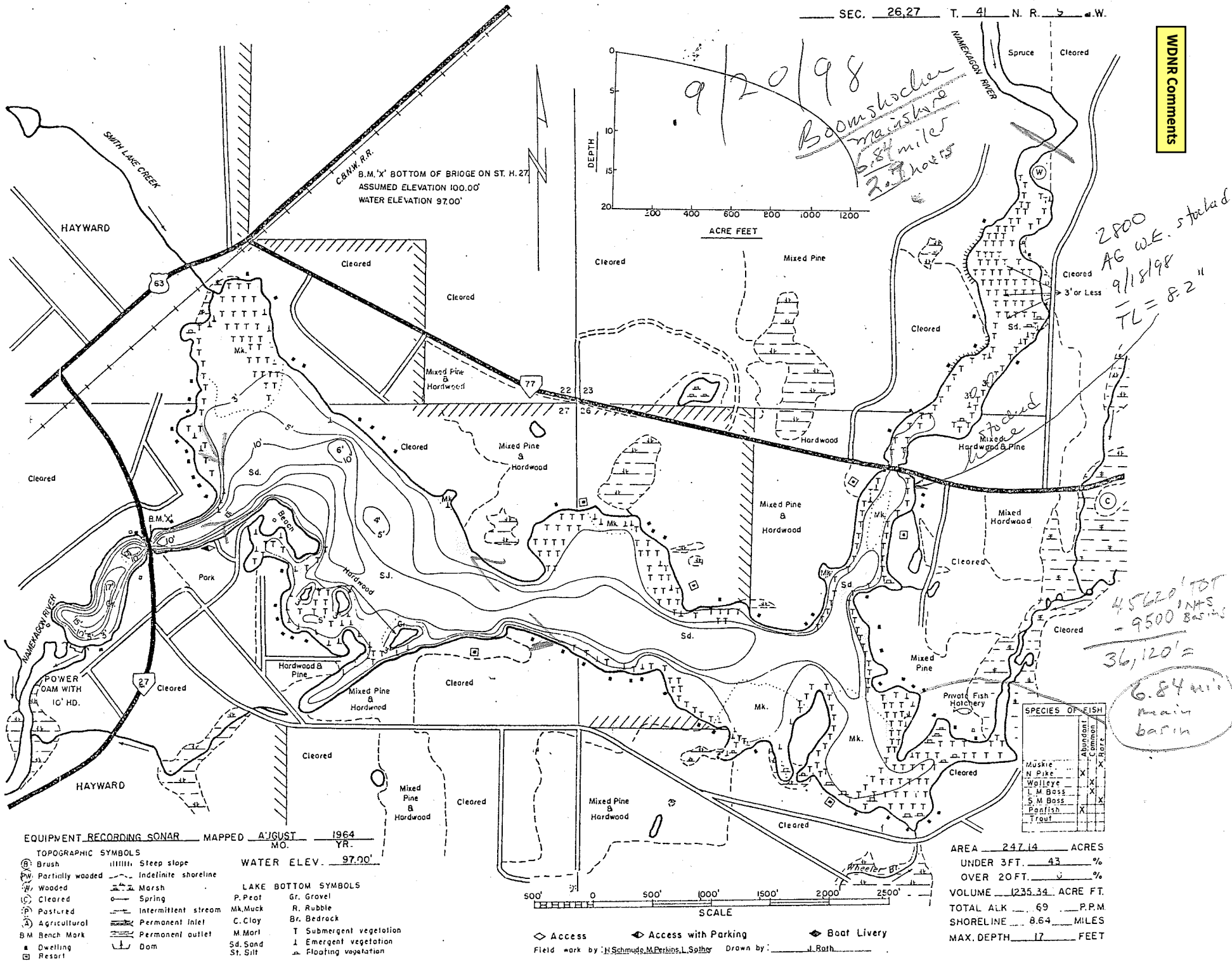
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 5 W.

WDNR Comments



9/20/98
Boomshocker
Manashore
6.84 miles
2.7 hours

2500 AG WE. stocked 9/18/98
TL = 8.2"

45620' TOT
- 9500' NMS Basin
36,120' =
6.84 mi's main basin

SPECIES OF FISH

	Abundant	Common	X Rare
Muskie			
N Pike	X		
Walleye		X	
L M Bass		X	
S M Bass			X
Panfish	X		
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST (MO.) 1964 (YR.)

WATER ELEV. 97.00'

AREA 247.14 ACRES
UNDER 3FT. 43 %
OVER 20FT. 0 %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmude, M. Perkins, L. Sother Drawn by: J. Rath

A-218

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters
Sawyer	Hayward Lake MWBC: 2725500
Sampling Objective: Walleye Recruitment Survey	Number and Locations of Stations (Habitat)
Period Fished (Dates): 09/21/98	Miles Actually Shocked = 6.8 (Source: LM) Acres = 247 (LM) Total Miles of Shoreline = 8.6 (LM) Total Miles of Shockable Shoreline = 8.6 (LM)

GEAR

Boomshocker (Hours)	Time
2.3	✓ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)	Characteristics
Boomshocker(s): 1 Mini-boomshocker(s): 0 Dip Netter(s): 2 Dip Netter(s): 0	Walleye Recruitment Code: C-ST

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Walleye (Age 0+)	44	7.0-7.9	6.5 - 10.9*	19.13 / hour 6.47 / mile
Serns Index NA YOY / acre				
Walleye (Age 1+)	0	None	-	0.00 / hour 0.00 / mile
Walleye (Other)	7	None	13.0 - 21.9	3.04 / hour 1.03 / mile
Smallmouth Bass	5	None	4.0 - 12.9	2.17 / hour 0.74 / mile
Largemouth Bass	18	None	2.5 - 15.4	7.83 / hour 2.65 / mile
Muskellunge	4	None	10.5 - 47.9	1.74 / hour 0.59 / mile
Northern Pike	34	9.0-10.4	6.5 - 32.4	14.78 / hour 5.00 / mile

Observations

1) Tank Mortality: None

2) Weather: Mostly Cloudy, Cold

3) Stocking: 2,470 Walleye, 8.3", 09/17/98, DNR; 247 Muskellunge, 11.7", 09/04/98, DNR

4) Reliabilty: High

5)Comments: *Extended growth YOY walleye stocked ~1 week before survey.

Rev. 10-70	Signed (Compiler)	Date 12/03/98

WDNR Comments

ament of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/21/98 County: Sawyer Collector(s): Pratt, Warwick

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 58°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 6.8 miles

Volts: 250 Amps: 5.0 Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:20 Shocking End Time: 23:00 Generator Start Hour: 272.0 Generator End Hour: 274.3

Number of Dippers: [ ] 1 [X] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] Dip Net Mesh Size: 3/8 inch bar H2O Clarity: 6.0 feet

inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			16.5-16.9		
3.0-3.4			17.0-17.4		
3.5-3.9			17.5-17.9		
4.0-4.4			18.0-18.4		
4.5-4.9			18.5-18.9		
5.0-5.4			19.0-19.4		
5.5-5.9			19.5-19.9		
6.0-6.4			20.0-20.4		
6.5-6.9	4		20.5-20.9		
7.0-7.4	13		21.0-21.4		
7.5-7.9	14		21.5-21.9	1	
8.0-8.4	3		22.0-22.4		
8.5-8.9	3		22.5-22.9		
9.0-9.4	2		23.0-23.4		
9.5-9.9	2		23.5-23.9		
10.0-10.4	2		24.0-24.4		
10.5-10.9	1		24.5-24.9		
11.0-11.4			25.0-25.4		
11.5-11.9			25.5-25.9		
12.0-12.4			26.0-26.4		
12.5-12.9			26.5-26.9		
13.0-13.4	1		27.0-27.4		
13.5-13.9	3		27.5-27.9		
14.0-14.4			28.0-28.4		
14.5-14.9			28.5-28.9		
15.0-15.4			29.0-29.4		
15.5-15.9	2		29.5-29.9		
16.0-16.4			30.0 +		
Totals:	51	0			

WDNR Comments

epartment of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/21/98 County: Sawyer Collector(s): Pratt, Warwick

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 58°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 6.8 miles

Volts: 250 Amps: 5.0 Current Type: [X] AC [ ] DC [ ] Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:20 Shocking End Time: 23:00 Generator Start Hour: 272.0 Generator End Hour: 274.3

Number of Dippers: [ ] 1 [X] 2 Entire Shoreline Shocked: [ ] Y [X] N [ ] Dip Net Mesh Size: 3/8 inch bar H2O Clarity: 6.0 feet

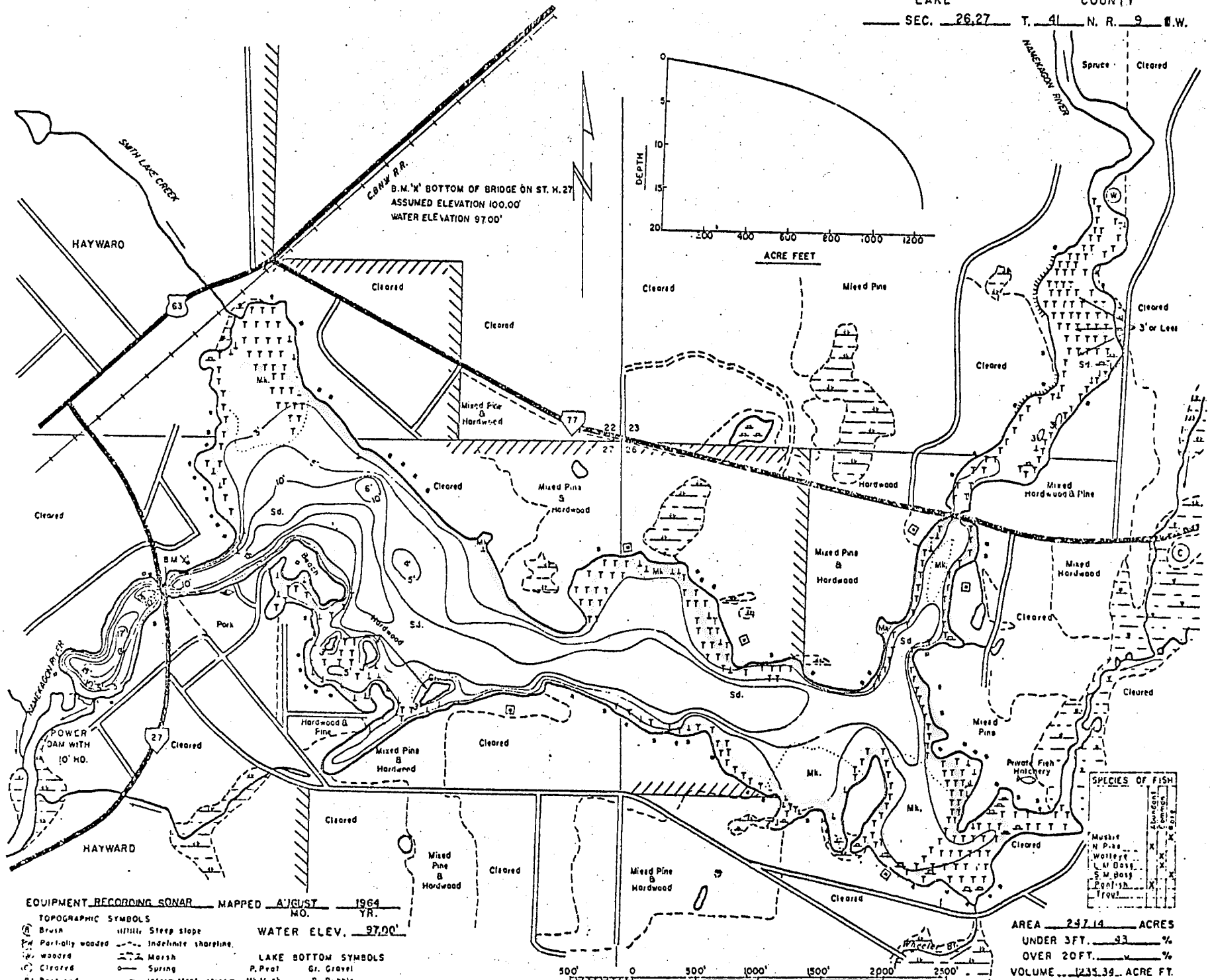
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9					2				26.0-26.4				
3.0-3.4					1				26.5-26.9				
3.5-3.9					1				27.0-27.4				
4.0-4.4							1		27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9							1		29.0-29.4				
6.0-6.4									29.5-29.9				
6.5-6.9	1				1				30.0-30.4				
7.0-7.4					3		1		30.5-30.9				
7.5-7.9									31.0-31.4				
8.0-8.4	1								31.5-31.9				
8.5-8.9	2				1				32.0-32.4	1			
9.0-9.4	5								32.5-32.9				
9.5-9.9	3								33.0-33.4				
10.0-10.4	5								33.5-33.9				
10.5-10.9	2		1						34.0-34.4				
11.0-11.4	2				1				34.5-34.9				
11.5-11.9	2		1		1				35.0-35.4				
12.0-12.4	3				3				35.5-35.9				
12.5-12.9					2		2		36.0-36.4				
13.0-13.4	2								36.5-36.9				
13.5-13.9	1				1				37.0-37.4				
14.0-14.4	1								37.5-37.9				
14.5-14.9	1								38.0-38.4				
15.0-15.4					1				38.5-38.9				
15.5-15.9	1								39.0-39.4				
16.0-16.4									39.5-39.9				
16.5-16.9	1								40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9									41.0-41.4				
18.0-18.4									41.5-41.9			1	
18.5-18.9									42.0-42.4				
19.0-19.4									42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4									45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9			1	
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	34	0	4	0	18	0	5	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (P-W) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation

SPECIES OF FISH

Muskie, N. Pike, Walleye, L. M. Bass, S. M. Bass, Panfish, Trout

- Access
- Access with Parking
- Boat Livery

Field work by: H. Schmude, M. Perkoz, L. Sather Drawn by: J. Roth

AREA 237.14 ACRES
UNDER 3FT. 93 %
OVER 20FT. — %
VOLUME 1235.39 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

WDNR Comments

A-222

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500
Sampling Objective	**Number and Locations of Stations (Habitat)**	
Walleye Recruitment Survey		Source
Period Fished (Dates)	Miles Actually Shocked = 5.4	LM
09/29/99	Acres = 247	LM
	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time	
2.0	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code: C-ST
Dip Netter(s): 1	Dip Netter(s):	

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	1		7.7	0.50 / hour	0.19 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	*		-	/ hour	/ mile
Walleye (Other)	14	None	9.1 - 15.4	7.00 / hour	2.59 / mile
Smallmouth Bass	0	None	-	0.00 / hour	0.00 / mile
Largemouth Bass	16	None	5.5 - 16.4	8.00 / hour	2.96 / mile
Muskellunge	2	None	18.0 - 20.9	1.00 / hour	0.37 / mile
Northern Pike	27	10.5-10.9	6.5 - 31.4	13.50 / hour	5.00 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Yellow Perch (incidental)	Common	6.7-10.0			

) Tank Mortality: None

2) Weather: Mostly Cloudy, Cool

3) Reliabilty: Medium

) Stocking: 2470 Walleye, 6.4", 08/30/99, WDNR

Comments: *Age 1+ Walleye included with Other Walleye; no ageing available.

ev. 10-70

Signed (Compiler) Scott D. Plaster

Date 03/09/00

WDNR Comments

of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191

8-95

Hayward MWB Code: 2725500 Date: 09/29/99 County: Sawyer Collector(s): Plaster

get Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 53°F Station: Portion of Shoreline

dverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 5.4 miles

Volts: 175 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:45 Shocking End Time: 22:20 Generator Start Hour: 320.7 Generator End Hour: 322.7

Number of Dippers: [X]1 [ ]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: 6 ft.

inches	Unclipped	Clipped	inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			7.2			11.5		
3.0			7.3			11.6	1	
3.1			7.4			11.7		
3.2			7.5			11.8		
3.3			7.6			11.9	1	
3.4			7.7	1		12.0-12.4	2	
3.5			7.8			12.5-12.9		
3.6			7.9			13.0-13.4		
3.7			8.0			13.5-13.9		
3.8			8.1			14.0-14.4	3	
3.9			8.2			14.5-14.9		
4.0			8.3			15.0-15.4	1	
4.1			8.4			15.5-15.9		
4.2			8.5			16.0-16.4		
4.3			8.6			16.5-16.9		
4.4			8.7			17.0-17.4		
4.5			8.8			17.5-17.9		
4.6			8.9			18.0-18.4		
4.7			9.0			18.5-18.9		
4.8			9.1	1		19.0-19.4		
4.9			9.2	1		19.5-19.9		
5.0			9.3	1		20.0-20.4		
5.1			9.4			20.5-20.9		
5.2			9.5			21.0-21.4		
5.3			9.6			21.5-21.9		
5.4			9.7			22.0-22.4		
5.5			9.8			22.5-22.9		
5.6			9.9			23.0-23.4		
5.7			10.0			23.5-23.9		
5.8			10.1			24.0-24.4		
5.9			10.2			24.5-24.9		
6.0			10.3			25.0-25.4		
6.1			10.4			25.5-25.9		
6.2			10.5	1		26.0-26.4		
6.3			10.6	2		26.5-26.9		
6.4			10.7			27.0-27.4		
6.5			10.8			27.5-27.9		
6.6			10.9			28.0-28.4		
6.7			11.0			28.5-28.9		
6.8			11.1			29.0-29.4		
6.9			11.2			29.5-29.9		
7.0			11.3			30.0 +		
7.1			11.4			**Totals:**	**15**	**0**

WALLEYE

WDNR Comments

nt of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Hayward MWB Code: 2725500 Date: 09/29/99 County: Sawyer Collector(s): Plaster

get Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 53°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 5.4 miles

Volts: 175 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 19:45 Shocking End Time: 22:20 Generator Start Hour: 320.7 Generator End Hour: 322.7

Number of Dippers: [X]1 [ ]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: 6 ft.

	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9				
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9					1				29.0-29.4				
6.0-6.4					1				29.5-29.9				
6.5-6.9	1				1				30.0-30.4	1			
7.0-7.4									30.5-30.9				
7.5-7.9	1								31.0-31.4	1			
8.0-8.4									31.5-31.9				
8.5-8.9									32.0-32.4				
9.0-9.4	1				1				32.5-32.9				
9.5-9.9					1				33.0-33.4				
10.0-10.4	1				3				33.5-33.9				
10.5-10.9	4				1				34.0-34.4				
11.0-11.4	3				1				34.5-34.9				
11.5-11.9					1				35.0-35.4				
12.0-12.4	1								35.5-35.9				
12.5-12.9	3								36.0-36.4				
13.0-13.4	1				1				36.5-36.9				
13.5-13.9	1								37.0-37.4				
14.0-14.4	1				1				37.5-37.9				
14.5-14.9	1								38.0-38.4				
15.0-15.4	1				1				38.5-38.9				
15.5-15.9									39.0-39.4				
16.0-16.4					2				39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9	2								41.0-41.4				
18.0-18.4			1						41.5-41.9				
18.5-18.9									42.0-42.4				
19.0-19.4	1								42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9	1		1						44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	27	0	2	0	16	0	0	0	50.0+				

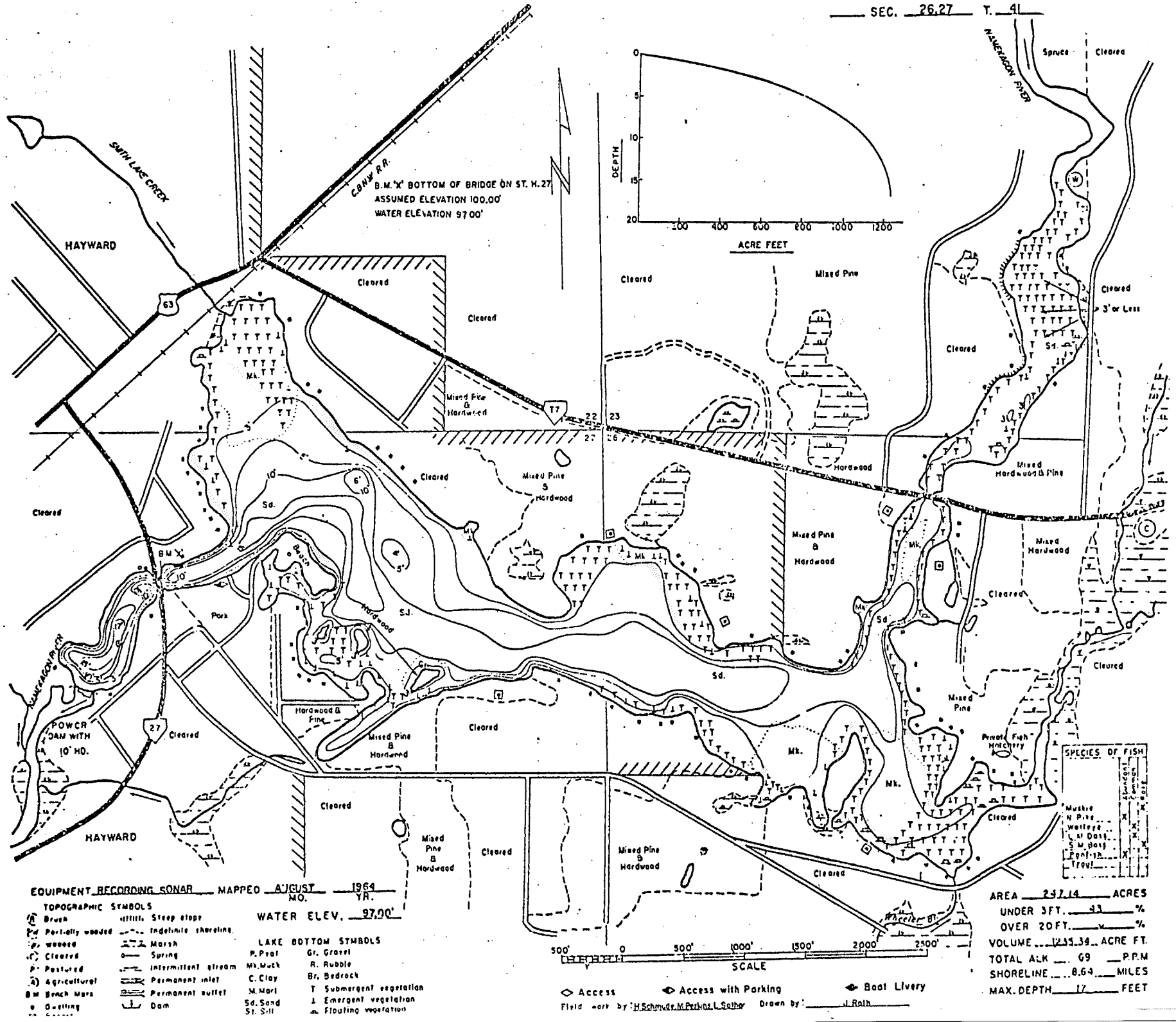
GAMEFISH

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE
LAKE

SEC. 26,27 T. 41



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964
MO. YR.

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

- Brush
- Pd Partially wooded
- Wooded
- C Cleared
- P Pastured
- A Agricultural
- BM Bench Mark
- Dwelling
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmidt, M. Perkins, L. Sather Drawn by: J. Rath

AREA 237.14 ACRES
UNDER 3FT. 93 %
OVER 20FT. — %
VOLUME 1235.38 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

A-226

WDNR Comments

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500

Sampling Objective	Number and Locations of Stations (Habitat)	Source
Walleye Recruitment Survey	Miles Actually Shocked = 7.0	LM
Period Fished (Dates)	Acres = 247	LM
09/25/00	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time	
2.5	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh Size**	**Depth**
Minnow Seine (No. of Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-NR
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	20	None	6.6 - 8.8	8.00 / hour	2.86 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	2	None	10.4	0.80 / hour	0.29 / mile
Walleye (Other)	21	None	12.0 - 26.4	8.40 / hour	3.00 / mile
Smallmouth Bass	3	None	11.0 - 16.9	1.20 / hour	0.43 / mile
Largemouth Bass	18	3.5-3.9	3.0 - 16.9	7.20 / hour	2.57 / mile
Muskellunge	8	11.5-11.9	8.5 - 13.4	3.20 / hour	1.14 / mile
Northern Pike	39	None	5.0 - 35.4	15.60 / hour	5.57 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None

2) Weather: Clear, Calm, Cold

3) Reliabilty: Medium

4) Stocking: 124 Muskellunge, 12 inches, 09/14, WDNR

2470 Walleye, 7.5 inches, 09/20, WDNR

5) Comments:

Rev. 10-70

Signed (Compiler) Scott D. Plaster

Date 12/01/00

WDNR Comments

/epartment of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/25/00 County: Sawyer Collector(s): Pratt, Tobias, Warwick

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 63°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 7.0 miles

Volts: 175 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:00 Shocking End Time: 23:26 Generator Start Hour: 378.6 Generator End Hour: 381.1

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			7.2	1		11.5		
3.0			7.3	2		11.6		
3.1			7.4			11.7		
3.2			7.5			11.8		
3.3			7.6	3		11.9		
3.4			7.7			12.0-12.4	3	
3.5			7.8	1		12.5-12.9	2	
3.6			7.9			13.0-13.4		
3.7			8.0	1		13.5-13.9	1	
3.8			8.1	2		14.0-14.4	1	
3.9			8.2	1		14.5-14.9	1	
4.0			8.3			15.0-15.4	3	
4.1			8.4			15.5-15.9	1	
4.2			8.5			16.0-16.4	1	
4.3			8.6			16.5-16.9		
4.4			8.7			17.0-17.4	2	
4.5			8.8	1		17.5-17.9		
4.6			8.9			18.0-18.4		
4.7			9.0			18.5-18.9	2	
4.8			9.1			19.0-19.4	2	
4.9			9.2			19.5-19.9		
5.0			9.3			20.0-20.4		
5.1			9.4			20.5-20.9		
5.2			9.5			21.0-21.4		
5.3			9.6			21.5-21.9		
5.4			9.7			22.0-22.4		
5.5			9.8			22.5-22.9		
5.6			9.9			23.0-23.4	1	
5.7			10.0			23.5-23.9		
5.8			10.1			24.0-24.4		
5.9			10.2			24.5-24.9		
6.0			10.3			25.0-25.4		
6.1			10.4	2		25.5-25.9		
6.2			10.5			26.0-26.4	1	
6.3			10.6			26.5-26.9		
6.4			10.7			27.0-27.4		
6.5			10.8			27.5-27.9		
6.6	1		10.9			28.0-28.4		
6.7			11.0			28.5-28.9		
6.8	1		11.1			29.0-29.4		
6.9			11.2			29.5-29.9		
7.0	3		11.3			30.0 +		
7.1	3		11.4			**Totals:**	**43**	**0**

WALLEYE

WDNR Comments

partment of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/25/00 County: Sawyer Collector(s): Pratt, Tobias, Warwick

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 63°F Station: Portion of Shoreline

Adverse Conditions: Aquatic vegetation Gear Type: Boomshocker Distance Shocked: 7.0 miles

Volts: 175 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:00 Shocking End Time: 23:26 Generator Start Hour: 378.6 Generator End Hour: 381.1

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

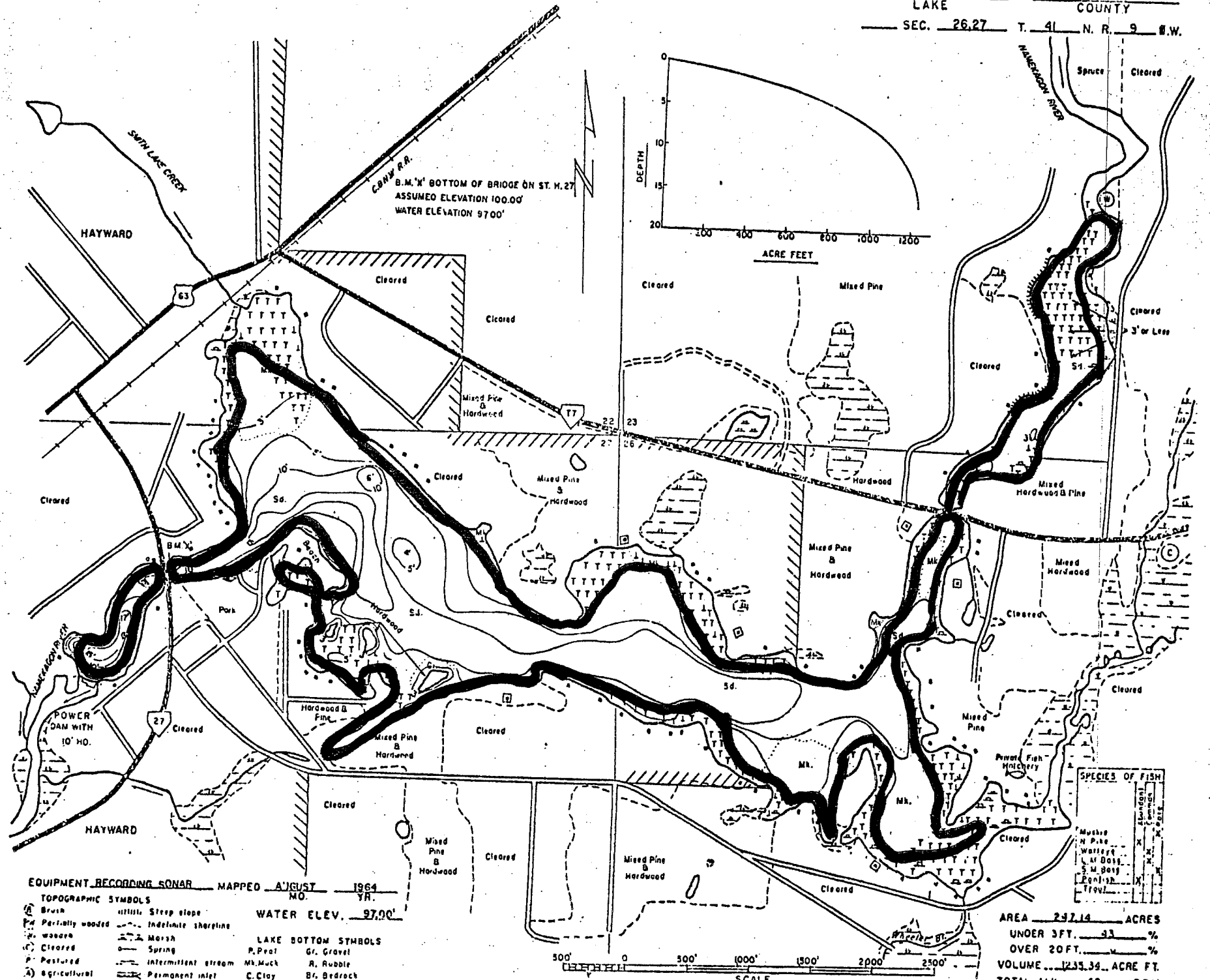
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9	1			
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9	1			
2.5-2.9									26.0-26.4				
3.0-3.4					1				26.5-26.9				
3.5-3.9					3				27.0-27.4				
4.0-4.4					2				27.5-27.9	1			
4.5-4.9									28.0-28.4	1			
5.0-5.4	1								28.5-28.9				
5.5-5.9	1								29.0-29.4				
6.0-6.4									29.5-29.9				
6.5-6.9	1								30.0-30.4				
7.0-7.4	2								30.5-30.9				
7.5-7.9									31.0-31.4	1			
8.0-8.4	2				1				31.5-31.9				
8.5-8.9			1						32.0-32.4				
9.0-9.4			1		1				32.5-32.9				
9.5-9.9			1		2				33.0-33.4				
10.0-10.4	2				1				33.5-33.9				
10.5-10.9	3		1						34.0-34.4				
11.0-11.4	2				1		1		34.5-34.9				
11.5-11.9	3		3		1				35.0-35.4	1			
12.0-12.4									35.5-35.9				
12.5-12.9									36.0-36.4				
13.0-13.4	2		1		1				36.5-36.9				
13.5-13.9									37.0-37.4				
14.0-14.4					2				37.5-37.9				
14.5-14.9	1								38.0-38.4				
15.0-15.4					1		1		38.5-38.9				
15.5-15.9									39.0-39.4				
16.0-16.4									39.5-39.9				
16.5-16.9	1				1		1		40.0-40.4				
17.0-17.4	1								40.5-40.9				
17.5-17.9									41.0-41.4				
18.0-18.4									41.5-41.9				
18.5-18.9	1								42.0-42.4				
19.0-19.4	3								42.5-42.9				
19.5-19.9	1								43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9	2								44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9	1								45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9	1								46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9	1								48.0-48.9				
24.0-24.4									49.0-49.9				
Totals:	39	0	8	0	18	0	3	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR — MAPPED AUGUST MO. 1964 YR.

WATER ELEV. 970.0'

TOPOGRAPHIC SYMBOLS

Brush; Steep slope; Partially wooded; Indefinite shoreline; Woods; Marsh; Cleared; Spring; Pastured; Intermittent stream; Agricultural; Permanent inlet; BM Bench Mark; Permanent outlet; Dwelling; Dam

LAKE BOTTOM SYMBOLS

P. Peat; Gr. Gravel; Mk. Muck; R. Rubble; C. Clay; Br. Bedrock; M. Marl; T Submergent vegetation; Sd. Sand; ⊥ Emergent vegetation

SCALE 500' 0 500' 1000' 1500' 2000' 2500'

◇ Access ◆ Access with Parking ◆ Boat Livery

SPECIES OF FISH

	Abundant	Common	Rare
Muskie			
N. Pike			
Walleye			
L. Mouth Bass			
S. M. Bass			
Panfish			
Trout			

AREA 297.14 ACRES

UNDER 3 FT. 93 %

OVER 20 FT. — %

VOLUME 1235.34 ACRE FT.

TOTAL ALK 69 P.P.M.

SHORELINE 8.64 MILES

MAX. DEPTH 17 FEET

WDNR Comments

A-230

WDNR Comments

Sheet____of____

TAG

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET

WALLEYE

9/25/00

Wisconsin Department of Natural Resources

Waterbody Name: Lk Hay Wat
MWB Code/WBIC:
Waterbody Type:
County:
Date (MM/DD/YY):
Station:
Start Time:
End Time:
Collectors:

Target Fish: Juvenile Walleye
Mark(s) Given: None
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather:
Adverse Conditions:
Water Temperature:
Water Conductivity:
Water Level: [HI] [NORM] [LOW]
Water Clarity:

Generator Start Time:
Generator End Time:
Volts:
Amps:
Pulse Rate:
Duty Cycle:
Current Type: [AC] [DC] [PDC]
Distance Shocked:
Entire Shoreline Shocked: [Y] [N] [ ]
Number of Dippers: [1] [2]
Dipnet Mesh Size:

WE - Tags 2

inches	Unclipped	Clipped	inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0	TAG	TL	7.5			12.2		
3.0			7.6			12.3		
3.1	05501	26.0	7.7			12.4		
3.2	05505	23.1	7.8	Large Green Flys		12.5		
3.3	05506	19.0	7.9			12.6		
3.4	05507	18.5	8.0			12.7		
3.5	05508	14.5	8.1			12.8		
3.6	05509	15.0	8.2			12.9		
3.7	05510	17.0	8.3			13.0		
3.8	05996	13.5	8.4			13.1		
3.9	05995	15.9	8.5			13.2		
4.0	05994	16.0	8.6			13.3		
4.1	05993	14.2	8.7			13.4		
4.2	05992	19.3	8.8			13.5-13.9		
4.3	05991	15.0	8.9			14.0-14.4		
4.4	05990	17.0	9.0			14.5-14.9		
4.5	05989	15.0	9.1			15.0-15.4		
4.6			9.2			15.5-15.9		
4.7			9.3			16.0-16.4		
4.8			9.4			16.5-16.9		
4.9			9.5			17.0-17.4		
5.0			9.6			17.5-17.9		
5.1			9.7			18.0-18.4		
5.2			9.8			18.5-18.9		
5.3			9.9			19.0-19.4		
5.4			10.0			19.5-19.9		
5.5			10.1			20.0-20.4		
5.6			10.2			20.5-20.9		
5.7			10.3			21.0-21.4		
5.8			10.4			21.5-21.9		
5.9			10.5			22.0-22.4		
6.0			10.6			22.5-22.9		
6.1			10.7			23.0-23.4		
6.2			10.8			23.5-23.9		
6.3			10.9			24.0-24.4		
6.4			11.0			24.5-24.9		
6.5			11.1			25.0-25.4		
6.6			11.2			25.5-25.9		
6.7			11.3			26.0-26.4		
6.8			11.4			26.5-26.9		
6.9			11.5			27.0-27.4		
7.0			11.6			27.5-27.9		
7.1			11.7			28.0-28.4		
7.2			11.8			28.5-28.9		
7.3			11.9			29.0-29.4		
7.4			12.0			29.5-29.9		
TOTALS:			12.1			30.0+		

WDNR Comments

Sheet 1 of 2

2.5 hrs.

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — GAMEFISH — Wisconsin Department of Natural Resources

Waterbody Name: Lake Hayward
WAS Code/WBIC: 272 5500
Waterbody Type: Dn R.
County: Sawyer
Date (MM/DD/YY): 09/25/2000
Station: All
Start Time: 20:00
End Time: 23.26
Collectors: Pratt, Tobias, Warwick

Target Fish: Juvenile Walleye
Mark(s) Given: [redacted] Fin
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: Clear, Calm, Cold
Adverse Conditions: Heavy weed growth
Water Temperature: ~~°F~~
Water Conductivity: Mod
Water Level: [HI] (NORM) [LOW]
Water Clarity: Mod.

Generator Start Time: 378.6
Generator End Time: 381.1
Volts: 175
Amps: 4.0
~~Pulse Rate:~~
~~Duty Cycle:~~
Current Type: (AC) ~~DC~~ ~~PDC~~
Distance Shocked: 6.6 mi
Entire Shoreline Shocked: (Y) [N] [I]
Number of Dippers: [1] (2)
Dipnet Mesh Size: 3/16

Inches	Northern Pike Unclipped	Northern Pike Clipped	Muskellunge Unclipped	Muskellunge Clipped	Largemouth Bass Unclipped	Largemouth Bass Clipped	Smallmouth Bass Unclipped	Smallmouth Bass Clipped	Inches	Northern Pike Unclipped	Northern Pike Clipped	Muskellunge Unclipped	Muskellunge Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9				
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4									28.5-28.9				
5.5-5.9									29.0-29.4				
6.0-6.4									29.5-29.9				
6.5-6.9									30.0-30.4				
7.0-7.4									30.5-30.9				
7.5-7.9									31.0-31.4				
8.0-8.4									31.5-31.9				
8.5-8.9									32.0-32.4				
9.0-9.4									32.5-32.9				
9.5-9.9									33.0-33.4				
10.0-10.4									33.5-33.9				
10.5-10.9									34.0-34.4				
11.0-11.4									34.5-34.9				
11.5-11.9									35.0-35.4				
12.0-12.4									35.5-35.9				
12.5-12.9									36.0-36.4				
13.0-13.4									36.5-36.9				
13.5-13.9									37.0-37.4				
14.0-14.4									37.5-37.9				
14.5-14.9									38.0-38.4				
15.0-15.4									38.5-38.9				
15.5-15.9									39.0-39.4				
16.0-16.4									39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4									40.5-40.9				
17.5-17.9									41.0-41.4				
18.0-18.4									41.5-41.9				
18.5-18.9									42.0-42.4				
19.0-19.4									42.5-42.9				
19.5-19.9									43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4				
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4									45.5-45.9				
22.5-22.9									46.0-46.9				
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4									49.0-49.9				
TOTALS			8 Mu				3 SmB		50.0+				

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WDNR Comments

Sheet ___ of ___

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET 9/28/09 **WALLEYE**

Wisconsin Department of Natural Resources

Waterbody Name: HAYWARD
MWB Code/WBIC: ____
Waterbody Type: FLOWAGE
County: ____
Date (MM/DD/YY): ____
Station: ____
Start Time: ____
End Time: ____
Collectors: ____

Target Fish: ____
Mark(s) Given: None
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: ____
Adverse Conditions: ____
Water Temperature: ____
Water Conductivity: ____
Water Level: [HI] [NORM] [LOW]
Water Clarity: ____

Generator Start Time: ____
Generator End Time: ____
Volts: ____
Amps: ____
Pulse Rate: ____
Duty Cycle: ____
Current Type: [AC] [DC] [PDC]
Distance Shocked: ____
Entire Shoreline Shocked: [Y] [N] [ ]
Number of Dippers: [1] [2]
Dipnet Mesh Size: ____

GREEN TAG

inches	TAG #	LENGTH	inches		inches	
<3.0			7.5		12.2	
3.0			7.6	* RECAP 5596	12.3	
3.1	5988	15.2	7.7	" 5595 13.5"	12.4	
3.2	5987	19.5	7.8		12.5	
3.3	5986	14.3	7.9	2 Keep'd	12.6	
3.4	5985	12.3	8.0		12.7	
3.5	5984	14.1	8.1		12.8	
3.6	5983	15.4	8.2		12.9	
3.7	5982	13.8	8.3		13.0	
3.8	5981	16.2	8.4		13.1	
3.9	5980	14.3	8.5		13.2	
4.0	5979	12.7	8.6		13.3	
4.1			8.7		13.4	
4.2			8.8		13.5-13.9	
4.3	10 new		8.9		14.0-14.4	
4.4			9.0		14.5-14.9	
4.5	tags		9.1		15.0-15.4	
4.6			9.2		15.5-15.9	
4.7			9.3		16.0-16.4	
4.8			9.4		16.5-16.9	
4.9			9.5		17.0-17.4	
5.0			9.6		17.5-17.9	
5.1			9.7		18.0-18.4	
5.2			9.8		18.5-18.9	
5.3			9.9		19.0-19.4	
5.4			10.0		19.5-19.9	
5.5			10.1		20.0-20.4	
5.6			10.2		20.5-20.9	
5.7			10.3		21.0-21.4	
5.8			10.4		21.5-21.9	
5.9			10.5		22.0-22.4	
6.0			10.6		22.5-22.9	
6.1			10.7		23.0-23.4	
6.2			10.8		23.5-23.9	
6.3			10.9		24.0-24.4	
6.4			11.0		24.5-24.9	
6.5			11.1		25.0-25.4	
6.6			11.2		25.5-25.9	
6.7			11.3		26.0-26.4	
6.8			11.4		26.5-26.9	
6.9			11.5		27.0-27.4	
7.0			11.6		27.5-27.9	
7.1			11.7		28.0-28.4	
7.2			11.8		28.5-28.9	
7.3			11.9		29.0-29.4	
7.4			12.0		29.5-29.9	
TOTALS:			12.1		30.0+	

WDNR Comments

Sheet 1 of 1

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET — **WALLEYE** — Wisconsin Department of Natural Resources

Waterbody Name: Howard
MWB Code/WBIC: 2072 5500
Waterbody Type: Impoundment
County: Sawyer
Date (MM/DD/YY): 9/29/2000
Station: All - between
Start Time: 20:00
End Time: 23:00
Collectors: Pratt, Tobias, Stowell (Elk Guy)

Target Fish: Juvenile Walleye
Mark(s) Given: ~~None~~ FIN
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: Clear, Cool
Adverse Conditions: None
Water Temperature: 50°F
Water Conductivity: Med
Water Level: [HI] [NORM] [LOW]
Water Clarity: Clear

Generator Start Time: 384.9
Generator End Time: 387.1
Volts: 150
Amps: 4
Pulse Rate:
Duty Cycle:
Current Type: [AC] [DC] [PDC]
Distance Shocked: 4.5
Entire Shoreline Shocked: [Y] [N] [1]
Number of Dippers: [1] [2]
Dipnet Mesh Size: 3/16

whole shoreline between bridges

inches		inches		inches	
<3.0		7.5		12.2	
3.0		7.6	1	12.3	1
3.1		7.7	stocked	12.4	
3.2		7.8	1 17 Sep	12.5	
3.3		7.9	1 yoy	12.6	
3.4		8.0		12.7	
3.5		8.1		12.8	
3.6		8.2	1	12.9	
3.7		8.3		13.0	
3.8		8.4	1	13.1	
3.9		8.5	1	13.2	
4.0		8.6	1	13.3	
4.1		8.7		13.4	
4.2		8.8		13.5-13.9	1
4.3		8.9		14.0-14.4	11
4.4		9.0	1	14.5-14.9	
4.5		9.1		15.0-15.4	111
4.6		9.2		15.5-15.9	
4.7		9.3		16.0-16.4	
4.8		9.4		16.5-16.9	
4.9		9.5	1	17.0-17.4	
5.0		9.6		17.5-17.9	
5.1		9.7		18.0-18.4	
5.2		9.8		18.5-18.9	
5.3		9.9		19.0-19.4	
5.4		10.0	1	19.5-19.9	1
5.5		10.1		20.0-20.4	
5.6		10.2	21	20.5-20.9	
5.7		10.3		21.0-21.4	
5.8		10.4		21.5-21.9	
5.9	1	10.5		22.0-22.4	
6.0		10.6		22.5-22.9	
6.1		10.7		23.0-23.4	
6.2		10.8		23.5-23.9	
6.3	11	10.9	1	24.0-24.4	
6.4		11.0		24.5-24.9	
6.5		11.1		25.0-25.4	
6.6	1	11.2	1	25.5-25.9	
6.7	1	11.3		26.0-26.4	
6.8		11.4		26.5-26.9	
6.9		11.5		27.0-27.4	
7.0		11.6		27.5-27.9	
7.1	1	11.7		28.0-28.4	
7.2	1	11.8		28.5-28.9	
7.3		11.9		29.0-29.4	
7.4	1111	12.0		29.5-29.9	
TOTALS:		12.1		30.0+	

31 WE 40

WDNR Comments

Sheet 2 of 2

FALL GAMEFISH ELECTROFISHING DATA COLLECTION SHEET

GAMEFISH

Wisconsin Department of Natural Resources

Waterbody Name: Hayward
MWB Code/WBIC: 27B 5500
Waterbody Type: Impoundment
County: County
Date (MM/DD/YY): 09/27/2000
Station:
Start Time: 22:00
End Time: ~2336
Collectors: Paul et al

Target Fish: Juvenile Walleye
Mark(s) Given: None
Survey Type: CPE (Fall Shoreline)
Gear Type: Boomshocker
Weather: Clear
Adverse Conditions: None
Water Temperature: 58 °F
Water Conductivity: Meas
Water Level: [HI] (NORM) [LOW]
Water Clarity: Clear

Generator Start Time: 384.9
Generator End Time: 387.1
Volts: 150
Amps: 4
Pulse Rate:
Duty Cycle:
Current Type: (AC) [DC] [PDC]
Distance Shocked: 4.5
Entire Shoreline Shocked: [Y] (N) [1]
Number of Dippers: [1] [2]
Dipnet Mesh Size: 3/8"

→ Main bay in between bridges

inches	Northern Pike	Muskellunge	Largemouth Bass	Smallmouth Bass	inches	Northern Pike	Muskellunge
<1.5					24.5-24.9		
1.5-1.9					25.0-25.4		
2.0-2.4					25.5-25.9		
2.5-2.9					26.0-26.4		
3.0-3.4					26.5-26.9		
3.5-3.9					27.0-27.4		
4.0-4.4					27.5-27.9		
4.5-4.9					28.0-28.4		
5.0-5.4	I				28.5-28.9		
5.5-5.9					29.0-29.4		
6.0-6.4					29.5-29.9		
6.5-6.9					30.0-30.4		
7.0-7.4	I				30.5-30.9		
7.5-7.9			II		31.0-31.4		
8.0-8.4	I		I		31.5-31.9		
8.5-8.9				I	32.0-32.4		
9.0-9.4		I	III	I	32.5-32.9		
9.5-9.9			II		33.0-33.4		
10.0-10.4	I		I		33.5-33.9		
10.5-10.9	I	I	III		34.0-34.4		
11.0-11.4	II		II		34.5-34.9		
11.5-11.9	I		HHT II		35.0-35.4		
12.0-12.4	I		III		35.5-35.9		
12.5-12.9	II	II			36.0-36.4		
13.0-13.4			II		36.5-36.9		
13.5-13.9	I		II		37.0-37.4		
14.0-14.4			I		37.5-37.9		
14.5-14.9	II				38.0-38.4		
15.0-15.4				I	38.5-38.9		
15.5-15.9	II		II		39.0-39.4		
16.0-16.4			I		39.5-39.9		
16.5-16.9					40.0-40.4		
17.0-17.4	I				40.5-40.9		
17.5-17.9			III		41.0-41.4		
18.0-18.4	I				41.5-41.9		
18.5-18.9					42.0-42.4		
19.0-19.4	I				42.5-42.9		
19.5-19.9			I		43.0-43.4		
20.0-20.4					43.5-43.9		
20.5-20.9					44.0-44.4		I
21.0-21.4					44.5-44.9		
21.5-21.9					45.0-45.4		
22.0-22.4	I				45.5-45.9		
22.5-22.9					46.0-46.9		I
23.0-23.4					47.0-47.9		
23.5-23.9					48.0-48.9		
24.0-24.4		I			49.0-49.9		
TOTALS	20 NP	5 Muskies	37 LMB	2 SMB	50.0+		1 MU

Muskies 5 SAW 1 - 45
1 - 55?

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Sawyer	Hayward	MWBC: 2725500

Sampling Objective	Number and Locations of Stations (Habitat)	Source
Walleye Recruitment Survey	Miles Actually Shocked = 5.4	LM
Period Fished (Dates)	Acres = 247	LM
09/29/00	Total Miles of Shoreline = 8.6	LM
	Total Miles of Shockable Shoreline = 8.6	LM

GEAR

Boomshocker (Hours)	Time
2.2	√ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-NR
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	18	7.4	6.3 - 9.0	8.18 / hour	3.33 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	5	None	9.5 - 11.2	2.27 / hour	0.93 / mile
Walleye (Other)	8	15.0-15.4	12.0 - 19.9	3.64 / hour	1.48 / mile
Smallmouth Bass	2	None	8.5 - 15.4	0.91 / hour	0.37 / mile
Largemouth Bass	36	11.5-11.9	7.5 - 19.9	16.36 / hour	6.67 / mile
Muskellunge	7	None	9.0 - 46.4	3.18 / hour	1.30 / mile
Northern Pike	20	None	5.0 - 22.4	9.09 / hour	3.70 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None 2) Weather: Clear, Cool 3) Reliabilty: High

4) Stocking: 124 Muskellunge, 12 inches, 09/14, WDNR 2470 Walleye, 7.5 inches, 09/20, WDNR

5) Comments:

Rev. 10-70

Signed (Compiler) Scott D. Plaster Date 12/01/00

WDNR Comments

partment of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600A-191 8-95

Lake: Hayward MWB Code: 2725500 Date: 09/29/00 County: Sawyer Collector(s): Pratt, Tobias, Stowell

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 55°F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 5.4 miles

Volts: 150 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:00 Shocking End Time: 23:00 Generator Start Hour: 384.9 Generator End Hour: 387.1

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

inches	Unclipped	Clipped	inches	Unclipped	Clipped	inches	Unclipped	Clipped
<3.0			7.2	1		11.5		
3.0			7.3			11.6		
3.1			7.4	4		11.7		
3.2			7.5			11.8		
3.3			7.6	1		11.9		
3.4			7.7			12.0-12.4	1	
3.5			7.8	1		12.5-12.9		
3.6			7.9	1		13.0-13.4		
3.7			8.0			13.5-13.9	1	
3.8			8.1			14.0-14.4	2	
3.9			8.2	1		14.5-14.9		
4.0			8.3			15.0-15.4	3	
4.1			8.4	1		15.5-15.9		
4.2			8.5	1		16.0-16.4		
4.3			8.6	1		16.5-16.9		
4.4			8.7			17.0-17.4		
4.5			8.8			17.5-17.9		
4.6			8.9			18.0-18.4		
4.7			9.0	1		18.5-18.9		
4.8			9.1			19.0-19.4		
4.9			9.2			19.5-19.9	1	
5.0			9.3			20.0-20.4		
5.1			9.4			20.5-20.9		
5.2			9.5	1		21.0-21.4		
5.3			9.6			21.5-21.9		
5.4			9.7			22.0-22.4		
5.5			9.8			22.5-22.9		
5.6			9.9			23.0-23.4		
5.7			10.0	1		23.5-23.9		
5.8			10.1			24.0-24.4		
5.9			10.2	1		24.5-24.9		
6.0			10.3			25.0-25.4		
6.1			10.4			25.5-25.9		
6.2			10.5			26.0-26.4		
6.3	2		10.6			26.5-26.9		
6.4			10.7			27.0-27.4		
6.5			10.8			27.5-27.9		
6.6	1		10.9	1		28.0-28.4		
6.7	1		11.0			28.5-28.9		
6.8			11.1			29.0-29.4		
6.9			11.2	1		29.5-29.9		
7.0			11.3			30.0 +		
7.1	1		11.4			**Totals:**	**31**	**0**

WALLEYE

WDNR Comments

artment of Natural Resources

GAMEFISH ELECTROFISHING DATA COLLECTION SHEET (FALL)

Form 3600F-186 8-95

ake: Hayward MWB Code: 2725500 Date: 09/29/00 County: Sawyer Collector(s): Pratt, Tobias, Stowell

Target Fish: Juvenile Walleye Survey Type: CPE Mark Given: None H20 Temperature: 55°F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 5.4 miles

Volts: 150 Amps: 4 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 20:00 Shocking End Time: 23:00 Generator Start Hour: 384.9 Generator End Hour: 387.1

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

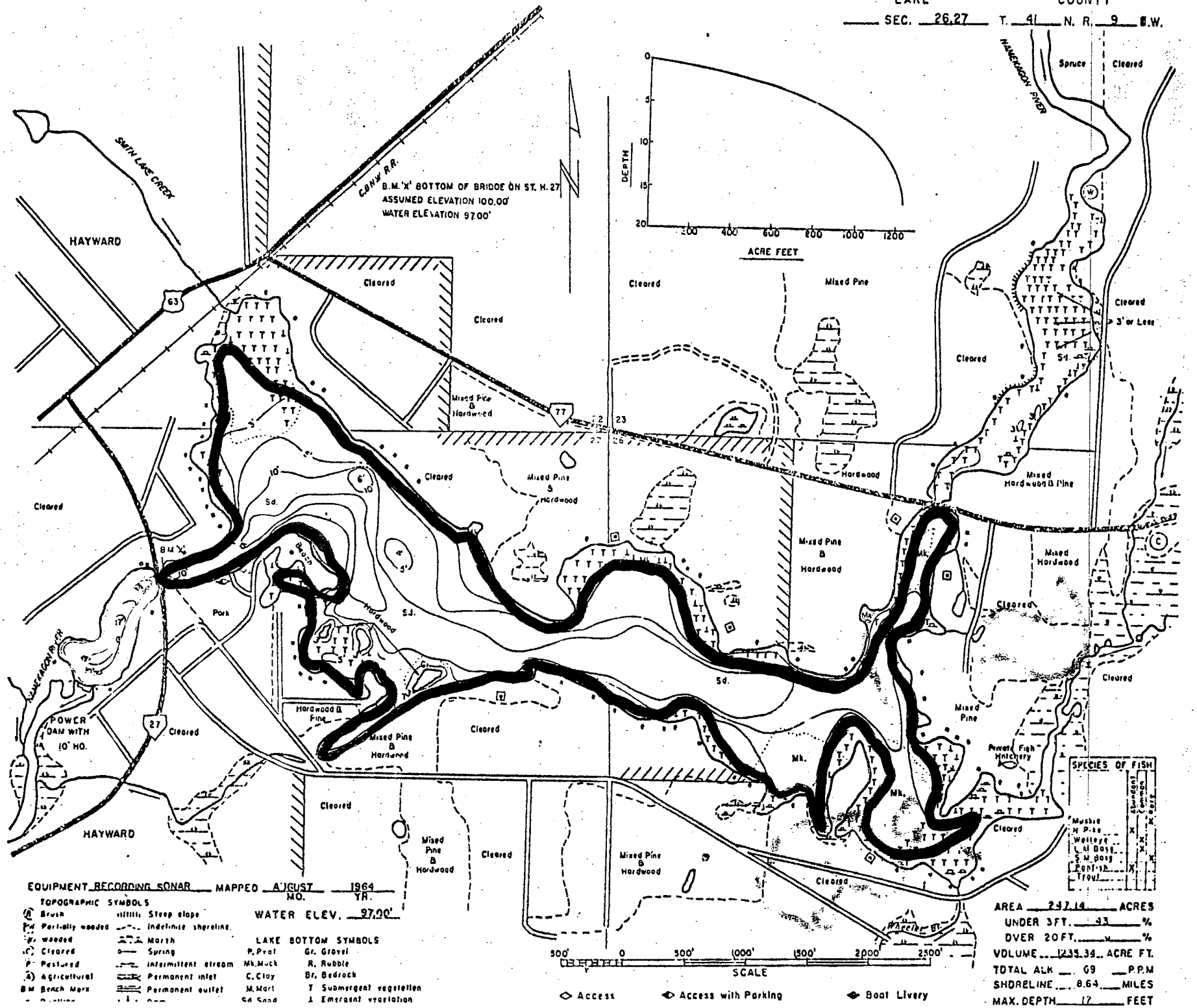
	Northern Pike		Muskellunge		Largemouth Bass		Smallmouth Bass			Northern Pike		Muskellunge	
inches	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	inches	Unclipped	Clipped	Unclipped	Clipped
<1.5									24.5-24.9				
1.5-1.9									25.0-25.4				
2.0-2.4									25.5-25.9				
2.5-2.9									26.0-26.4				
3.0-3.4									26.5-26.9				
3.5-3.9									27.0-27.4				
4.0-4.4									27.5-27.9				
4.5-4.9									28.0-28.4				
5.0-5.4	1								28.5-28.9				
5.5-5.9									29.0-29.4				
6.0-6.4									29.5-29.9				
6.5-6.9									30.0-30.4				
7.0-7.4	1								30.5-30.9				
7.5-7.9					2				31.0-31.4				
8.0-8.4	1				1				31.5-31.9				
8.5-8.9							1		32.0-32.4				
9.0-9.4			1		3				32.5-32.9				
9.5-9.9					2				33.0-33.4				
10.0-10.4	1				1				33.5-33.9				
10.5-10.9	1		1		3				34.0-34.4				
11.0-11.4	2				2				34.5-34.9				
11.5-11.9	1				7				35.0-35.4				
12.0-12.4	1				3				35.5-35.9				
12.5-12.9	2		2						36.0-36.4				
13.0-13.4					2				36.5-36.9				
13.5-13.9	1				2				37.0-37.4				
14.0-14.4					1				37.5-37.9				
14.5-14.9	2								38.0-38.4				
15.0-15.4							1		38.5-38.9				
15.5-15.9	2				2				39.0-39.4				
16.0-16.4					1				39.5-39.9				
16.5-16.9									40.0-40.4				
17.0-17.4	1								40.5-40.9				
17.5-17.9					3				41.0-41.4				
18.0-18.4	1								41.5-41.9				
18.5-18.9									42.0-42.4				
19.0-19.4	1								42.5-42.9				
19.5-19.9					1				43.0-43.4				
20.0-20.4									43.5-43.9				
20.5-20.9									44.0-44.4			1	
21.0-21.4									44.5-44.9				
21.5-21.9									45.0-45.4				
22.0-22.4	1								45.5-45.9				
22.5-22.9									46.0-46.9			1	
23.0-23.4									47.0-47.9				
23.5-23.9									48.0-48.9				
24.0-24.4			1						49.0-49.9				
Totals:	20	0	7	0	36	0	2	0	50.0+				

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.



EQUIPMENT RECORDING SONAR MAPPED AUGUST MO. 1964 YR.

WATER ELEV. 97.00'

TOPOGRAPHIC SYMBOLS

Brush	Steep slope		
Partially wooded	Indefinite shoreline		
Wooded	Marsh		
Cleared	Spring		
Pastured	Intermittent stream		
Agricultural	Permanent inlet		
BM Bench Mark	Permanent outlet		

LAKE BOTTOM SYMBOLS

P. Peat	Gr. Gravel		
Mk. Muck	R. Rubble		
C. Clay	Br. Bedrock		
M. Marl	T Submergent vegetation		
Sd. Sand	⊥ Emergent vegetation		

◇ Access ◆ Access with Parking ◆ Boat Livery

AREA 247.14 ACRES
UNDER 3FT. 43 %
OVER 20FT. — %
VOLUME 1235.34 ACRE FT.
TOTAL ALK. 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

A-239

WDNR Comments

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 4-92

272 5500

Lake Hayward MWB Code: 1 Date: 04/04/2000 County: Sawyer Collector: Pat Warwick Weiner

Target Fish: Walleye Survey Type: FERC W.E. Evel. Marking Mark Given: HLY Floy H_2O Temp: 4 °F Time 20:00

Adverse Conditions: Cold, Poor Access H_2O Conduct: 44 Station: Below STH 177

Volts: 230 Amps: _____ Current Type: (AC)/DC/Pulsed ~~DC) Pulse Rate:~~ _____ ~~Duty Cycle:~~ _____

Gear Type: Boom shocker Start Time: 338.3 End Time: 340.5 Distance Shocked: _____ mile

# of Dippers: (1)(2) Entire Shoreline Shocked: (Y)N/I) Dip net mesh size: 4' H_2O Clarity: (Clear/Turbid/Very Turbid)

* Except for above STH 77

Walleye — Tagging —

Inches	Male	Female	Unkwn	Imm.			Floy	Sex	TL
4.4 - 4.4									
4.5 - 4.9				(2)					
5.0 - 5.4				IIII (3) R	3 + 1R				
5.5 - 5.9				II (2)	2 + 0R				
6.0 - 6.4				III (3) R	3 + 1R				
6.5 - 6.9				III (3) R	3 + 1R				
7.0 - 7.9				IIII RR	5 + 2R				
7.5 - 7.9				IIII RR	7 + 2R				
8.0 - 8.4				IIII RR	7 + 2R				
8.5 - 8.9				IIII	6 + 0R				
9.0 - 9.4				I R	1 + 1R				
9.5 - 9.9				IIII	4		Mu	46.0	
10.0-10.4				II	2				
10.5-10.9				II RRR	2 + 3R		SMB	20.1	
11.0-11.4				III RRR	3 + 3R		SMB	14.0	
11.5-11.9				III	3		LMB	15.4	
12.0-12.4				IIII	5		SMB	13.5	
12.5-12.9				II	2		SMB	15.0	
13.0-13.4							LMB	15.3	
13.5-13.9			1		61 + 16 Recaps		SMB	13.2	
14.0-14.4			1						
14.5-14.9					77 C		BC	A	
15.0-15.4							BG	P	
15.5-15.9					Immature		NP	P	
16.0-16.4		II					YP	A	
16.5-16.9	I						WS	C	
17.0-17.4							WH	P	
17.5-17.9		R							
18.0-18.4							NP	C	
18.5-18.9							Mu	P	
19.0-19.4							NHS	P	
19.5-19.9		II					Lamprey	P	
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4	Male	Female							
24.5-24.9	(1)	(4+1R)	(3)						
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9									

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WDNR Comments

Department of Natural Resources

~~S~~ 3553
E 3580

→ Recap 2

STATION FISH SAMPLING SUMMARY
Form 3600-57

STREAM		INVESTIGATOR	
Lake Hayward - FERC Evaluation		Pratt, Worwick, Winert	

Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO.	NO. PER ACRE	DATE
						4-08-2000

SIZE RANGE	Walleye Unmarked	Recap	SMB	LMB	NP	MU
1			8.0	7.5	31.0	18.0
1.0 - 1.4			8.5	13.0		
1.5 - 1.9				11.5		
2.0 - 2.4				14.0		
2.5 - 2.9				7.5		
3.0 - 3.4				16.0		
3.5 - 3.9				14.0		
4.0 - 4.4				9.0		
4.5 - 4.9				10.0		
5.0 - 5.4				14.5		
5.5 - 5.9				16.5		
6.0 - 6.4	IIII			17.0		
6.5 - 6.9	III	II		11.0		
7.0 - 7.4				10.5		
7.5 - 7.9	~~IIII~~					
8.0 - 8.4						
8.5 - 8.9						
9.0 - 9.4	II	II				
9.5 - 9.9	II					
10.0 - 10.4	II	I				
10.5 - 10.9	II					
11.0 - 11.4	IIII II					
11.5 - 11.9	II	I				
12.0 - 12.4	I					
12.5 - 12.9						
13.0 - 13.4						
13.5 - 13.9						
14.0 - 14.4	I					
14.5 - 14.9	I					
15.0 - 15.4						
15.5 - 15.9						
16.0 - 16.4						
16.5 - 16.9						
17.0 - 17.4						
17.5 - 17.9						
18.0 - 18.4						
18.5 - 18.9						
19.0 - 19.4		6 Recaps				
19.5 - 19.9						
20.0 - 20.4						
20.5 - 20.9						
21.0 - 21.4						
21.5 - 21.9						
22.0 - 22.4						
22.5 - 22.9						
23.0 - 23.4						
23.5 - 23.9						
24.0 - 24.4						
24.5 - 24.9						
25 + (give actual size)						
TOTAL	311					

Hymn
95

BG - A
RL - C
RS - C

YP - P
RH - F
WS - C
BrBh - R

H_2O - 66°F

Rev. 3-75

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)

Form 3600-187 4-92

Yahara Hayward Marsh 2000 April

Lake _____ MWB Code: _____ Date: ___ / ___ / ___ County: _____ Collector: _____

Target Fish: _____ Survey Type: _____ Mark Given: _____ H_2O Temp: _____ Time _____ : _____

Adverse Conditions: _____ H_2O Conduct: _____ Station: _____

Volts: _____ Amps: _____ Current Type (AC/DC/Pulsed DC) Pulse Rate: _____ Duty Cycle: _____

Gear Type: _____ Start Time: _____ End Time: _____ Distance Shocked: _____

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: _____ H_2O Clarilty: (Clear/Turbid/Very Turbid)

Inches	Male	Female	Unknown	Dmg					
4.4 - 4.4									
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9									
7.0 - 7.9									
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4									
9.5 - 9.9									
10.0-10.4									
10.5-10.9									
11.0-11.4									
11.5-11.9									
12.0-12.4									
12.5-12.9									
13.0-13.4									
13.5-13.9									
14.0-14.4									
14.5-14.9									
15.0-15.4									
15.5-15.9									
16.0-16.4									
16.5-16.9									
17.0-17.4									
17.5-17.9									
18.0-18.4									
18.5-18.9									
19.0-19.4									
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9									

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WDNR Comments

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)

Form 3600-187 4-92

Lake Hayward MWB Code: _____ Date: 04/03/2000 County: Sawyer Collector: Patt/Warwick

Target Fish: Walleye Survey Type: FERC Eval. Mark Given: Hip Punch Fin H_2O Temp: 4 Time _____ : _____

Adverse Conditions: Snow, rain, cold, low water H_2O Conduct: _____ Station: Airport Rd → STH 77

Volts: _____ Amps: _____ Current Type (AC/DC/Pulsed DC) Pulse Rate: _____ Duty Cycle: _____

Gear Type: DC Mini shock Start Time: _____ End Time: _____ Distance Shocked: (map)

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: 3/8 H_2O Clarilty: (Clear/Turbid/Very Turbid) light Br Stain 4'

← Walleye →

Inches	Male	Female	Unknown						
4.4 - 4.4									
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9									
7.0 - 7.9									
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4									
9.5 - 9.9									
10.0-10.4									
10.5-10.9									
11.0-11.4									
11.5-11.9									
12.0-12.4									
12.5-12.9									
13.0-13.4									
13.5-13.9									
14.0-14.4	1								
14.5-14.9	111								
15.0-15.4									
15.5-15.9	1								
16.0-16.4									
16.5-16.9		1							
17.0-17.4	1	111							
17.5-17.9									
18.0-18.4									
18.5-18.9									
19.0-19.4									
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9		1							
22.0-22.4									
22.5-22.9									
23.0-23.4		1							
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4		1							
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9									

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WDNR Comments

Marking (Recap 1?) 1

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 4-92

Lake: Hayward MWB Code: 2725500 Date: 04 / 13 / 00 County: Sawyer Collector: Pratt Warwick

Target Fish: WE mature Survey Type: Marking Mark Given: HLV / + Floy H_2O Temp: ______ Time: 08 : 00 PM

Adverse Conditions: ______ H_2O Conduct: ______ Station: whole lake emphasis STH '77' area + Dam basin area

Volts: 230 Amps: 4.0 Current Type (AC/~~DC/Pulsed DC~~) ~~Pulse Rate:~~ 2.5 hrs. Duty Cycle: ______

Gear Type: V AC BS Start Time: 344.8 End Time: 347.3 Distance Shocked: ______

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/(N)/I) Dip net mesh size: 3/8" H_2O Clarity: (Clear)/Turbid/Very Turbid)
└ above STH '77' not accessible

Inches	Walleye Male	Female	Unkwn ←	Imm.	N.P	Recaps M	F	U	I
4.4 - 4.4					35.0				
4.5 - 4.9					31.0				
5.0 - 5.4									
5.5 - 5.9					MU				
6.0 - 6.4			II 2		34.5				
6.5 - 6.9			卌 I 6		46.0				
7.0 - 7.9			I 1						
7.5 - 7.9			II 2						
8.0 - 8.4			卌 5						
8.5 - 8.9			II 2						
9.0 - 9.4			II 2						
9.5 - 9.9			IIII 4		LMB				
10.0-10.4			IIII 4		15.0				
10.5-10.9			卌 5		14.0			R	
11.0-11.4			III 3		12.5			R	
11.5-11.9					11.5			R	
12.0-12.4	I		I 1		10.0				
12.5-12.9	I	I			16.5				
13.0-13.4			I 1		10.5				
13.5-13.9	I								
14.0-14.4		I							
14.5-14.9									
15.0-15.4	II								
15.5-15.9					YP				
16.0-16.4	I	I			C				
16.5-16.9	I					I R	4 RECAPS		
17.0-17.4					WS				
17.5-17.9					C				
18.0-18.4		I							
18.5-18.9					RH				
19.0-19.4					C				
19.5-19.9									
20.0-20.4					BG-P				
20.5-20-9					BC-C				
21.0-21.4		4 [illegible] ft							
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4	7	4							
29.5-29.9			38						

Other fish: (Can include rarely caught species and fish greater than 30 inches.)
TC = immature

4 Recaps

WDNR Comments

Department of Natural Resources

Marking Run (HLP – Adult walleye)

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-187 4-92

Lake: Hayward MWB Code: 2725500 Date: 03/28/2000 County: Sawyer Collector: Pratt/Warwick

Target Fish: WE Survey Type: Walleye FERC eval. Mark Given: Floy/or HLV H_2O Temp: 42 Time: 7:40

Adverse Conditions: Cold! H_2O Conduct: Good Station: Inlet, Outlet, Lindholm Bay

Volts: 200 Amps: 4.0 Current Type (AC/DC/Pulsed DC): AC ~~Pulse Rate:~~ ~~Duty Cycle:~~

Gear Type: AC BS Start Time: 336.7 End Time: 338.3 1.6 hrs. Distance Shocked: 2.4 mi

\# of Dippers: (1/2) 1 Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: 4' H_2O Clarilty: (Clear/Turbid/Very Turbid)

Jumping around looking for concentrations to mark / net

Walleye

Inches	Male	F	Unkwn		Mu	CMB	NP	YP	BG
4.4 - 4.4							P	6 Spawn	P
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9			2						
6.0 - 6.4			8						
6.5 - 6.9			8						
7.0 - 7.9			10	63 49%					
7.5 - 7.9			13						
8.0 - 8.4			10						
8.5 - 8.9			3						
9.0 - 9.4			1	Floy'd					
9.5 - 9.9			1						
10.0-10.4	Mature HLP clip		5						
10.5-10.9			11						
11.0-11.4			5						
11.5-11.9			7						
12.0-12.4	/		2						
12.5-12.9	/		1						
13.0-13.4	/		1						
13.5-13.9									
14.0-14.4	/				1				
14.5-14.9	/								
15.0-15.4					34.5 M	1			
15.5-15.9	/								
16.0-16.4	/								
16.5-16.9									
17.0-17.4	/				3 others				
17.5-17.9		//			seen				
18.0-18.4							1 SMB	seen	
18.5-18.9							WS –	P	
19.0-19.4							RH –	none seen	
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9	8 males	2 females	[illegible]						

Other fish: (Can include rarely caught species and fish greater than 30 inches.) Inlet + Outlet [illegible]

WDNR Comments

Department of Natural Resources

Markins Run (TC - juv. HLP - Adult Walleye)

LAKE ELECTROFISHING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)

Form 3600-187 4-92

2725500

Lake Hayward MWB Code: _____ Date: 03/28/2000 County: Sawyer Collector: Pratt/Warnicke

Target Fish: WE Survey Type: Walleye FERC evel. Mark Given: ~~Floy~~ HLP H_2O Temp: 42 Time 9:40

Adverse Conditions: Cold! H_2O Conduct: Good Station: Inlet, outlet, cindhalm

Volts: 200 Amps: 4.0 Current Type (AC/DC/Pulsed DC) ~~Pulse Rate:~~ _____ ~~Duty Cycle:~~ _____

Gear Type: AC BS Start Time: 336.7 End Time: 338.3 1.6 hrs. Distance Shocked: 2.4 mi

# of Dippers: (1/2) Entire Shoreline Shocked: (Y/N/I) Dip net mesh size: 4' H_2O Clarity: (Clear/Turbid/Very Turbid)

Jumping around looking for concentrations to mark / net

Inches	Walleye Male	F	Unknown		MU	LMB	NP	YP	BG
4.4 - 4.4							P	& Spawn	P
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9			2						
6.0 - 6.4			8						
6.5 - 6.9			8						
7.0 - 7.9			10	63 yg/.					
7.5 - 7.9			13						
8.0 - 8.4			10						
8.5 - 8.9			3						
9.0 - 9.4			1						
9.5 - 9.9			1						
10.0-10.4	Marked HLP Clip		7 5						
10.5-10.9									
11.0-11.4			5						
11.5-11.9			7						
12.0-12.4	1		2						
12.5-12.9	1		1						
13.0-13.4	1		1						
13.5-13.9									
14.0-14.4	1				1				
14.5-14.9	1								
15.0-15.4					34.5 M	1			
15.5-15.9	1								
16.0-16.4	1								
16.5-16.9									
17.0-17.4	1				3 others seen				
17.5-17.9		11							
18.0-18.4							ISMB	seen	
18.5-18.9							W.S -	P	
19.0-19.4							RH -	none seen	
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9	8 males	2 females	88 juv.						

Other fish: (Can include rarely caught species and fish greater than 30 inches.) Inlet & Outlet areas most effort & fish juveniles above dam. Adults upstream near STH 77

WDNR Comments

Department of Natural Resources

NETTING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)
Form 3600-188 4-92

Lake Hayward MWB Code: _____ Date: 04/03/2000 County: Sawyer Collector: Pratt/Warwick

Target Fish: Walleye Survey Type: FERC Eval. Mark Given: HLP+/- Pink Floy H_2O Temp: _____ Time _____ : _____

Adverse Conditions: Snow, cold, current Station: Airport Rd - 77

Net Type: 4' Fyke Length/Frame: 4' Bar Mesh: 1 1/2"

Color: 3 Black 1 White Mesh Type: 1/2" Wh - Knotted Black - Woven Net Nights: 1

— Walleye —

Inches	Male	FEMALE	Unkwn							
4.4 - 4.4						N.P 6.3	Y.P 10.1	L.M.D 16.6	B.C 10.1
4.5 - 4.9									9.4
5.0 - 5.4							6.3		9.2
5.5 - 5.9							5.1		10.0
6.0 - 6.4									[illegible]
6.5 - 6.9									9.3
7.0 - 7.9									
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4									
9.5 - 9.9									
10.0-10.4									
10.5-10.9								L.P 3.2	R.B 2.9
11.0-11.4									
11.5-11.9	13.4 - 144								
12.0-12.4	14.3 143	15.0 148							
12.5-12.9									
13.0-13.4	12.5 142								
13.5-13.9									
14.0-14.4									
14.5-14.9									
15.0-15.4									
15.5-15.9									
16.0-16.4									
16.5-16.9									
17.0-17.4									
17.5-17.9									
18.0-18.4									
18.5-18.9									
19.0-19.4									
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9									

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

WDNR Comments

Department of Natural Resources

Marking Run – Net (4 fykes)

NETTING DATA COLLECTION SHEET (4.0 in. - 29.9 in.)

Form 3600-188 4-92

272500

Lake Hayward MWB Code: _____ Date: 04 / 01 / 2000 County: Sawyer Collector: Pratt

Target Fish: WE Survey Type: WE PE Mark Given: HLP FLY H_2O Temp: _____ Time _____ : _____

Adverse Conditions: strong current, poor access Station: upstream Hwy 77

Net Type: Fyke Length/Frame: 4' Bar Mesh: 1/2"

Color: 3-Bl 1-Wh Mesh Type: 1 Knot(W) 3 Woven (Black) Net Nights: 1

Inches	Walleye Male	Female	Unknown			NP 19.0			
4.4 - 4.4									
4.5 - 4.9									
5.0 - 5.4									
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9									
7.0 - 7.9									
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4									
9.5 - 9.9									
10.0-10.4									
10.5-10.9									
11.0-11.4									
11.5-11.9									
12.0-12.4									
12.5-12.9									
13.0-13.4									
13.5-13.9									
14.0-14.4									
14.5-14.9									
15.0-15.4									
15.5-15.9		1							
16.0-16.4	1								
16.5-16.9									
17.0-17.4									
17.5-17.9									
18.0-18.4									
18.5-18.9									
19.0-19.4									
19.5-19.9									
20.0-20.4									
20.5-20-9									
21.0-21.4									
21.5-21.9									
22.0-22.4									
22.5-22.9									
23.0-23.4									
23.5-23.9									
24.0-24.4									
24.5-24.9									
25.0-25.4									
25.5-25.9									
26.0-26.4									
26.5-26.9									
27.0-27.4									
27.5-27.9									
28.0-28.4									
28.5-28.9									
29.0-29.4									
29.5-29.9									

Other fish: (Can include rarely caught species and fish greater than 30 inches.)

Boomshacks fall 2000

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

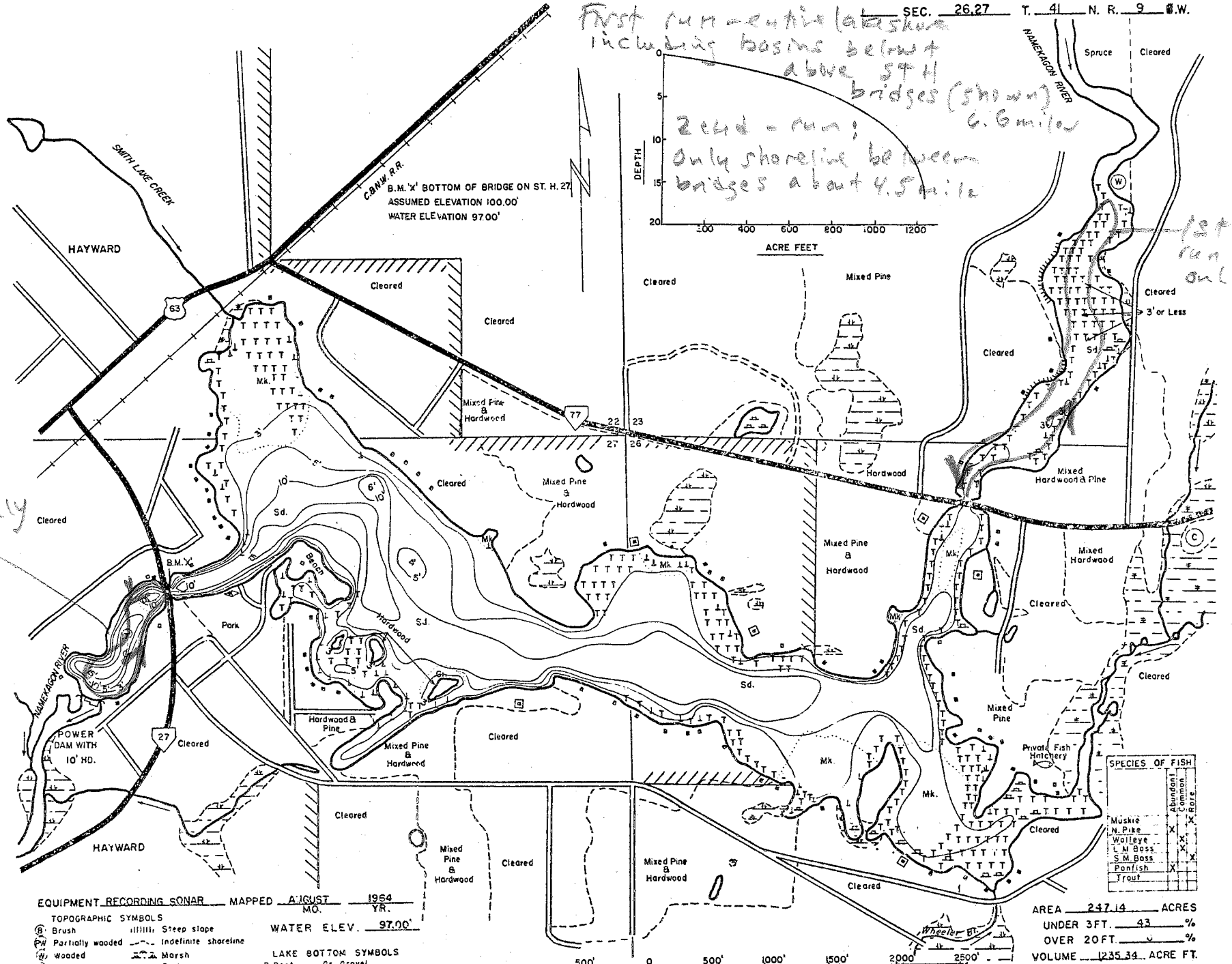
HAYWARD FLOWAGE LAKE — SAWYER COUNTY

SEC. 26,27 T. 41 N. R. 9 W.

First run - entire lake shown including basins below and above ST 11 bridges (shown) 6.6 miles

2nd run only shoreline between bridges about 4.5 miles

1st run only



SPECIES OF FISH

	Abundant	Common	Rare
Muskie			
N. Pike	X		
Walleye		X	
L.M. Bass		X	
S.M. Bass			X
Panfish	X		
Trout			

EQUIPMENT RECORDING SONAR MAPPED AUGUST 1964 (MO. / YR.)

WATER ELEV. 97.00'

AREA 247.14 ACRES
UNDER 3FT. 43 %
OVER 20FT. 0 %
VOLUME 1235.34 ACRE FT.
TOTAL ALK 69 P.P.M.
SHORELINE 8.64 MILES
MAX. DEPTH 17 FEET

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- BM Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- Submergent vegetation
- Emergent vegetation
- Floating vegetation

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by: H. Schmude, M. Perkins, L. Sather Drawn by: J. Roth

WDNR Comments

A-249

WDNR Comments

SUMMARY SHEET
FORM 3500-8

DEPARTMENT OF NATURAL RESOURCES

Name of Dam Hayward Dam File No. 57.4 County Sawyer

Location SW 1/4 NW 1/4 Section 27 T 41 N, R 9 W

Stream Namekagon River Name of Lake Held by Dam Hayward

Present Owner: Lake Superior District Power Company

Existing Benchmarks:

Benchmark 226-A - destroyed

Benchmark 226-C - can't find

Benchmark 226-D is a 2-inch square cut in the top of the concrete retaining wall at the left of the tailwater and 5 inches from the southwest corner of the power house. Elevation = 508.76 feet.

Benchmark 226-E is a bronze cap in a concrete post, 97 feet east of dam, 10 feet north of power pole and 54 feet west of center line of First Street on east bank of lake.

Benchmark 226-F is a chiseled square on east abutment of dam 1 foot upstream from stoplog.

Rev. 8-70

WDNR Comments

Summary Sheet

Name of Dam Hayward Dam File No. 57.4 County Sawyer

Location SW ¼ NW ¼ Section 27 T 41 N, R 9 W

Stream Namekagon River Name of Lake Held by Dam Hayward Lake

Present Owner Lake Superior District Power Company - Ashland, Wis.

Existing Bench Marks

Benchmark 226A - a bronze tablet marked Railroad Commission of Wisconsin set in top of 6½ foot concrete post on east side of north-south street and on north side of east-west street on east bank of Namekagon River at dam. Benchmark is 20.5 feet west of northwest corner of house on north side of east-west street and 80.4 feet north of northwest corner of house on side of east-west street. Elevation = 517.04 feet.

destroyed

Benchmark 226C - a square chisel cut in upstream end of east abutment of spillway. Elevation = 513.09 feet.

Can't Find

Benchmark 226D - a 2-inch square cut in the top of the concrete retaining wall at the left of the tailwater and 5 inches from the southwest corner of the power house. Elevation = 508.76 feet.

WDNR Comments

WATER LEVEL DATA
Form 3500-27

Department of Natural Resources

Hayward Pond Sawyer Co 57.04
Lake or Stream

SW¼ NW¼ Sec 27 T41N R9W
Location

Date	Taken by	Field Book No.	Lake Level or Gage Reading	Remarks
7/14/19	J. Harris	842	511.24	Shut Down At 3PM to repair wheel
5/20/27	G. Steinmetz	770	511.89	
7/17/33	W. Muegge	869	512.08	
9/23/39	W Muegge	893	511.94	
7/31/46	P. Finsland	903	512.21	
6/18/65	T. Windau	975	512.09	
4/19/74	T Ginder	1032	512.15	gage at headwall read 512.14
6-21-89	Rydberg		85.65	BM 1067-A ELEV=100.00

8-73

WDNR Comments

57.4

AUTHORIZATION - LAWS 1883 CH 11

WP-119 - PERMIT TO RECONSTRUCT DAM ISSUED.

MAX. POND ELEV. = 512.55 FT. (LOCAL DATUM)

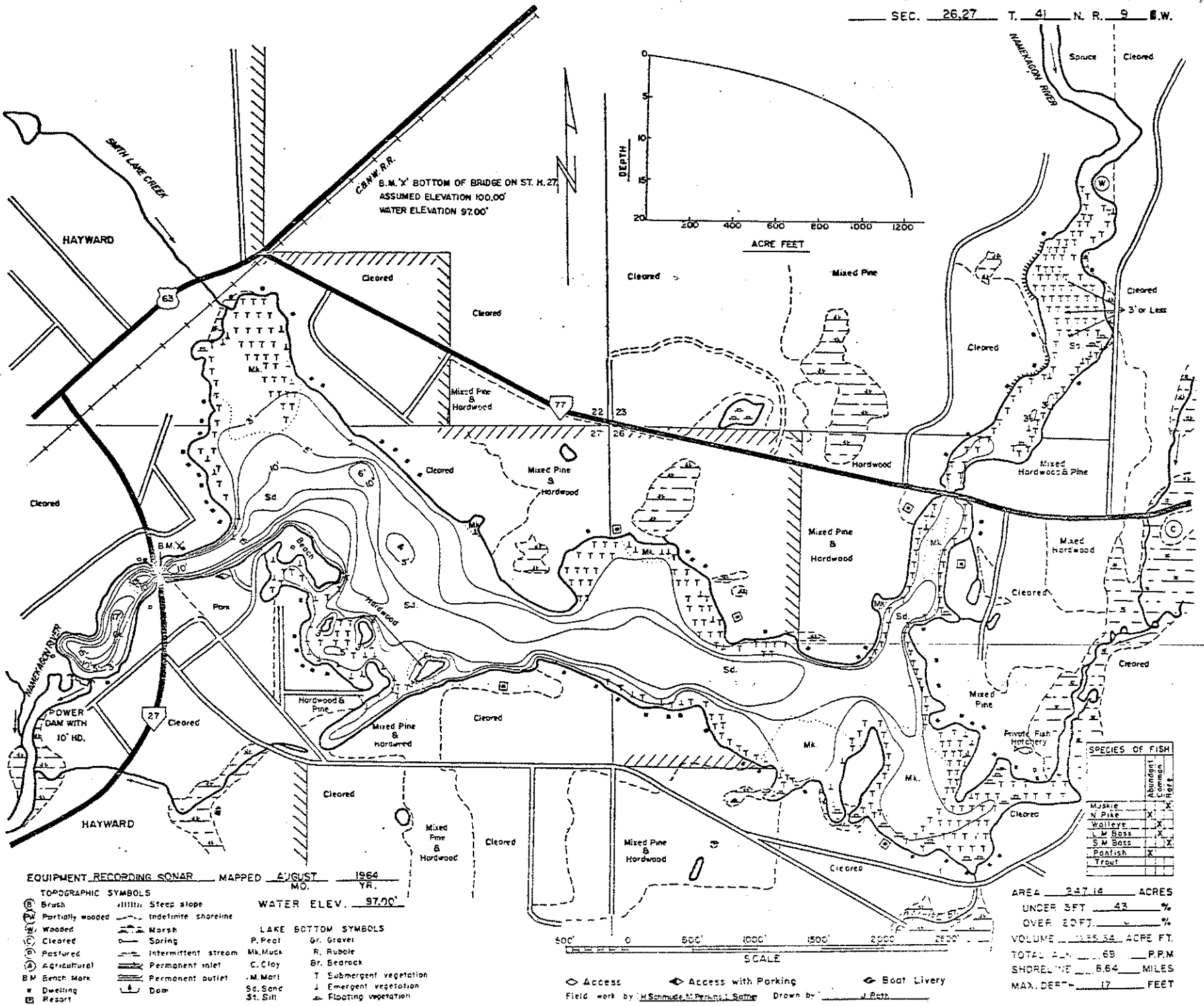
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

HAYWARD FLOWAGE LAKE — SAWYER COUNTY — 57.4

SEC. 26,27 T. 41 N. R. 9 W.

WDNR Comments



A-254

WDNR Comments

57.4

JMB 138 to 143 5/21/14

Form WP1

Sheet 1
Report by C. P. Halbert
Date Apr 24 1914

Engineering Department
Railroad Commission of Wisconsin

MMS

WATER-POWER DEVELOPMENT INVESTIGATION St Croix DRAINAGE BASIN

IDENTIFICATION

Name of stream on which power is located Namekagon River

County Sawyer Town Town of Hayward

SWNW Sec. 27 T. 41 N R. 9W

Distance to Hayward Wis (nearest P.O.) 1/4 Miles

Name of next tributary stream above Hayward's Pond

" " " " " below Spring creek

Local name of dam Hayward Dam

Name of mill or power station Willow River Lumber Co

Name of owner Willow River Lumber Co Address Hayward Wis

Name of operator Willow River Lumber Co Address "

HISTORICAL

Name of original grantee Anthony J Hayward

Date of original franchise or permit Feby 28 - 1883

Date and conditions of renewal none

Duration of original grant No Limit (right reserved to repeal or amend)

Where recorded Laws 1883 Chapter 11

Purpose of grant: (a) ~~Protection of navigation~~
(b) ~~Log driving~~
(Note-strike) (c) ~~Power purposes~~
(out purposes) (d) ~~Mill~~ purposes
(not obtaining) (e) For Manufacturing and other purposes

~~Year dam~~ was first constructed about 1883

Type of original dam (a) ~~Concrete~~
(b) Timber + piles
(c) ~~Earthen~~

ENGINEERING DEPT.
Received 5/4/14
Referred to:
77 1313

WDNR Comments

Form WP1 Sheet 2

Re Haywards Dam on Manitowish at or near Haywards

DESCRIPTIVE (GENERAL):

Has dam been rebuilt Yes When 1905-1908-1918 rebuilt.

Type of present dam (a) ~~Concrete~~ Concrete over stone & timber Crib
(b) Timber
(c) ~~Earthen~~

Present purpose of dam Mill (Saw) & log driving - Power

If formerly used for other purposes give details with dates

Boats first dam built about 30 yrs ago for log driving
It went out 1904 or 05

General topographic and geological conditions at site Soil sandy
with glacial stone country in vicinity low and flat

Character of stream banks Sandy

Character of stream bottom Sand & gravel

CONSTRUCTIVE FEATURES:

Note: If plans are available, arrange to have a copy prepared for the commission's files, otherwise make detailed sketches of dam, gates, and all other constructive features on blank sheets provided for the purpose, giving dimensions, etc., including typical cross-sections.

Dam: Type Timber crib Dam. Concrete Gravity,

Foundations: (a) Piles Kind Soft Wood Amount Unknown
(b) ~~Grillage~~ Kind Amount
(c) ~~Stone Masonry~~ Kind Amount
(d) ~~Concrete~~ Kind Amount

Depth below natural river bed Estimate 10-20'

Character of river bed Sand & gravel

Do foundations go to rock or impervious stratum no

Anchorage of dam or retaining walls to stream banks (describe)

cribs run well into banks

WDNR Comments

Form WP1 Sheet 3

Re Hayward Dam on Namekagan at or near Hayward

CONSTRUCTIVE FEATURES: Continued [concrete stone + sand + timber]

Materials in dam proper Timber cribs Rock filled Plank apron concrete.

Materials in walls cribs run well into banks Stone + sand filled

Methods used in construction Timber crib Rock + sand filled drained water off thru old flume.

General condition of masonry and concrete None except E flume wall. [Concrete good]

General condition of timber construction In dam - good

See page (describe) Timber cribs from sluiceway to mill and under Mill are very poor. Mill rests on old stream bed.

Height of stream banks at juncton with dam or wall construction 5'-0" above crest of Dam ? about level with fill.

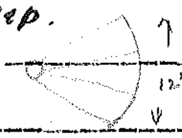
Provision for resisting ice pressure Piling + Braces

Provision aganist scouring below dam Piling + sheeting concrete apron.

Protection for gates aganist clogging by floating debris Wooden trash racks iron trash rack

Booms: Kind Log Anchorage Pile

Gates: Number 1 Tainter gate 4 head gates. Depth 8' wide 5 x 8' deep.



Width 10' Depth 12'

Operating mechansim Hand windlass OK

General condition of gates Fair

Description of approach to gates Fore bay on sketch

Fishways: Kind none Size

Locks: Kind none Size ✓

WDNR Comments

Form WP1 Sheet 4

Re Hayward Dam on Namekagon at or near Hayward

CONSTRUCTIVE FEATURES: Continued

Log chutes: Kind none Size

Ice chutes: Kind none Size

Spillways: Length 148'-6" 110'

Distance from top of spillway to low point in retaining walls or embankment 5'-0"

Flashboards: Height 3' in place now Provision for 4' Kind 2" plank

Pond or Forebay: Kind of banks Sandy - gravel

Condition of banks Good

Maximum depth Said to be 30'

Approximate area low water ?

" " normal ?

" " high water ?

Capacity in cubic feet

Extent of back water Estimate 9 miles

with safety factor

Method of Supplying water to wheels:

~~Canal~~:	Length		Dimensions		Material	
Flume:	"	150'	"	(5'-9" back x 6'-2" inside)	"	2" plank
~~Pipe~~:	"		"		"	

Power House

OPERATIVE FEATURES:

Purpose of operation at present Saw Mill & Elec Power for Hayward

Total operating head, forebay to tail race without flashboards:

(a) Low water 12'-6" (b) Ordinary water 12'-6" (c) High water 12'-6"

about 12'-6" from crest of Dam to Tail waters Flash board raises Head water 3' = 15'-6" said to be always plenty water available

Operating capacity of canal, flume or pipe line in sec. feet:

(a) Low water (b) Ordinary water (c) High water

WDNR Comments

Sheet 4 Form WP1

Re ______ Dam on ______ at or near ______

CONSTRUCTIVE FEATURES: Continued

Log chutes: Kind ______ Size ______

Ice chutes: Kind ______ Size ______

Spillways: Length ______

Distance from top of spillway to low point in retaining walls or embankment ______

Flashboards: Height *Two wheels in power house*

Pond or Forebay: *1914* Kind of banks *Trump. 60"*

Condition of banks *One wheel*

Maximum depth ______

Approximate area low water ______

" " normal ______

" " high water ______

Capacity in cubic feet ______

Extent of back water ______

Method of Supplying water to wheels:

Canal:	Length ______	Dimensions ______	Material ______
Flume:	" ______	" ______	" ______
Pipes:	" ______	" ______	" ______

OPERATIVE FEATURES:

Purpose of operation at present ______

Total operating head, forebay to tail race without flashboards:

(a) Low water ______ (b) Ordinary water ______ (c) High water ______

Operating capacity of canal, flume or pipe line in sec. feet:

(a) Low water ______ (b) Ordinary water ______ (c) High water ______

WDNR Comments

Form WP1 Sheet 5

Re *Hayward* Dam on *Namekagan* at or near *Hayward*

OPERATIVE FEATURES: Continued

Water wheels: Give for each wheel the following: (1) Kind; (2) Type; (3) Maker; (4) Size - inches; (5) Number of runners; (6) Usual gate opening - inches; (7) Kind of gate; (8) Rated power at usual gate and head; (9) Kind of draft tube; (10) Date installed; (11) General Condition.

1 water wheel in service about 150 H P

72" dia 23" deep old style Horizontal

1 wheel as above out of service

(This company have let contract to install about 400 H P capacity of wheels — generators — power house etc to be erected on opposite side of river from mill) The old wheel now in place is in poor condition and takes but little of the stream flow

Water wheel governors: State the following; (1) Kind; Type; (3) Maker; (4) Date installed; (5) General condition.

~~None~~

2 woodward governors — 1914

Generators; Give for each unit (1) Make; (2) Type; (3) KV-A.capacity; (4) R.P.M. (5) Phase; (6) Voltage; (7) Amperes; (8) Belted or direct connected; (9) Date installed; (10) General condition.

out [1 Westinghouse A C 100 K W EMF 2200 A
1 Phase about 7200 belt connected with line
shaft

1 G.E. alt. 9½ K.W. 125 V. 975 R.P.M. shaft connected
installed 1914.

WDNR Comments

Form WP1 Sheet 6

Re Hayward Dam on Namekagon at or near Hayward Wis

OPERATIVE FEATURES: Continued

Transmission lines:

From Dam To Hayward Circuit Miles 1/4
Phase 3φ Voltage 2300 Wire ______ Poles 30'

From ______ To ______ Circuit Miles ______
Phase ______ Voltage ______ Wire ______ Poles ______

From ______ To ______ Circuit Miles ______
Phase ______ Voltage ______ Wire ______ Poles ______

Auxiliary steam plant: Location ______

Owner Willow River Lumber Co Address Hayward Wis

Equipment 1 Corliss Eng 900 H P Rated (Allis)

Planing Mill 1 Westinghouse A C Gen 120 K W E M F 2200 Amp
3 phase speed 720 (See back of page)

Percentage of running time that power is used City use power every day

Average number of days per year that plant operates 365

Hours of operation: From ______ To ______
Saw mill Hours per day 10-12 Days per week 6
City Lt. Hours per day dark dawn

Are date openings recorded? No

Are turbine performances recorded? No

Are switchboard readings recorded? No

Secure sample of station log sheet None

WATER RECORDS:

Kind of gages None How often read ______

Maximum reading None Time ______

Minimum reading None Time ______

Records of stream flow (get sample) None

What portion of fow of stream is plant entitled to Entire

For what portion of year is water supply adequate water always adequate for the 1 - 150 H P wheel

WDNR Comments

Steam and oil eng in Clemmons Oil &

Allis Eng about 400 HP

48" stroke — 24" bore

Brunell Eng 16" x 24 simple
belt connected with Generator

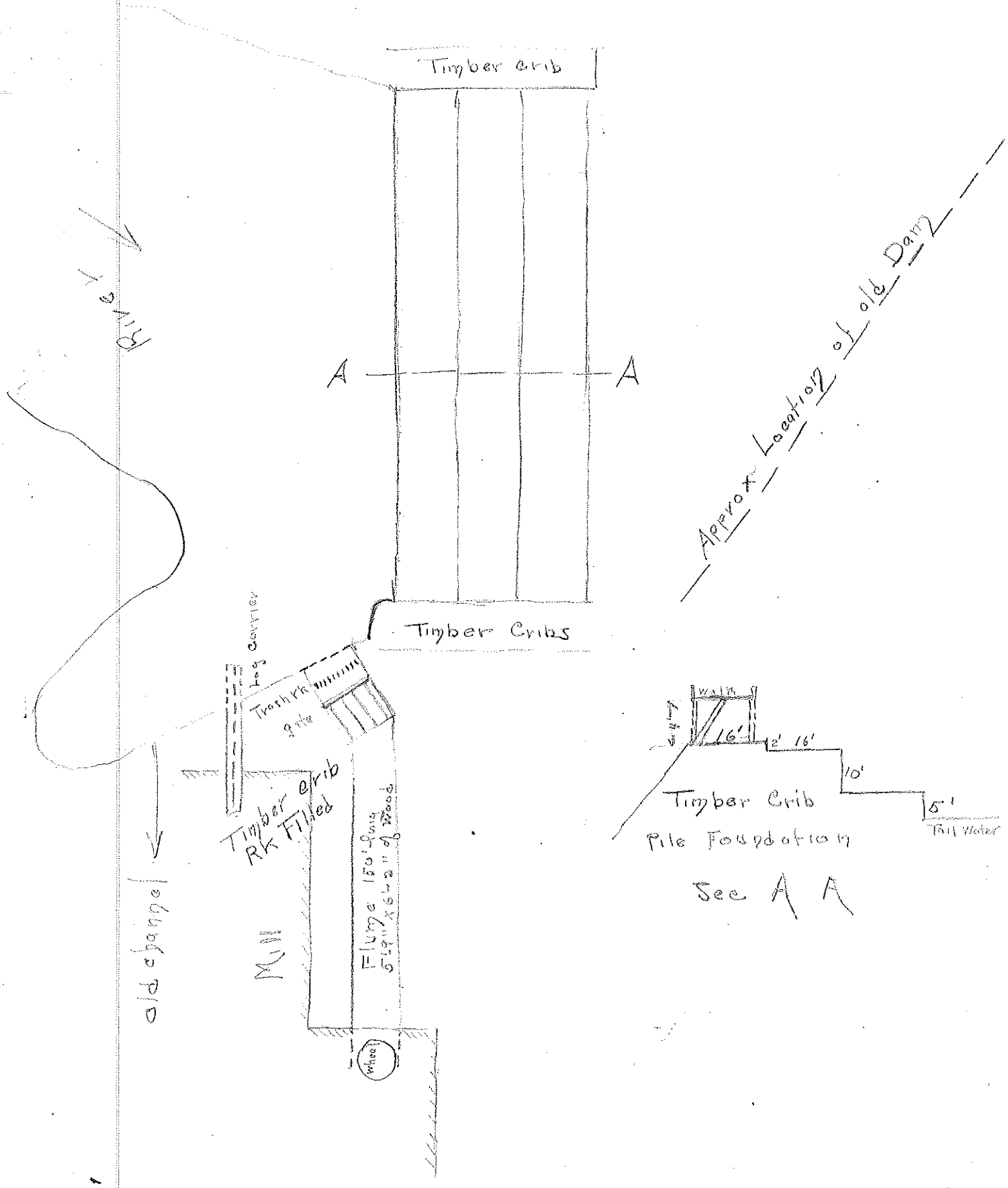
WDNR Comments

Form WP1

Insert

Re Hayward Dam on Namekagon at or near Hayward

Sketch of



WDNR Comments

One Page

Memorandum

BENCH MARKS - HAYWARD DAM 57.4
OWNED BY WILLOW RIVER LUMBER
COMPANY.
(FIELD BOOK #842)

Submitted by John W. Harris,
July 16, 1919

Bench marks were set under authority granted by Chapter 31.02 of the Wisconsin Statutes.

Dam is located on the Namakagon River in the City of Hayward.

Bench marks were set and levels taken July 14, 1919.

Bench Mark #226A is a bronze tablet marked Railroad Commission of Wisconsin set in top of 6 1/2 foot concrete post flush with gravel surface of ground on the east side of north and south street and on the north side of east and west street on the east bank of Namakagon River at dam. Bench mark is 20.5' W. of N.W. corner of house on north side of east and west street and 80.4' N. of N.W. corner of house on side of east and west street. Elevation = 516.04.

Bench Mark #226B is a square notch cut on east flume wall between spillway and flume 8.1' upstream from wheel house. Elevation = 512.53'.

Bench Mark #226C is a square notch cut in upstream end of east abutment of spillway. Elevation = 513.09'.

The following elevations are referred to the datum of bench marks 226, A, B & C.

Points Taken	Elevation
East end spillway wall gate section	513.04
East end foot bridge	514.79
Top of flashboards east gate (All boards in place)	513.24
Average of (Top of flashboard 9 gates)	511.68
Average elevation top of center piers (9)	512.76
Average elevation gate sill, spillway gates	508.57
East flume wall gate section	512.52
Average headgate sill (4 gates)	504.41
West flume wall	512.63
South flume wall auxillary flume gate section	512.78
North flume wall auxillary flume gate section	512.88
West end foot bridge	513.40
Dike between the two flumes	512.95
Pond level (3 P.M. shut down to repair wheel)	511.24
Tailwater wheels not running	495.04
Apron (Center) Top	498.77

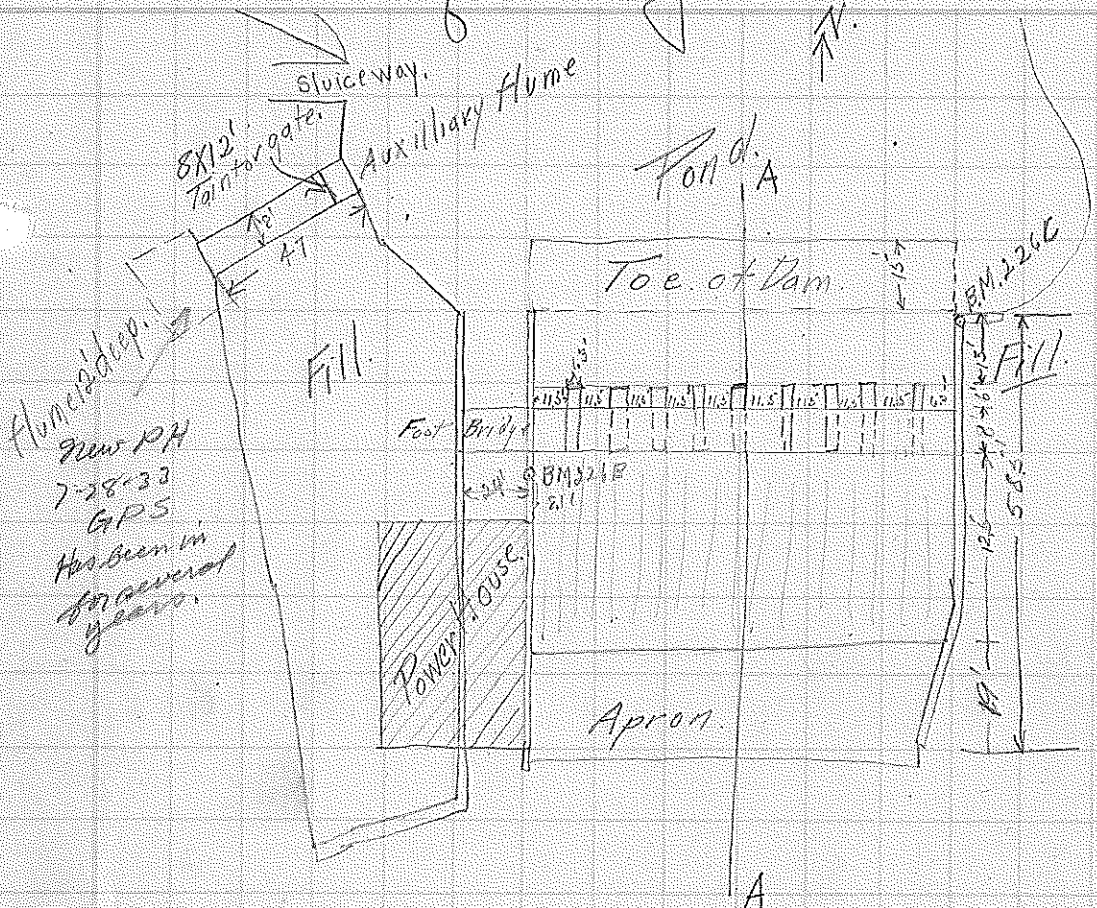
WDNR Comments

FORM 499

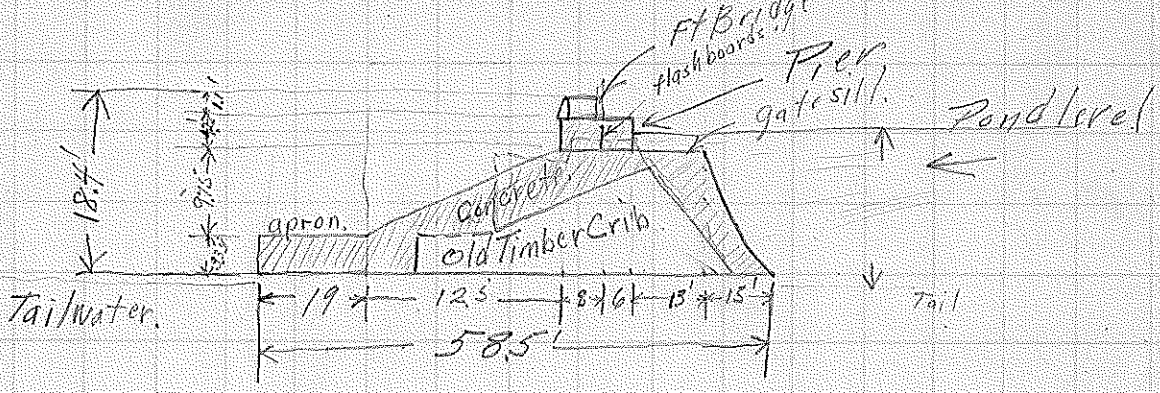
STATE OF WISCONSIN
DEPARTMENT OF ENGINEERING
RAILROAD AND UTILITIES DIVISION

Date July 16 1919 No.
Made by J. J. M. H.
Checked by J.

Refers to Sketch of New Hayward Dam.



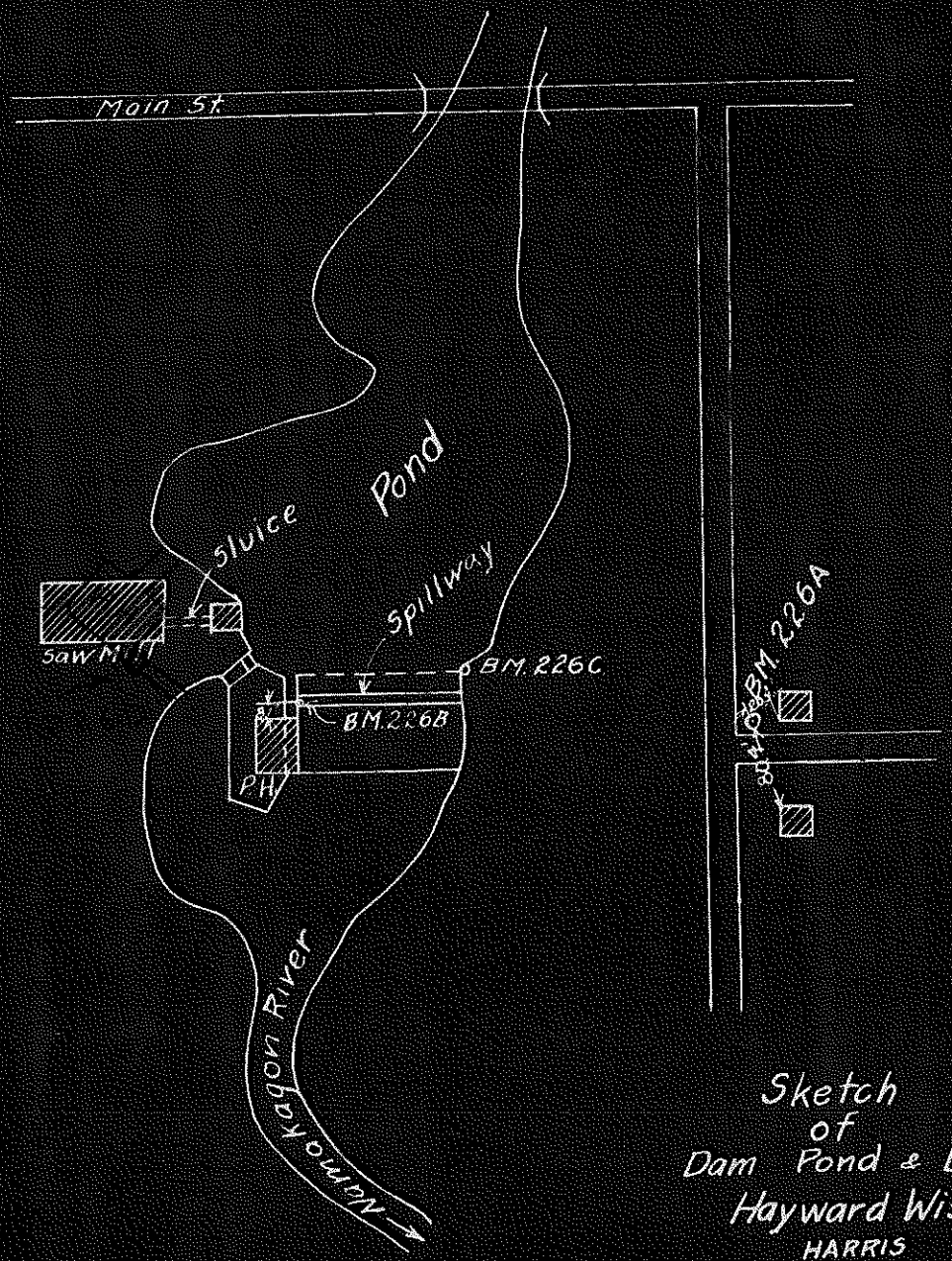
Sec thru A-A according to Mr. Rectors Description.



Probably piles under a large portion of old timber crib.

Dam file 574

WDNR Comments



Sketch
of
Dam Pond & BM's.
Hayward Wis.
HARRIS
1919

WDNR Comments

gently fix the proper elevation at which the new dam shall be built.

After completing the work at Chetek we desire you to make a special investigation of the Hayward Dam at Hayward, Wisconsin. I established a temporary bench mark at this dam on June 20, 1919, the location of which is as follows: elevation of up-stream S.W. abutment at up-stream end, square chiseled in top of concrete, elevation 513.09. Bench marks should be set at this dam using the above bench mark for your datum. The elevation of the head race wall at which elevation the owner of the dam wishes to secure permission to hold the pond level was also taken and found to be 512.22. This concrete wall is between the main spillway section and the intake to the wheels. The top of the wall was taken about 6 feet up-stream from the wheel house. While at this dam new sketches of the dam should be made and the report corrected because the dam was remodled in 1918.

In these two special investigationsit is desired that as soon as the work is completed you prepare the bench mark memoranda and write us the results of your investigation.

Yours very truly,

CAH/a

WDNR Comments

RAILROAD COMMISSION OF WISCONSIN

MADISON

IN REPLY PLEASE REFER TO FILE NO. 855--CAH April 10, 1924

ADDRESS ALL COMMUNICATIONS TO THE COMMISSION

TO OWNERS OF DAMS:

Will you kindly check the following information regarding the water power owned by you. If this information is not correct, make the necessary changes on this sheet and return it to us as promptly as possible in the enclosed stamped envelope.

Local Name of Dam Hayward

Owner Hayward Electric Light & Power Company

Address Hayward

Location of Dam Sec.27, T.41 N., R.9 W.

Use of Dam

Wheel Installation:

Number	Kind	Make	Size	Rated Capacity h.p. (total)
2	Vertical turbine	Trump	48"	300 total
1	Turbine	Br	48"	250 ~

This information is desired in connection with the administration of the Water Power Law.

Yours very truly,

RAILROAD COMMISSION OF WISCONSIN

C. M. Larson

Engineer

574

Enc. 1

WDNR Comments

Supplementary Memorandum — One page

57.4

HAYWARD DAM OWNED BY THE LAKE SUPERIOR DISTRICT POWER COMPANY FIELD BOOK 770.

Submitted by Geo. P. Steinmetz, May 28, 1927.

Following correspondence carried on with the Wise Land Company of Hayward concerning the height of the above dam, the writer made an inspection and took levels on the same on May 20, 1927.

The normal headwater authorized by this commission in the above dam is elevation 512.55' when referred to the datum of bench mark 225A, 226B, and 226C described in earlier memos.

Points Taken	Elevation
Bench mark 226 C	513.09'
Headwater above dam	511.34
Top of flashboards (1- 7" board was removed for the entire length of the spillway)	511.34
Top of flashboards when all in place, approx.	511.92

From the above elevations it can be seen that the maximum elevation of the flashboards is approximately 6" below the height authorized by this commission.

WDNR Comments

Supplementary Memorandum — One Page 57.4

HAYWARD DAM
OWNED BY SUPERIOR DISTRICT
POWER COMPANY
(FIELD BOOK #869)

Submitted by W.A. Muegge
July 17, 1933

Bench marks were checked and elevations taken on July 11, 1933.

It was found that, in checking over the notes of Harris, 1919 field book, an error of one foot, which would make the elevation of 226-A 517.04 ft. instead of 516.04 ft. was made. The present survey shows Bench Mark 226-A to be 517.15 ft. when referred to datum of Bench Mark 226-C.

The following elevations are referred to datum of Bench Marks 226-A and 226-C:

Pond level	512.08 ft.
Highwater mark, observed	512.28
Tailwater, wheel running	495.13
Water below dam	495.24
Crest of left section of spillway 6.2 ft. long	508.70
Flash " " " " "	512.58
Crest 2nd " " " 11.5 ft. long	508.68
Flash " " " "	512.63
Crest of 3rd " " " 11.5 " "	508.48
Flash of 3rd " " " " " "	512.40
Crest of 4th " " " " " "	508.53
Flash of 4th " " " " " "	512.35
Crest of 5th " " " " " "	508.50
Flash of 5th " " " " " "	512.39
Crest of 6th " " " " " "	508.49
Flash of 6th " " " " " "	512.46
Crest of 7th " " " " " "	508.55
Flash of 7th " " " " " "	512.42
Crest of 8th " " " " " "	508.52
Flash of 8th " " " " " "	512.53
Crest of 9th " " " " " "	508.41
Flash of 9th " " " " " "	512.57
Crest of Right " " " " " "	508.31
Flash of Right " " " " " "	512.57
Upstream wall at right of spillway	512.61

517

WDNR Comments

Memorandum One Page

BENCH MARK 226A
HAYWARD DAM, SAWYER COUNTY

Submitted by G.P. Steinmetz,
July 19, 1933.

The decision of this Commission granting authority to raise and enlarge the above dam, decided September 17, 1919, (23-W.R.C.R. page 647) gives the elevation of bench mark 226A as 516.04 feet. Upon resurveying this dam in 1933 Mr. Muegge found an error in the original field notes. When this error is corrected, the original elevation of bench mark 226A is found to be 517.04 feet and the order of this Commission should be corrected accordingly.

- - - -

Adolph Williams - Mayor

WDNR Comments

ENGINEERING DEPARTMENT
PUBLIC SERVICE COMMISSION OF WISCONSIN

File 574
Inspected by [illegible]
Date 7-28-33

Name of Dam Hayward
Stream Namekagon River
Owner Lake Superior Distr. Power Co
Address Ashland, Wis

Condition of Structure:

Concrete: Spillway + gate piers good. Lt wall old PH spalled in 8" at toe (above tailwater). [illegible] Rt retaining wall below old PH spalled in 4" to 6" at TW line. [illegible] walls of new PH spalled badly, mostly at [illegible] above H.W.

~~Stone Masonry~~: [illegible] in 5 or 6 places. Lt wing wall at new PH spalled 2' at water line adjacent to PH. Apparently undermined.

Timber: Stop logs + [illegible] bridge good. [illegible] Head gate & timber frame [illegible] at new PH good.

Earth dykes: Good

Flood gates: Stop logs OK

Flood gate hoists: By hand.

Flood capacity:

Seepage: 1 sec ft under downstream edge of retaining wall at [illegible] old PH.

Scouring below dam: Very little. Large boulders

Flood capacity:

Repairs since 1930:

Bench Marks:

Gages: HW 13" to 15" below piers [illegible] 4' below piers

Headwater:
Normal Flow: Max. Normal Min.
Flood Flow: Date Max.

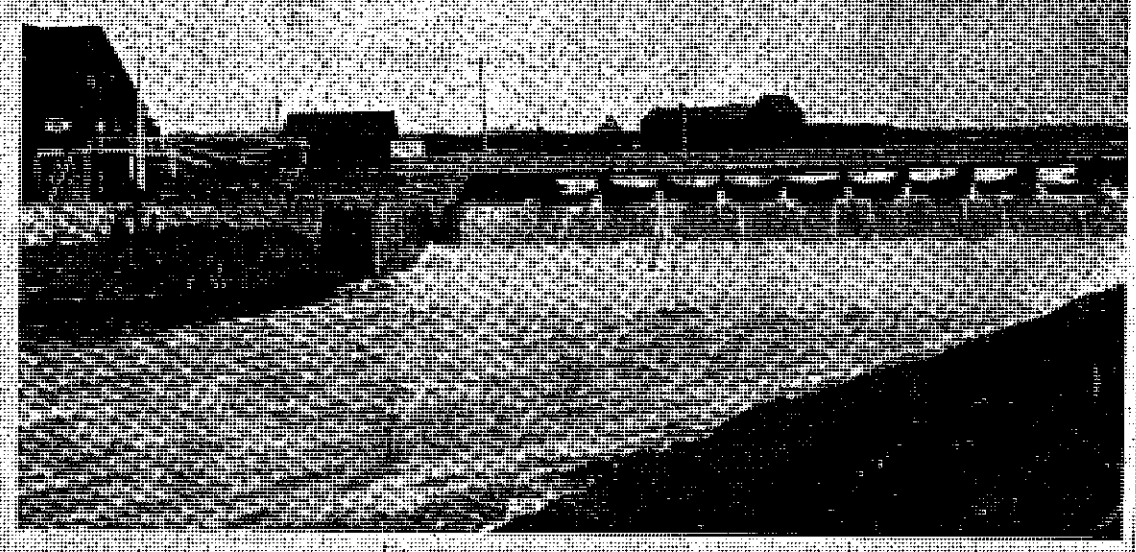
Remarks: New PH walls should be repaired. Leakage under old PH should be checked if possible. Head race new PH [illegible]

WDNR Comments

504

SAWYER COUNTY RECORD AND HAYWARD REPUBLICAN — HAYWARD, Sawyer County, WISCONSIN 54843

MILLDAM AT HAYWARD, circa



THE DATE OF this week's "Old Time Photo" is unknown, but shows the old mill dam in Hayward.

WDNR Comments

Memorandum

HAYWARD DAM
OWNED BY LAKE SUPERIOR DISTRICT POWER CO.
FIELD BOOK #893

Submitted by W.A. Muegge
February 2, 1940

Bench marks were checked and elevations taken on September 23, 1939.

The following elevations are referred to datum of bench marks 226-A and 226-C.

Pond level	511.94 ft.
High water mark observed	512.19
Tailwater, wheel running	495.24
Water below dam	495.24
Sill of gates - left end	508.44
Sill of gates - center	508.34
Sill of gates - right end	508.19
Top of left gate 6.0 ft. wide-all others 11.5 ft. wide	511.88
Top of 2d gate	511.77
Top of 3d "	512.20
Top of 4th "	512.13
Top of 5th "	511.80
Top of 6th "	511.94
Top of 7th "	512.14
Top of 8th "	512.09
Top of 9th "	511.88
Top of right gate	509.79
Platform over flume	513.32
Dike at left of power house	513.09
Dike at left of wasteway	514.14

- - -

WDNR Comments

SERVICE COMMISSION OF WISCONSIN
ENGINEERING DEPARTMENT
INSPECTION OF DAM

File No. 57.4
Date 9/23/39
Inspected by W.A. Huegge.

Name of dam Hayward Stream Namakagon.

Owner of dam Lake Superior Dist. Pr. Co. Address Ashland.

Present purpose of dam Hydro Elec. Normal pondage _____ Acres

Type of dam gate & Spillway section.

Has dam been rebuilt or repaired? (Dates?) Probably only minor repairs.

Condition of structure

Concrete Spalled about 1.0' deep reinforcing exposed at bottom downstream side of ~~left~~ wall of dam at apron edge. Also downstream wall.

Masonry

Timber good.

Flood Capacity

I. Gates

Number	Type	Width	Top Elevation	Sill Elevation
1	Stop Log	6.0 ft.	~~514.88~~ ft.	508.~~44~~ ft.
9	"	11.5 "	Varies "	Av 508.32 "
		"	"	"

II. Spillways

Number	Length	Crest elevation	Flash elevation
None	ft.	ft.	ft.
	"	"	"
	"	"	"

III. Fishways None

IV. Available freeboard to elevation Flyer. 513.09 ft.

Operating Head

Head water elevation observed 511.99 ft. Tailwater elevation 495.24 ft.
Highwater mark observed 512.19 ft.
Headwater elevation _____ ft. Operator
Maximum _____ ft. Minimum _____ ft. Normal _____ ft.
Maximum load plant can pull-normal head ?
What is condition of tailrace? Good
Maximum known flood:
Elevation _____ ft. No gates open _____ Date _____
Remarks:
Seepage through dyke at right wall of old powerhouse. about 10 C.F.S.

WDNR Comments

Kind of Gages: None.

Headwater reading _____ ft. Tailwater reading _____ ft.

Dykes: Condition, freeboard, length etc.? Good except for seepage.

Canals: Condition, length etc.? None.

Operating features

I. Generators

Number	Make	Type	K.V.A.	K.W.	Volts	Amps. per phase	Speed

II. Exciters

III. Governors

Number	Make	Type	Size

IV. Water Wheels

Number	Make	Type	Size	Horsepower

Remarks and sketches: _____

WDNR Comments

Memorandum 57.4

HAYWARD DAM
OWNED BY LAKE SUPERIOR DISTRICT POWER COMPANY
FIELD BOOK NO. 903

Submitted by P. O. Finsland
July 31, 1946

Bench marks were checked, bench mark 226D was established, and elevations were taken on July 31, 1946.

Bench mark 226D is described as a 2-inch square cut in the top of the concrete retaining wall at the left of the tailwater and 5 inches from the southwest corner of the new power house.

The following elevations are referred to datum of bench mark 226A:

Bench mark 226C	512.92
Bench mark 226D	508.76
Pond level	512.21
High watermark observed	512.51
High water per dist. mgr. 3" over old concrete flume wall	512.67
Tailwater, wheel running	495.36
Water below gates	495.85
Sill of right stop log gate 11.2' (clear) wide	508.03
" " 2nd " " " 11.2'	508.10
" " 3rd " " " 11.3'	508.21
" " 4th " " " 11.3'	508.30
" " 5th " " " 11.1'	508.27
" " 6th " " " 11.3'	508.26
" " 7th " " " 11.2'	508.35
" " 8th " " " 11.2'	508.26
" " 9th " " " 11.2'	508.41
" " left " " " 6.2' wide	508.47
Top of right stop log gate	512.33
" " 2nd " " "	511.68
" " 3rd " " "	512.31
" " 4th " " "	511.97
" " 5th " " "	511.82
" " 6th " " "	512.22
" " 7th " " "	512.03
" " 8th " " "	512.10
" " 9th " " "	512.26
" " left " " "	512.30
Top of old concrete flume wall at right of spillway	512.42

Top of concrete wall between right & 2nd gates (over gates)		512.38
" " " " " 2nd & 3rd " " "		512.42
" " " " " 3rd & 4th " " "		512.46
" " " " " 4th & 5th " " "		512.45
" " " " " 5th & 6th " " "		512.50
" " " " " 6th & 7th " " "		512.60
" " " " " 7th & 8th " " "		512.61
" " " " " 8th & 9th " " "		512.65
" " " " " 9th & left "	(dated 1918)	512.76
Top of left abutment (over gates)		512.86
Top of concrete platform over flume now in use		513.30
Top of concrete curb over trash rack		513.57

- - -

WDNR Comments

INTERVIEWED:
District Manager
R. H. Suess
Main office - Ashland, Wisconsin

PUBLIC SERVICE COMMISSION OF WISCONSIN
ENGINEERING DEPARTMENT
INSPECTION OF DAM

File No. 57.9
Date July 31, 1946
Inspected by P.C. Finsland

Name of dam Hayward Dam Stream Namekagon River

Owner of dam Lake Superior Dist. Power Co Address HAYWARD Ashland

Present purpose of dam Hydro-elec. Normal pondage _____ Acres

Type of dam Concrete, gravity

Has dam been rebuilt or repaired? (Dates?) Not since last report

Condition of structure

Concrete abutments above waste way - poor
Sills of waste way, wing walls - good
Junction of concrete at right of waste way and old P.H. - poor
~~Masonry~~

Timber stop logs - good

Flood Capacity

I. Gates

Number	Type	Width	Top Elevation	Sill Elevation
1	Stop log	6.7 ft.	ft.	508.47 ft.
9	" "	(CLEAR) 11.2 "	LOW 511.68 "	LEFT END 508.41 "
		"	HIGH 512.33 "	RIGHT END 508.03 "

II. Spillways

Number	Length	Crest Elevation	Flash Elevation
NONE	ft.	ft.	ft.

III. Fishways NONE

IV. Available freeboard to elevation L. ABUT 512.86 ft.

Operating Head

Head water elevation observed 512.21 ft. Tailwater elevation 495.36 ft.
Highwater mark observed 512.51 ft.
Headwater elevation _____ ft. Operator
Maximum _____ ft. Minimum _____ ft. Normal _____ ft.
Maximum load plant can pull-normal head 480 about 170 K.W.
What is condition of tailrace? good
Maximum known flood:
Elevation 512.67 ft. No gates open _____ Date _____
Remarks: _____

WDNR Comments

57.4

Name of Dam HAYWARD

Date FEBRUARY 8, 1954

INSTALLED EQUIPMENT

Water Wheels			Connected To Generators		
Unit	Size	Horse Power	Kva Rating	Kw Rating	Mechanical Equipment
1		280	210	168	None

WDNR Comments

Memorandum 57.4

HAYWARD DAM
OWNED BY LAKE SUPERIOR DISTRICT POWER COMPANY
FIELD BOOK #975, p. 12

Submitted by T. D. Windau
June 22, 1965

The following survey was taken on June 18, 1965. The survey was referred to the datum of BM 226D which has an elevation = 508.76 feet.

Water level (gage read 512.0)	512.09 feet
Tailwater	495.26 feet
Top of right abutment	512.39 feet
Top of 2nd abutment	512.23 feet
Top of 3rd abutment	512.03 feet
Top of 4th abutment	512.37 feet
Top of 5th abutment	512.36 feet
Top of 6th abutment	512.43 feet
Top of 7th abutment	512.53 feet
Top of 8th abutment	512.53 feet
Top of 9th abutment	512.57 feet
Top of 10th abutment	512.70 feet
Top of left abutment	512.80 feet
Top of right spillway	512.09 feet
Top of 2nd spillway	511.68 feet
Top of 3rd spillway	511.79 feet
Top of 4th spillway	511.42 feet
Top of 5th spillway	512.30 feet
Top of 6th spillway	512.40 feet
Top of 7th spillway	512.53 feet
Top of 8th spillway	512.33 feet
Top of 9th spillway	512.05 feet
Top of left spillway	512.20 feet
Right sill	507.87 feet
2nd sill	507.91 feet
3rd sill	508.09 feet
4th sill	508.21 feet
5th sill	508.14 feet
6th sill	508.18 feet
7th sill	508.27 feet
8th sill	508.16 feet
9th sill	508.31 feet
Left sill	508.38 feet

WDNR Comments

Memorandum

57.4

HAYWARD DAM
OWNED BY LAKE SUPERIOR DISTRICT POWER CO.
FIELD BOOK #983

Submitted by R. Bubolz
August 15, 1966

On August 2, 1966, Benchmark 226-A was located along the edge of South First Street.

RB/jp

WDNR Comments

DEPARTMENT OF NATURAL RESOURCES

[illegible]

Hayward

Location: SW ¼ NW ¼ Sec 27 T 41 R 9W

Sawyer County

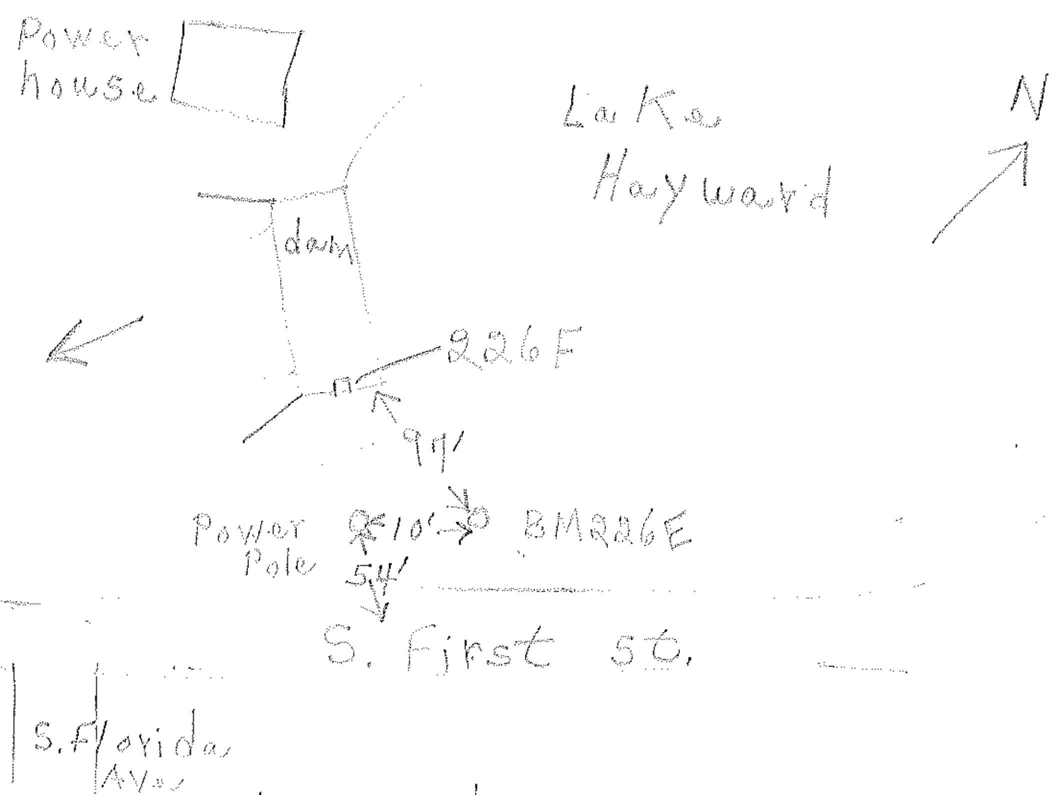
Benchmark No. 226E + F Elevation E– F–

Set by: R.J.T., DRS

Vertical Datum:

Date of survey: Aug 19, 1970

Location Sketch:



Detailed Description: BM 226E is a bronze cap in a concrete post, 97' E of dam 10' N of power pole + 54' W of C/L of "First St. on E bank of lake

BM 226F is a chiseled sq. on E abutment of dam 1ft upstream from stoplog

WDNR Comments

State of Wisconsin
Department of Natural Resources

DAM INSPECTION REPORT
Form 3500-59
Rev. 5-81

1. Dam Name: Hayward Dam
2. Stream: Namekagon River
3. County: Sawyer
4. Inspection Date: 10-21-81
5. State Inspection Party: Ron O'Keefe
6. Other Persons Present: Mike Popko
7. Dam Owner: Lake Superior District Power
8. Address: Ashland, Wi.
9. Contact: Mike Popko
10. Telephone Number:
11. Field File Number: 54.4
12. Field Book Number:
13. Benchmarks Located:

14. Water Level: (Specify datum) Headwater: Gage: Tailwater: Gage:

15. How many photos taken: 2 (Prints) or slides:

16. Estimated Federal Dam **Hazard Rating (High, Significant, Low):**

CONDITION OF DAM

I. EMBANKMENTS

a. Seepage

none

b. Slope Stability

good

c. Surface Erosion

none

d. Animal Burrows

~~2~~ none

e. Embankment-Structure Junctions (at retaining walls, natural ground, etc.)

good

WDNR Comments

f. Slope Protection

some riprap

g. Vegetation

a tree at right in of spillway should be taken out

h. Repairs Since Last Inspection

piers and spillway repaired last summer

II. SPILLWAY(S)

a. Surface Condition

good

b. Cracking

good

c. Horizontal and Vertical Alignment

good

d. Exposed Reinforcement

none

e. Seepage

none

f. Joints

good

g. Repairs Since Last Inspection

spillway repaired last summer

III. GATES

a. Steel, Timber, None

WDNR Comments

b. Gate Seals

good

c. Gate Pins

good

d. Gate Hoist and Chains

good

e. Repairs Since Last Inspection

none

IV. MISCELLANEOUS

a. Debris

none

b. Walkway and Railing

good

c. Paint

good

d. Downstream Apron

new last summer

e. Stilling Basin - Scour, Undercutting

none

f. Foundation Seepage

none

g. Downstream Channel - Scour

none

h. Other Observations

WDNR Comments

V. BOATING SAFETY

a. Warning devices and signs:

signs

b. Portage signs and facilities:

signs

VI. HYDROPOWER USE

a. Last date used for power: Continuous

b. Current installed capacity: 195 KW

c. Average power output during inspection: 195 KW

VII. RECOMMENDED MAINTENANCE ACTION:

Ronald E O Kife 10-21-81
Date Signed Inspected By:

WDNR Comments

mcg

WI DNR

Jeff Scheier
Park falls

OPERATION REPORT

Federal Energy Regulatory commission
Chicago Regional Office

For the period September 11, 1996 to August 19, 1998

Licensee Northern States Power Company Project No. 2417

Project Name Hayward NATDAM No. WI00795

Location Namekagon River (waterway) Sawyer County WI State

License Issued September 1, 1995 Expires December 31, 2025

Type Minor

Date of last amendment None

Inspected by Kevin S. Richards/Adam S. Pawelek Date August 19, 1998

Parts Inspected All visible parts of the facility were inspected

Weather Cloudy, 60 degrees F.

Accompanied by Mr. Tom Ricci of Northern States Power Company

Summary

An operation inspection of the Hayward Hydroelectric Project, FERC No. 2417, was performed by Mr. Kevin Richards on August 19, 1998. All visible portions of the project water-retaining structures were inspected and found to be in satisfactory condition. No dam safety deficiencies were found that require immediate remediation. A small depression in the soil was noted behind the sheet pile near the intake, which we understand is already scheduled for repair. Minor deterioration of concrete in pier No. 6 and leaking cracks on the rollway should be monitored. The project is being operated and maintained in a safe manner.

No public safety deficiencies were found with the exception of a faded warning sign, on the downstream side of the powerhouse, which the licensee indicated would be immediately replaced.

Submitted: November 12, 1998

Kevin S. Richards

Kevin S. Richards, P.E.

WDNR Comments

A. Safety of the Project

Attached are 11 photographs that show the features and condition of the project at the time of the inspection. The approximate location and orientation of the camera for each photograph are shown on the attached exhibit. Project data is on the attached Pertinent Data Sheet.

1. Dams, Dikes and Appurtenant Structures

Spillway - Access to the spillway is fenced, a project sign is posted at the main entrance (Photograph *1*). The concrete spillway has 10 wooden stoplog bays (Photograph *2*). The concrete surfaces of the spillway ogee and downstream apron could not be observed due to water flowing over the apron (Photographs *3*, *4*, *5*, *6*). The upstream concrete and sheet piling retaining walls appeared to be in generally satisfactory condition (Photograph 7). The operator deck and the piers that support the stoplogs on top of the spillway appear to be in good condition (Photograph *8*). The downstream right training wall appeared to be in generally satisfactory condition, with some cracks and efflorescence noted on the wall. Some minor leakage was observed in the left retaining wall near a 3 inch gap between the surface of the spillway and left retaining wall. The leakage was under slight artesian pressure (Photograph *5*). A similar leak was observed along a construction joint in the center of the spillway (Photograph *4*). The cracks and spalling are not serious enough to require repair at this time. Pier No. 6 has reinforcing steel exposed and should be carefully monitored for any further deterioration. Minor leakage was observed exiting between stoplogs in gate bay No. 7.

Powerhouse - The powerhouse superstructure, intake structure and head gate appeared to be in satisfactory condition, with the exception of a large crack in the back of the powerhouse (Photographs *9*, *10* and *11*). The downstream wall of the powerhouse substructure and the left downstream retaining wall contain cracks, spalling and efflorescence. No action is required at this time other than closely monitoring the larger cracks for signs of offset or leakage. It appeared that the spalled area of concrete has not increased sufficiently during this report period to warrant any repair at this time. No leakage was observed.

Embankments - The middle earth embankment, located between the spillway and powerhouse, appears to be generally in good condition (Photograph 7). Weeds had been cleared from the middle and right embankments. The right embankment is in good condition. No soft spots or wet areas were observed. The licensee indicated two piezometers were removed from the right earth embankment.

WDNR Comments

2. Instrumentation. There is a headwater elevation recording chart which was functioning at the time of the inspection. Piezometers Nos. 1 and 2 were buried 8 years ago. Piezometric levels in Nos. 3 and 4 were consistent with water levels of the past four years. They were at 13.6 and 13.5 feet below surface, respectively. A slug test was reportedly performed on the piezometers two weeks prior to this inspection which indicated the piezometers are functioning properly. No additional instrumentation is required at this time.

3. Hazard Potential Classification. During the inspection, no changes in the downstream conditions were reported by the licensee's representative or observed from the dam by the inspector. There are no permanent structures immediately downstream. The licensee confirmed by letter dated December 23, 1997 that there were no upstream or downstream conditions which would endanger life, health, or property as a result of an emergency at the project. Therefore, the current low hazard potential rating should remain in effect.

4. Consultant's Safety Inspection Report. A consultant's safety inspection report is not required for this project.

5. Licensee's Inspection Program. There is no formal program of inspection. The spillway operator visits the project daily to check water levels and the operation of the gates. Also, the operator visually inspects the project structures once a week. The project is also inspected by Mr. Mark Fort, supervisor of project operations, every three months. Mr. Dick Rudolph, the Hydro Administrator, also inspects the project every six months. Records of the condition of the structures are kept in the licensee's Hayward office.

B. Operation and Maintenance

There were no maintenance items requested following our 1996 operation inspection.

1. Dams, Dikes and Appurtenant Structures. The drainage system on the right embankment, consisting of five, four-inch corrugated plastic pipes connected to a head pipe near the concrete retaining wall, appeared to be working satisfactorily. Approximately 1 g.p.m. was observed exiting the pipe at the downstream slope near the powerhouse wall (Photograph *10*). A new headwater monitor was reportedly installed. The licensee indicated repairs were scheduled to correct minor erosion behind the sheet pile on the center embankment. Holes will be backfilled with gravel and soil.

WDNR Comments

2. Spillway Gates and Standby Power. The spillway gate operation criteria does not apply to this stoplog spillway. There are stoplog slots in the retaining walls of the intake structure for stopping the flow. Also, a vertical steel head gate is available for emergency closure of the powerhouse intake, however a boom truck would need to be brought in to lower the slide gates. The licensee indicated they are not cindering the gates, and that the minor leakage observed was due to this fact.

3. Power Plants. There is only one generating unit in the powerhouse, which has 200 kW capacity. At the time of inspection, the unit was in operation and generating 175 kW. There were no unscheduled shutdowns or suspensions of operation during the reporting period, and no modifications to the powerhouse.

4. Reservoir. The reservoir rim in the proximity of the dam was inspected and appeared to be free of excessive debris. No signs of shoreline instability or erosion were noted.

5. Records. The operational history, piezometer readings, daily water level readings and generation records are kept at the project site. Also, Exhibit F drawings are kept in the powerhouse.

6. Emergency Action Plan. This project was exempted from filing an emergency action plan by the Regional Director on July 15, 1982. A remote alarm system has been installed to notify the licensee's Eau Claire office in the event of a high water condition. If the plant trips, the dispatcher in Eau Claire receives the alarm and pages the plant operator, who will then proceed to the project site to inspect the condition or he will call the Hayward office to investigate the problem. Based on the conversation with the licensees representative, it appears that the present arrangement is satisfactory for this project. Emergency numbers and current notification procedures were posted.

C. Environmental, Public Use and Safety

1. Public Safety Plan. By letter dated April 27, 1992, the licensee submitted a Public Safety Plan for the project. Provisions for public safety at this project include:

a. Fencing of the project structures to restrict public access.

b. Warning signs on the upstream side of the spillway and on the downstream sides of the spillway and powerhouse had recently been installed.

WDNR Comments

c. Signs warning of thin ice on the upstream face of the spillway and powerhouse intake structure.

d. A boat-restraining barrier upstream of the dam and powerhouse intake. The boat barrier was in-place during the inspection (Photograph *1*). There are reflective warning signs on the barrier, and the barrier is kept in place all year round. During the winter season, the licensee places "THIN ICE" warning signs on the floats of the barrier.

e. A canoe portage is located on the right shoreline of the reservoir a short distance upstream of the restraining barrier. A sign directs canoeists to the canoe portage.

f. A recreational facility sign is posted on the left shoreline at the left end of the spillway (Photograph *1*).

At the time of inspection, the warning sign at the downstream side of the powerhouse was faded. The licensee indicated they would immediately replace the sign. Public safety provisions are adequate at this time.

No recreational activity was observed during the inspection. The public safety aspects of the project appeared to be adequate. There are existing overhead power lines crossing the reservoir of the project. The power lines are high enough and do not present a danger to the public.

2. Need for Action. None apparent at this time.

3. Environmental and Public Use Inspection. The last environmental and public use inspection was performed by Mrs. Patricia A. Grant, Environmental Protection Specialist, on July 16, 1997. The there were no deficiencies noted requiring remediation. Her report is on file in the Chicago Regional Office. Review of the headwater chart recordings indicated the reservoir was operated in a band between 1187.4 to 1187.2 in July, with high water of 1187.6 in June. There was approximately 14 cfs minimum flow at the time of the inspection. The licensee reported that they were still working on the streamflow gage plan. The WDNR will be directing placement of boulders in the stream for the Sturgeon, the work was planned but had not been completed at the time of the inspection.

D. Matters of Commission Interest

1. Additions, Betterments, Leases, Retirements, or Needed Extensions. None.

WDNR Comments

2. Requiring Commission Action. Nothing to report.

3. Project Compliance. Based on a file review and field inspections, the licensee appears to have been in compliance with all compliance requirements in the license during this report period.

E. Findings and Follow-up Actions

No dam safety deficiencies were found that require immediate remediation. A small depression in the soil was noted behind the sheet pile near the intake which we understand is already scheduled for repair. Minor deterioration of concrete in pier No. 6 and leaking cracks on the rollway should be monitored. The project is being operated and maintained in a safe manner.

No public safety deficiencies were found with the exception of a faded warning sign on the downstream side of the powerhouse. The licensee indicated the sign would be immediately replaced. There were no other public safety deficiencies that would require immediate action. The public safety aspects of the project appeared to be adequate.

Attachments:

1. Pertinent Data Sheet
2. Set of 11 Photographs
3. Exhibit 1

Original and one copy to DIR, D2SI, OHL/RIMS
Richards, K.S./mcl (m:\ksr\wpdocs\2417\2417.op)

WDNR Comments

PERTINENT DATASHEET

Date Run: 9/21/98

----------Chicago Regional Office ... D2SI ... FERC ----------

GENERAL DATA

Dam Number: 02417-01-01
Project Name: HAYWARD
Project Owner: NORTHERN STATES POWER CO (WI
Reservoir Name: HAYWARD
Dam Name: HAYWARD
State,County: WI SAWYER
USGS Quad: HAYWARD 7.5'

LATITUDE(deg/min/sec): 46 0 24
LONGITUDE(deg/min/sec): 91 29 6

River: NAMEKAGON
Rivermile: 45
Drainage Area (sq/mi): 192
Seismic Zone: 1
DS Hazard: L
Dam Height (ft): 20
Hydraulic Height(ft):
Completion Date: 1925
DS City : HAYWARD
Distance (mi): 0

Hydrologic Data

PMF (cfs): 51,580
Flood of Record (cfs): 2,150
Date Flood of Record: 1/1/41
Average Flow (cfs): 175
Minimum Flow Required (Y/N): Y
Minimum flow (cfs): 8

Part 12 Requirements

CSIR REQUIREMENT (Y/N): N

CSIR REPORT HISTORY

Round	Due	Received

Reservoir Data

Normal Surface Area (acres):: 240
Pool Elevation Max (msl): 1,187.50
Normal (msl): 1,187.40
Minimum (msl): 1,187.00
Normal Storage (acre-ft): 1,100
Maximum Storage (acre-ft): 1,900

EAP Status: EXT
Latest EAP/Eap Mod:

PRB Required (Y/N): Y

	Mo	Day
Date In :	1	1
Date Out	12	31

Inspection History

NAME:	STAT	DATE:	TYPE:
RICHARDS	ACT	8/17/98	OP
GRANT	ACT	7/16/97	EPUI
MALHOTRA	ACT	9/10/96	OP
MALHOTRA	ACT	9/19/94	OP
DIDOS	ACT	9/24/92	OP
KLINKENBERG	ACT	6/13/90	EPUI

Project Works

Type of Dam:	ER	TC
Authorised Gen. Capacity (Kw):	168	
Number of Generating Units:	1	
Number of Gates:	10	
Number of Powerhouses:	1	
Number of Penstocks:	0	
Number of Canals:	0	
Number of Tunnels:	0	

Project Notes

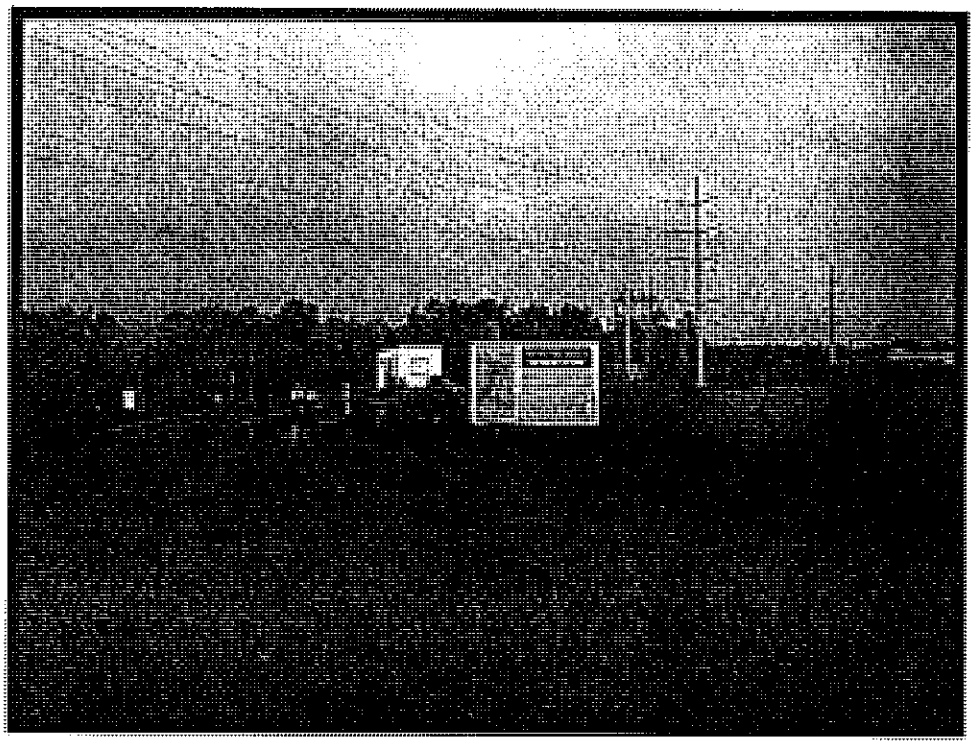
Dam & Spillway: A rock-filled timber crib dam about 300' (91m) long x 20' (6m) high with a concrete spillway 122' (37m) long which is divided into nine bays 12' (4m) wide and 4' (1m) deep and one bay 6' (2m) wide and 45' (14m) deep all closed with flashboards. Remaining portion of dam is earthfill section integral with the powerhouse. Note: Article 402 requires run-of-river operation. Article 402 also stipulates a target pool elevation of 1187.4, with fluctuations allowed between 1187.5 and 1187.0.

Conduit: None.

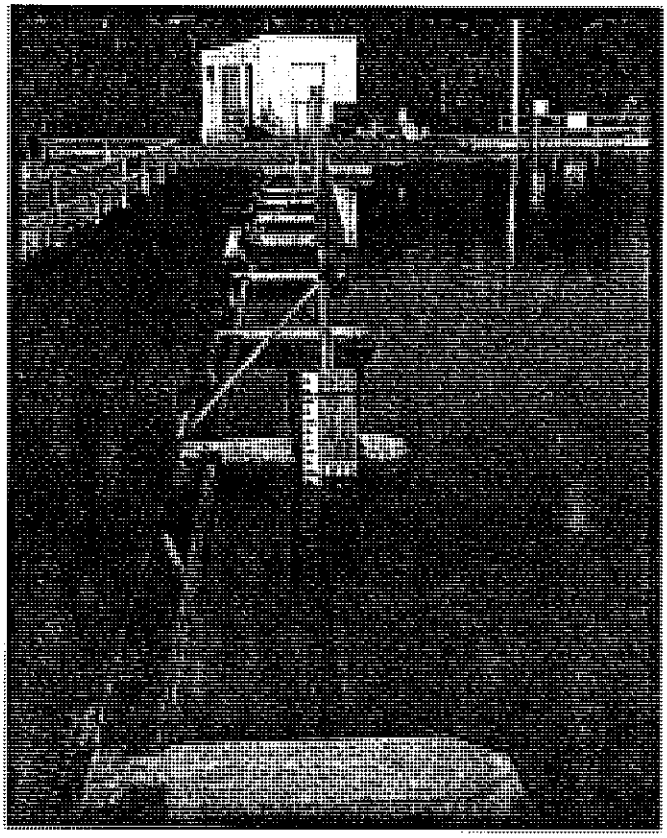
Powerhouse: Brick powerhouse contains a generator of 168 kW capacity at .8 pf and turbine rated at 280 hp (209kW) at 180 rpm.

Substation & Transmission Line(s): None.

WDNR Comments

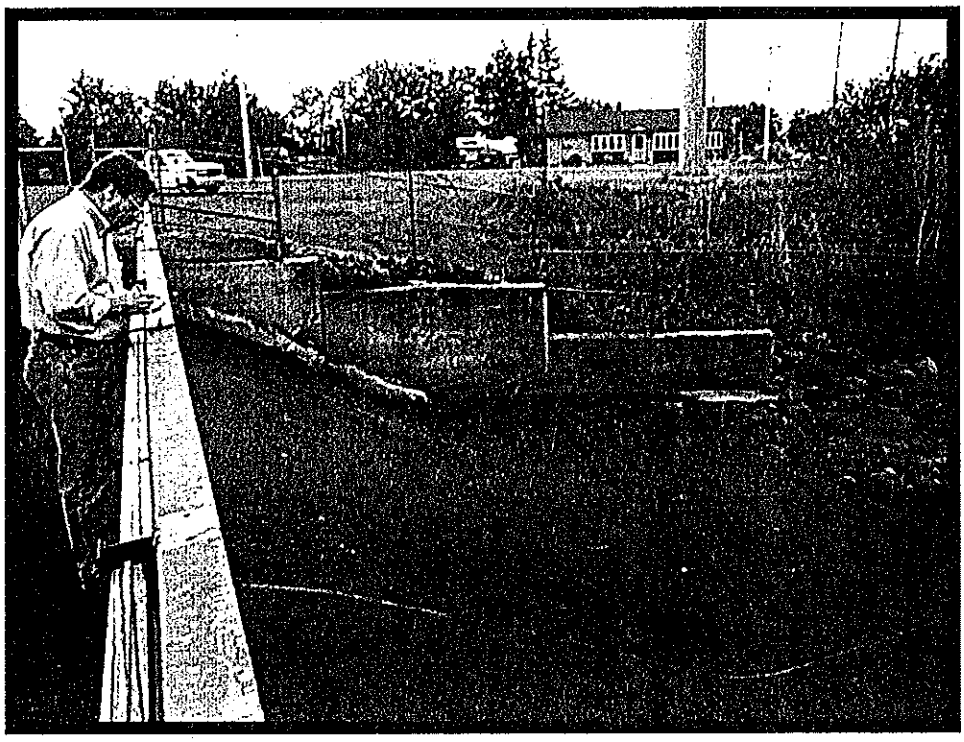


Photograph 1- Project sign, with boat barriers in background.

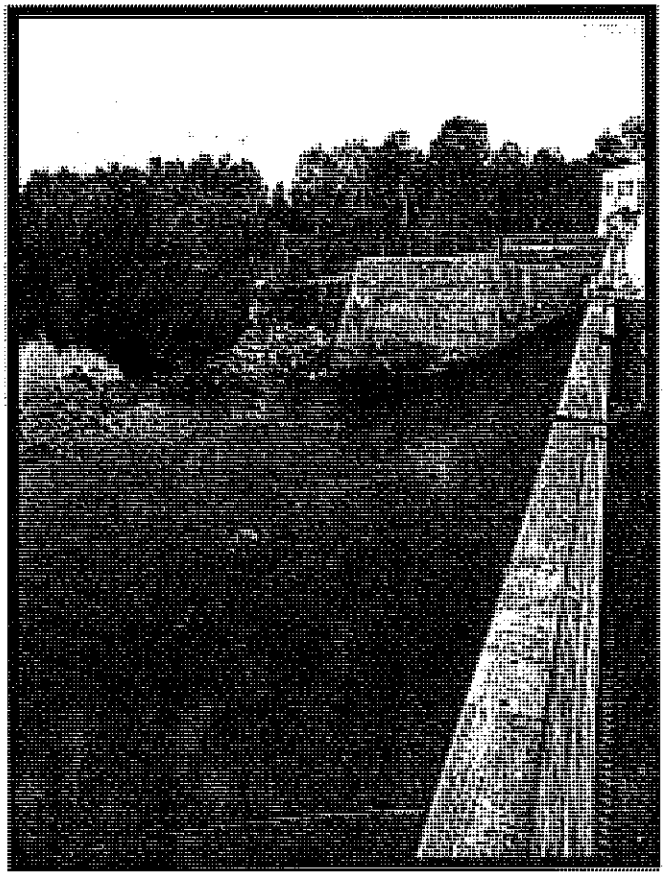


Photograph 2- Piers in good condition.

WDNR Comments

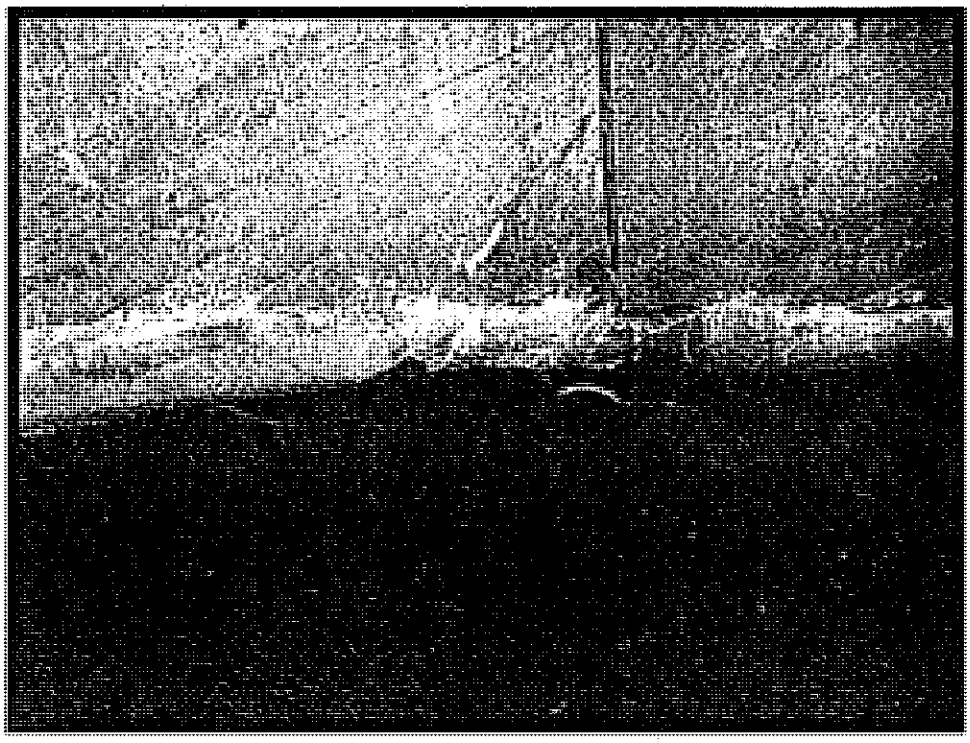


Photograph 3- Spillway and left retaining wall in fair condition, note riprap at end of left retaining wall.



Photograph 4- Leak through spillway surface, minor cracking in right retaining wall.

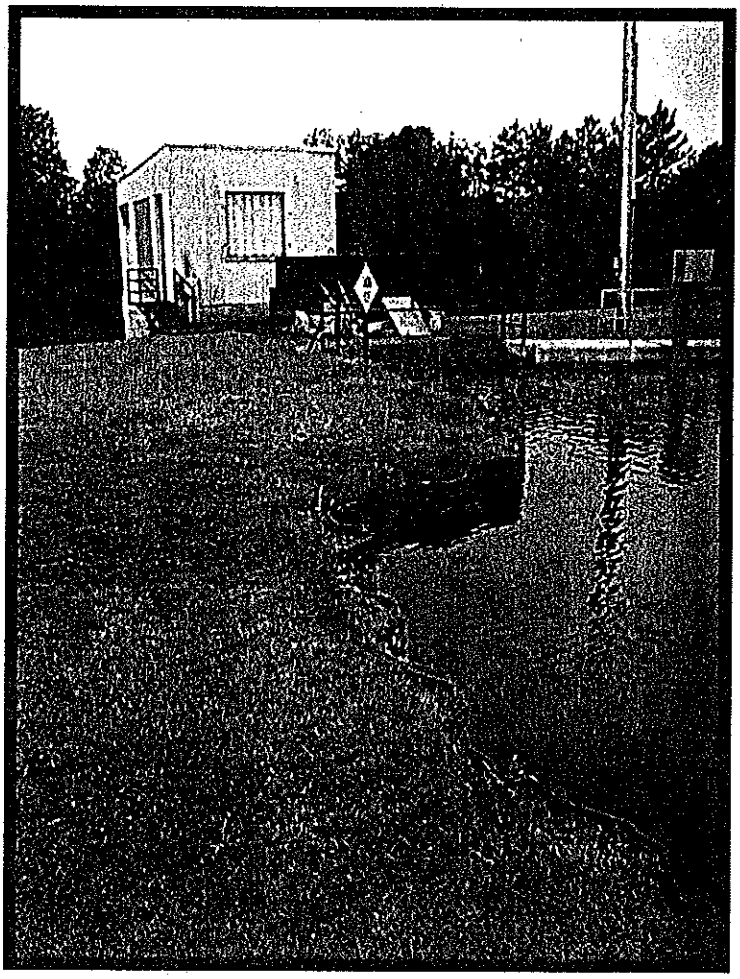
WDNR Comments



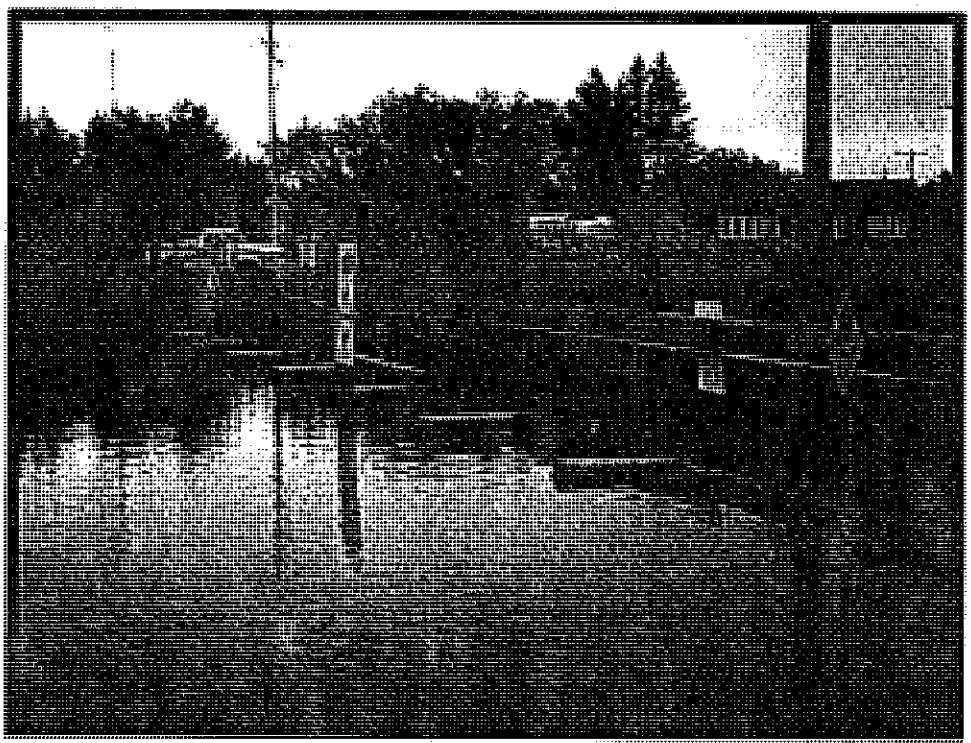
Photograph 5- Leak through spillway surface.

Photograph 6- Downstream area looks stable. WDNR have not installed Sturgeon boulders yet.

WDNR Comments

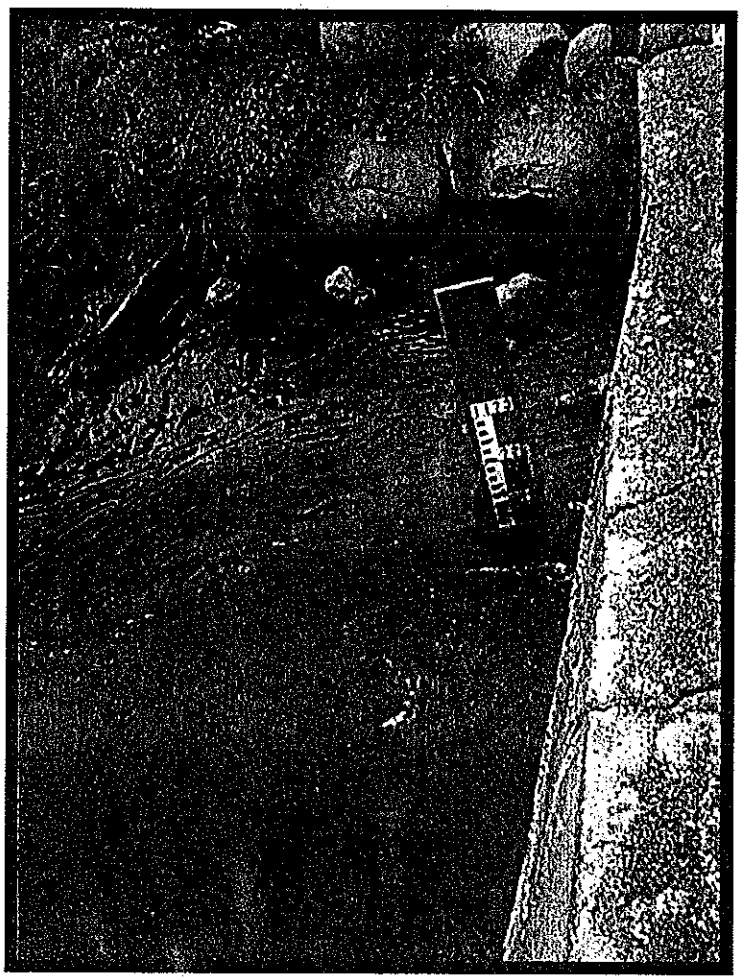


Photograph 7- Intake, left embankment and sheet pile.



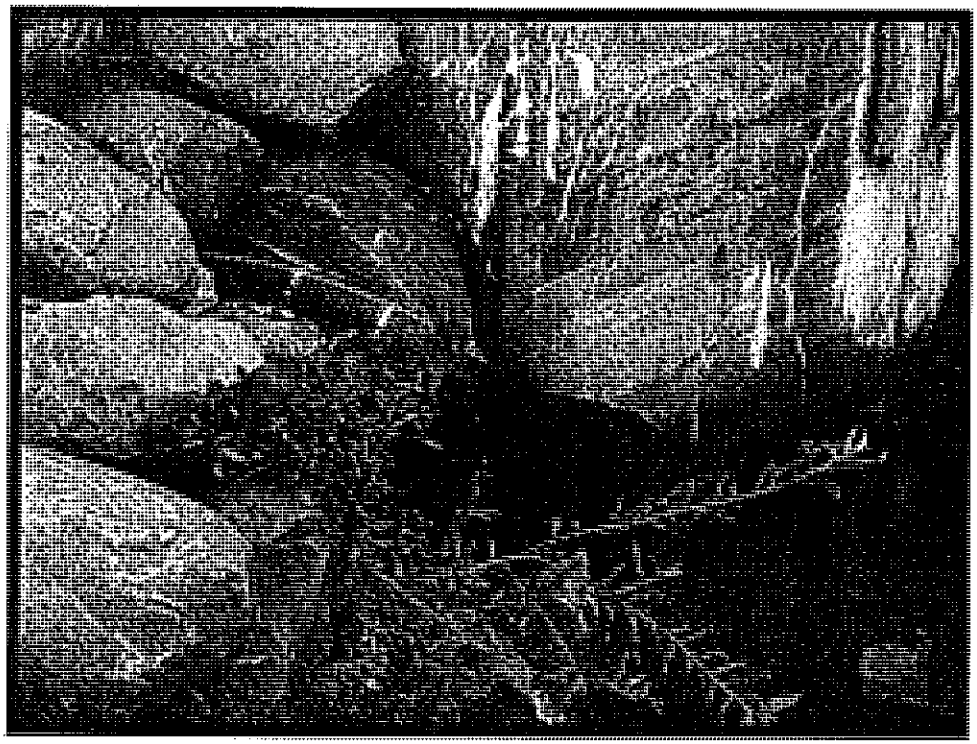
Photograph 8- Warning signs, operator deck and piers in good condition.

WDNR Comments

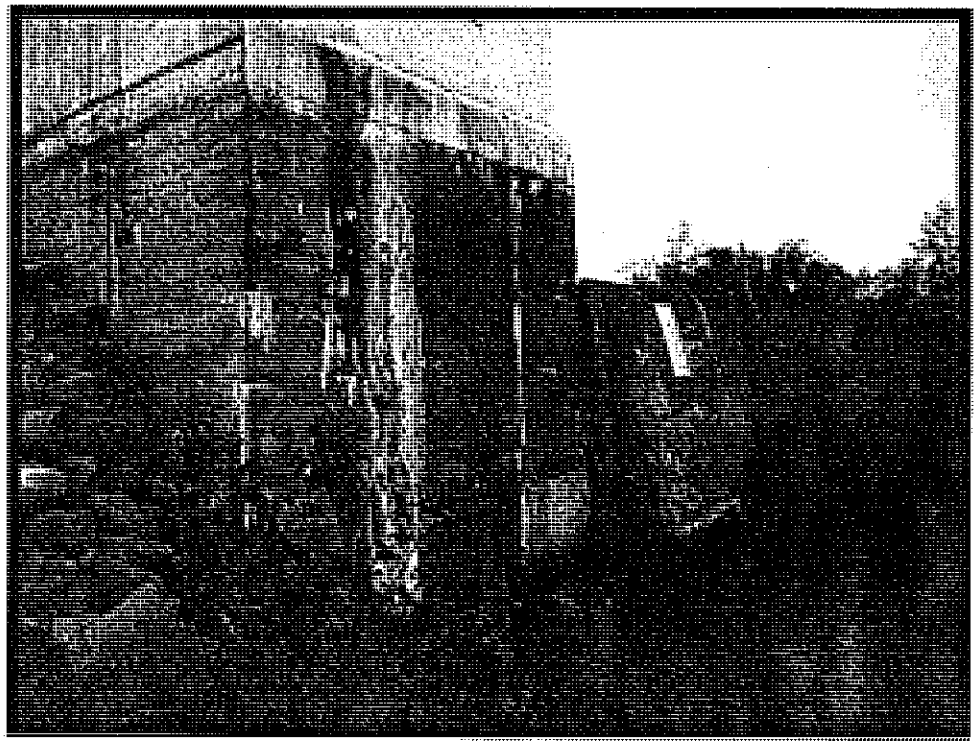


Photograph 9- Tailrace area and downstream staff gage. Note minor cracks in concrete.

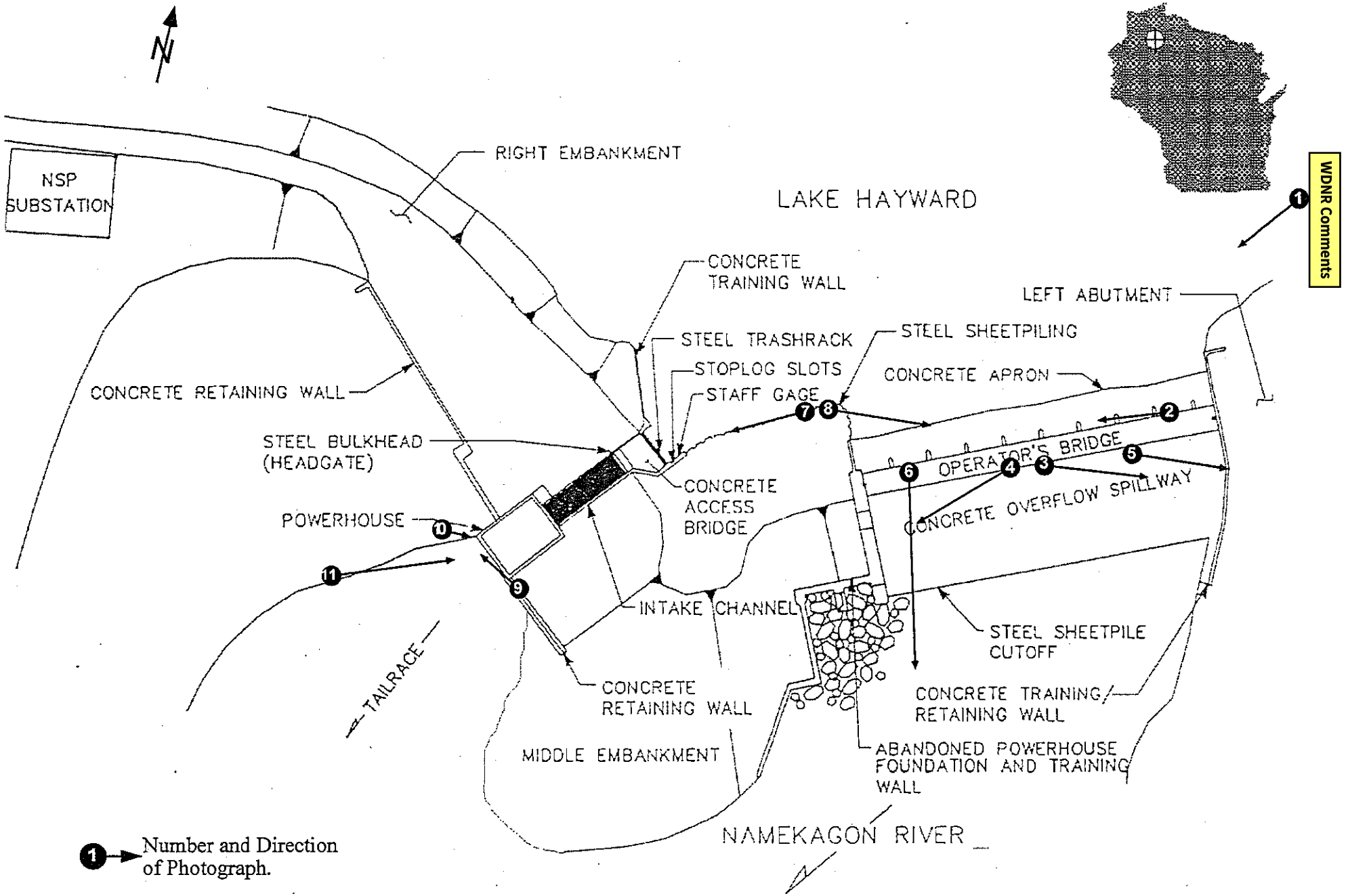
WDNR Comments



Photograph 10- Drain for right embankment flowing at approximately 1 g.p.m.. Note large crack in concrete (also visible in Photograph 11).



Photograph 11- Tailrace area and back of powerhouse. Note faded sign and large crack in concrete.



A-301

Note: Photo 11 was taken from the left bank of the river downstream of the dam.

DATE:	TITLE:	Exhibit 1 Project No. 2417 CRO • D2SI • FERC
112296	Hayward - Plan View of Project Structure Construction Inspection	

WDNR Comments

Summary Sheet

Name of Dam Trego Dam File No. 65.12 County Washburn

Location NW ¼ SW ¼ Section 17 T 40 N, R 12 W

Stream Namekagon River Name of Lake Held by Dam Trego Lake

Present Owner Northern States Power Company

Existing Bench Marks

BM 633-A - a bronze tablet marked Railroad Commission of Wisconsin set on the upstream portion of the right wingwall of the dam several feet upstream from the walk over the tainter gates. The elevation of this wingwall is shown on the plans as being 105.0 feet. 6-17-71

BM 633-B - a square cut in top of upper retaining wall at left of tailrace. Benchmark is in center of gateway leading to tailrace. Elevation when referred to benchmark 633-A is 90.06 feet. 6-17-71

BM 633-C - a bronze tablet marked Public Service Commission of Wisconsin set in concrete post, 55.5 feet NW of power pole, 21.8 feet north of 8-inch Jack Pine, 21.4 feet north of 4-inch Jack Pine, 155 feet NW of NW corner of fence around transformers. Elevation = 107.60 feet. 7-16-65

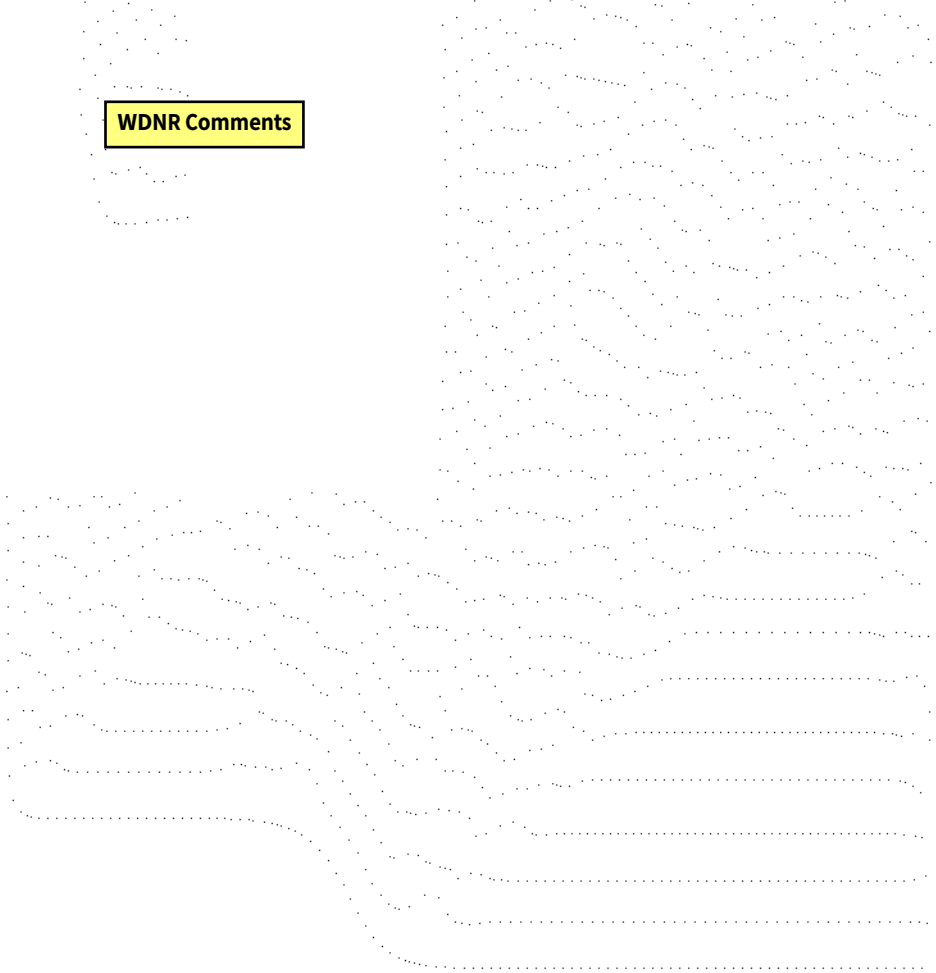
WDNR Comments

WATER LEVEL DATA

Lake or Stream Tegeo Dam

Location Sec 17 T40N R12W, Washburn Co.

Date	Taken By	Field Book #	Lake Level Or Gage Reading	Observed High	Remarks
8/17/27	W.A. Muesse	817	92.79	93.79	
7/16/65	W. Murray	974	99.95		Stge - 99.90
9/7/34	W.A. Muesse	inspection form	98.80	99.00	
9/12/36	W.A. Muesse	"	99.14		Stge - 99' 1 3/4"
10/8/37	"	"	99.02		Stge - 99.05
8/22/45	"	"			Stge - 99' 8"
7/21/49	"	"			Stge - 100.07
8/16/51	"	"			Stge - 100.' 1/4"
9/9/53	"	"			Stge - 90.9
7/9/54	"	"			Stge - 100.1
8/25/55	"	"			Stge - 99.7
7/30/57	"	"			Stge - 99.75
11/6/59	W.S.	"			Stge - 99.11
11/24/64	R.J. Knutter	"			Stge - 99-11 1/2
7/16/65	W. Murray	974	99.95		Stge - 99.90
10/30/65	AKB	inspection form			Stge - 99' 10"
10/24/64	R.J. Knutter	"			Stge - 99.9


WDNR Comments

WDNR Comments

Memorandum

One page
65.12

NAMEKAGON DAM
OWNED BY PEOPLES WISCONSIN HYDRO-ELECTRIC CO.

Submitted by G.P. Steinmetz,
May 28, 1927.

On May 21, 1927, the writer made an inspection of the above dam which is now completed. The headwater was being carried at the elevation of the tainter gate sills or approximately a 20' head.

Several of the riparian owners above have refused to settle for the flowage rights and these lands are now in the process of condemnation. After the necessary flowage lands are acquired by the company it will be necessary to clear these lands before the water may be raised to the full head granted by the permit by this commission.

Bench marks were set under authority granted by Chapter 31.02 of the Wisconsin Statutes.

Bench mark 633A is a bronze tablet marked Railroad Commission of Wisconsin set on the upstream portion of the right wing wall of the dam several feet upstream from the walk over the tainter gates. The elevation of this wing wall is shown on the plans as being 105.0'.

The normal headwater elevation granted by the permit is 97.00' and the normal tailwater elevation is shown on the plans as 69.00'. The top of the tainter gates is shown as 101.00'. Top of walk over tainter gates 107.00'.

WDNR Comments

Memorandum — One page

65.12

BENCH MARKS 633A and 633B
TREGO DAM (NAMEKAGON)
OWNED BY PEOPLES WISCONSIN HYDRO-ELECTRIC CORPORATION
(FIELD BOOK 617)

Submitted by W.A. Muegge,
August 17, 1927.

The dam is located on the Namakagon River in Sec. 17, T. 40 N., R. 12 W., in Washburn County, Wisconsin.

The distance to Trego is about 6-1/2 miles on old S.T.H. 11.

Bench marks were set in accordance with authority granted by Chapter 31.02 of the Wisconsin Statutes, and elevations taken at various points of dam on August 17, 1927.

Bench Mark 633A is a bronze tablet marked Railroad Commission, State of Wisconsin, set in top of upstream end of right dam abutment. Elevation when referred to elevation of top of abutment (105.00) is 105.02 feet.

Bench Mark 633B is a square cut in top of upper retaining wall at left of tailrace. Bench mark is in center of gateway leading to tailrace. Elevation when referred to bench mark 633A is 90.06 feet.

The operator, John Whitmer, states that they have been keeping the water at about its present level, that the highest they have had it is a foot above present headwater, which checks with strong highwater mark.

The following elevations are referred to datum of Bench Marks 633A and B.

Points Taken	Elevations
Headwater	92.79
Highwater mark	93.79
Tailwater - full load	69.58
Top of concrete over gates - right end	106.96
" " " " " - left "	107.03
Top of right gate	101.16
" " center "	101.13
" " left "	101.14
Top of concrete over trash racks	100.92

WDNR Comments

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: January 14, 1991

FILE REF:

TO: Bill Clark

FROM: Larry Damman LD

SUBJECT: Trego Fish Survey

I don't have a lot to add or question on the NSP report. The report is what they found. We did do a fall shocker survey which tends to support some of their findings that:

1. There has been a shift in relative abundance among the species since the 1983 survey. Smallmouth and walleye became more abundant while largemouth became less dominant but still significant to the fishery. Relative increases in abundance of perch and crappie and a decline in bluegill may also be true. However, probably not to the extent indicated. They were too early in the year to get a picture of the bluegill population.

2. Some natural walleye recruitment is occurring. We found a few natural walleye young of the year, although its not certain if this represents reproduction from resident fish or immigrants from upstream areas.

The NSP survey does not address the important issue of entrainment and turbine mortality. Because of the short retention time, significant entrainment is a virtual certainty. It appears that the walleye population is most affected since year classes are weak despite excellent upstream spawning conditions and good habitat within the Flowage. I strongly suspect that walleye fry simply drift down from the spawning grounds and right through the Flowage in the first few days of life. There is no way to prevent losses of fry in such a case. Fingerling stocking appears to contribute to the population and may be necessary to sustain a fishable population.

One very interesting observation on stocked musky fingerling resulted from the fall DNR survey. Musky had been stocked one month prior at the town access near the midpoint of the Flowage. Twenty-nine of these fish were recaptured and many more were observed indicating good initial survival. However, all captures and observations were down stream of the stocking point. Future musky and walleye stockings will be made at Trego Park above the Flowage. This should maximize dispersal to suitable habitat before entrainment can occur.

Based on facility design, I suspect turbine mortality may be low and NSP's tailwater survey at least suggests that entrained fish contribute to downstream fishery. However, we have no hard data here to address entrainment or turbine mortality so additional studies on site or at comparable sites are likely to be required.

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters
Washburn	Trego MWBC: 2712000
Sampling Objective	**Number and Locations of Stations (Habitat)**
Baseline Monitoring	Source
Period Fished (Dates)	Miles Actually Shocked = 4.0 LM
10/07/03	Acres = 451 LM
	Total Miles of Shoreline = 16.9 LM
	Total Miles of Shockable Shoreline = 16.9 LM

GEAR

Boomshocker (Hours)	Time
1.9	√ Night Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)	Characteristics
Boomshocker(s): 1 Mini-boomshocker(s):	Walleye Recruitment Code: C-ST
Dip Netter(s): 2 Dip Netter(s):	

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	7	None	5.6 - 7.6	3.68 / hour	1.75 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	7	None	9.2 - 10.9	3.68 / hour	1.75 / mile
Walleye (Other)	19	12.0-12.4	11.7 - 19.4	10.00 / hour	4.75 / mile
Smallmouth Bass	38	3.5-3.9, 16.5-16.9	3.0 - 19.4	20.00 / hour	9.50 / mile
Largemouth Bass	9	None	3.5 - 13.9	4.74 / hour	2.25 / mile
Muskellunge	1	None	16.5 - 16.9	0.53 / hour	0.25 / mile
Northern Pike	33	9.0-9.4	7.5 - 22.4	17.37 / hour	8.25 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range
Bluegill	Common	1.0-7.5	River Redhorse	Present	12.2-23.9
Pumpkinseed	Present	5.4	Shorthead Redhorse	Present	7.2-12.6
Black Crappie	Present	2.4-9.5	Silver Redhorse	Present	13.6-22.1
Yellow Perch	Present	7.9-9.0	Golden Shiner	Present	
Rock Bass	Present	3.6-7.1	Common Shiner	Present	
White Sucker	Present	12.2	Spottail Shiner	Present	
Golden Redhorse	Common	7.3-18.5	Chestnut Lamprey	Present	8.3

1) Tank Mortality: None 2) Weather: Clear, calm 3) Reliabilty: Medium

4) Stocking: 22,548 Walleye, 1.6 inches, 06/26/03, DNR 1150 Lake Sturgeon, 3.2 inches, 08/05/03, DNR 133 Lake Sturgeon, 10.9, 08/05/03, DNR
760 Lake Sturgeon, 6.5 inches, 09/30/03, DNR

5) Comments:

Rev. 10-70

Signed (Compiler) Scott D. Plaster Date 12/04/03

WDNR Comments

Smallmouth Bass and Muskellunge Fisheries in Northwestern Wisconsin Rivers:

A Guide to the Future Project

5-year report

Max Wolter
WDNR Senior Fisheries Biologist

Dave Neuswanger
Area Team Supervisor

WISCONSIN DEPT. OF NATURAL RESOURCES

WDNR Comments

Foreword and Acknowledgments

The "Guide to the Future" project was initiated in 2012 to meet a data collection need for sportfish populations in some of the most popular rivers in northwest Wisconsin. Five years of partnership between the Wisconsin DNR and the Hayward Fly Fishing Company has generated 1,487 records of guided angler trips. The data from these guided trips has allowed for comparisons of catch rate for smallmouth bass, muskellunge, and other species among rivers, times of year, different river conditions, and more. Collection of this large volume of data would not be possible without the excellent participation of each of the individual guides working for the Hayward Fly Fishing Company including Wendy Williamson, Larry Mann, Stu Neville, Erik Huber, Brett Nelson, and Cory Andraschko. Rarely does science get to be as fun as this project has been. Max Wolter



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WDNR Comments

Summary of Major Findings

- Angler skill accounts for a significant amount of variation in catch rates for both smallmouth bass and muskellunge. Accounting for skill with a correction factor allows for more meaningful comparisons of catch rate, particularly when sample size is limiting.
- Smallmouth bass catch rate (relative abundance) and size structure varied among rivers. Rivers with high catch rate demonstrated smaller size of fish caught, and vice versa.
- Muskellunge catch rate varied among rivers, but size differences among rivers were generally less pronounced. The Namekagon River emerged as a better river for catching larger muskellunge (>40”) than the Chippewa or Flambeau.
- Catch rates for smallmouth bass and muskellunge appeared relatively stable from one year to the next. Smallmouth catch rates were positively related to water temperature and were highest during peak summer (July). Muskellunge catch rates appeared higher in early summer and fall compared to mid-summer, though the relationship was not statistically significant.
- Spatial trends in catch rates for both species within rivers did not demonstrate consistent increases or decreases from upstream to downstream reaches.
- The amount of discharge on a river (cubic feet per second) generally had a negative impact on both smallmouth bass and muskellunge catch rates, though the relationship was typically not statistically significant.
- Catch rates for smallmouth bass were significantly higher under flat water conditions compared to rising water. There was an indication of a similar trend for muskellunge but it was not statistically significant.
- Northern pike catch rates were significantly higher on the Namekagon compared to the Flambeau with the Chippewa being intermediate. Incidental catch of other species like walleye and largemouth bass were rare.

WDNR Comments

Project Objectives and General Methods

Due to a variety of factors including current, water clarity, structural complexity, and access, river fish populations are often not easily (or representatively) sampled by traditional fisheries methods such as netting or electrofishing. On an experimental and voluntary basis from 2012 to 2016, the Wisconsin Department of Natural Resources (WDNR) enlisted a group of river fishing guides who completed hundreds of fishing trips on these rivers annually with their clients while targeting smallmouth bass and muskellunge using fly fishing gear. Records of the effort and catch from these fishing trips can provide important information on relative abundance and size structure of river populations of smallmouth bass and muskellunge in a manner that is efficient to the monitoring agency (WDNR) and informative to the guides, their clients, and other anglers.

WDNR personnel and guides met and developed the following protocol for data collection. For each trip, the guide recorded the catch for each client (typically two people) separately. There was no set schedule or locations that guides were asked to follow with their fishing activities. However, as a result of the use of logical access points, fishing trips were assigned to "reaches" within each river with set start and end points. Each captured fish was recorded on a labeled 12-key mechanical counter corresponding to the angler that caught the fish. Four sizes categories of smallmouth bass (7-11, 11-14, 14-17, and >17 inches) and muskellunge (20-30, 30-40, 40-50, and >50 inches) were recorded. Guides also recorded catches, but not sizes, of northern pike, walleye, and largemouth bass. "Encounters" with muskellunge were recorded whenever a fish followed but did not strike, struck and missed, or was lost after hooking but before landing.

Each guide recorded daily water temperature (degrees F), which was measured in a shaded portion of the river near noon. Guides also recorded "mitigating conditions" (inclement weather, challenging water level, off-color water, etc.) that they judged may have negatively impacted fishing success. Data on river discharge (cubic feet per second) was obtained for each day from nearby USGS or hydropower dam gauges. Short-term variation in discharge was calculated and expressed as the most recent 3-day change in discharge (noon discharge three days prior minus noon discharge on day of fishing). Based on this calculation, river conditions on each day of fishing were classified as either falling (≥15% *decrease* in discharge over 3-day period), stable (<15% change in discharge over 3 day period), or rising (≥15% *increase* in discharge over 3-day period).

Data were entered into an Excel database and analyzed using R software. Trips when guides noted "mitigating conditions", as described above, were excluded from all analyses unless specified otherwise. Similarly, only trips where at least four hours of targeted effort for a species were used for analyses of that species. A non-parametric Kruskal-Wallis test was used to make statistical comparisons of catch rates across classes of data (i.e. different rivers, months) because of non-normal shape of the catch rate data. When significant differences were found between classes, multiple comparison analysis was made using a Dunn Test with a Holm modification of the Bonferroni adjustment. Comparisons between catch rate and river discharge or temperature were made using standard linear regression. Results of statistical tests were considered significant at P values less than 0.05.

WDNR Comments

Study Area

There was no set schedule or locations that guides were asked to follow with their fishing activities. However, as a result of the use of logical access points, fishing trips were assigned to "reaches" within each river with set start and end points. In this report these are labeled with the river name (or abbreviation) and a number corresponding to the relative downstream location of the reach within that river (e.g., Chippewa 4 is downstream from Chippewa 3). To protect the proprietary information of these guides, the specific start and end points of each reach are not presented in this report. Individual reaches were rarely fished on sequential days. Three rivers were primarily fish by the guides– the Flambeau (Figure 1, Price and Sawyer counties), Chippewa (Sawyer and Rusk counties), and Namekagon (Sawyer, Washburn, and Burnett counties). However, data was also collected on the West Fork of the Chippewa River (Sawyer County) and the St. Croix River (Burnett County). Because of smaller sample size, these two rivers are not included in all analyses.

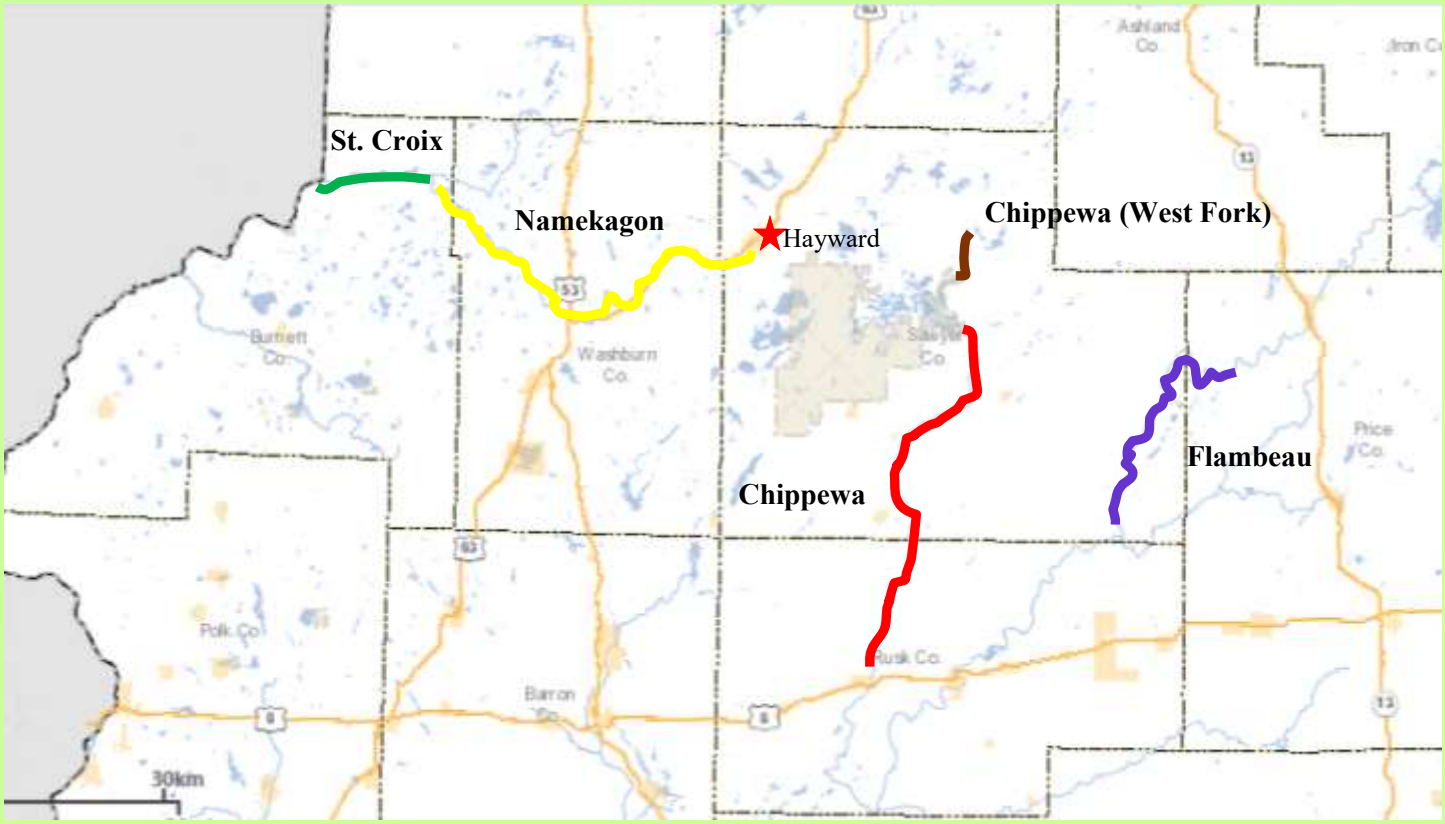


Figure 1. The sections of rivers fished by guides in the "Guide to the Future" fisheries data collection program. Each river is broken into multiple reaches that are fished for single-day float trips. Hayward, the home base for the guides, is denoted with a star.

WDNR Comments

Description of Angling Effort and Skill

Fishing effort for guides varied considerably among rivers, with the Namekagon River receiving the most total trips and hours of targeted effort for each species (Table 1). Most guided trips took place between June and October. October had the most overall trips (353) followed by July (278) and August (224). Trips in the summer (May-August) were more likely to target smallmouth bass while trips in the fall (September-November) are more likely to target muskellunge.

Table 1. Total number of angler trips and hours spent targeting muskellunge (musky) and smallmouth bass between 2012 and 2016 as a part of the Guide to the Future project.

River	Total trips	Hours targeting musky	Hours targeting smallmouth bass
Chippewa	315	1,035	1,194
Chippewa (West Fork)	70	161	295
Flambeau	155	677	493
Namekagon	851	2,086	3,987
St. Croix	94	481	189

It was known at the onset of this project that anglers fishing with guides would have wide variation in their skill, which would likely affect catch rate data. To account for this, we asked guides to discreetly assign a skill level rating to each client. Assignment of a skill level rating was done early in the trip and was based on casting ability and prior experience so rating would not be influenced by the day's catch. The three rating categories were inexperienced/beginner, average, or expert.

As expected, catch rates for both muskellunge and smallmouth (Figure 2) differed by angler skill level. To prevent this known source of variation from influencing other comparisons, we developed a correction factor to standardize catch rates. Multipliers were applied to catch rates in each skill level (Table 2).

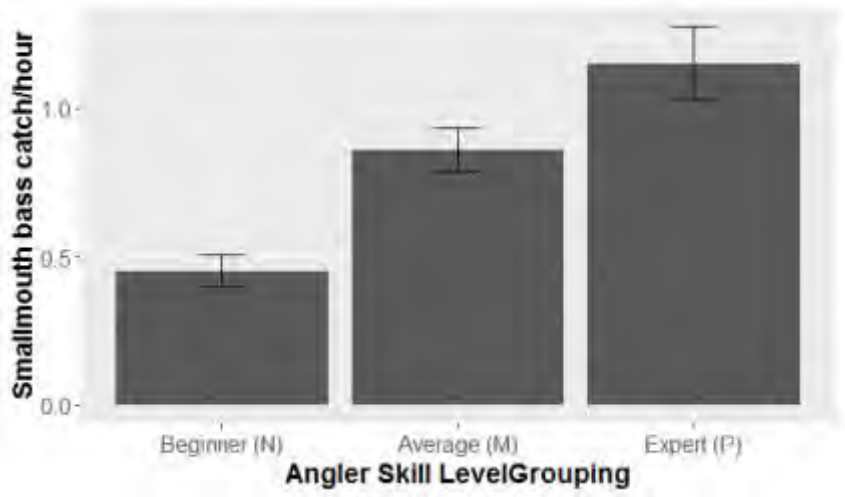


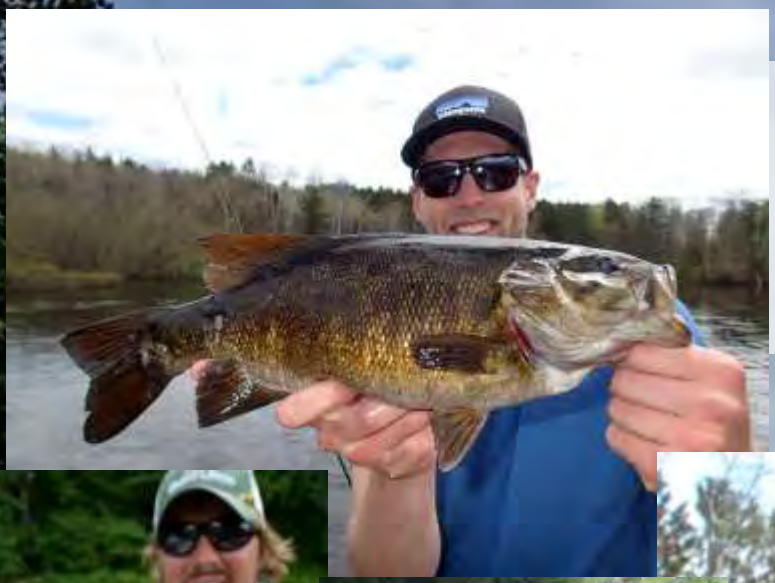
Figure 2. Catch rates (number of fish per hour of targeted angling effort) for smallmouth bass by anglers of different skill levels, shown with no correction factor applied. Error bars represent 95% confidence intervals. Skill levels were assigned by guides to account for the expected variation in catch due to individual anglers' fishing experience. Differences between the three skill levels were used to develop a correction factor to account for this variation when making other comparisons (i.e. catch rate among rivers).

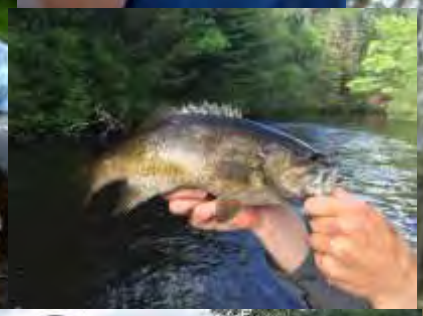
Table 2. Correction factors applied to smallmouth bass and muskellunge catch rates.

	Beginner	Average	Expert
Smallmouth Bass	2.0	1.0	0.75
Muskellunge	1.5	1.0	0.5

WDNR Comments

SMALLMOUTH BASS ABUNDANCE AND SIZE





WDNR Comments

Smallmouth Bass Relative Abundance and Size

Smallmouth bass are well-suited for life in shallow rocky riverine habitats and as a result they are one of the most abundant sportfish in many northern Wisconsin rivers. Smallmouth bass are a popular target for anglers fishing either from shore or on float trips, yet little is known about the relative abundance of smallmouth in one river compared to the next or how size distribution compares among rivers. Data collected by guides demonstrated significantly different catch rates for smallmouth bass among five northwestern Wisconsin Rivers (Figure 3). Differences in catch rate are assumed to reflect differences in abundance.

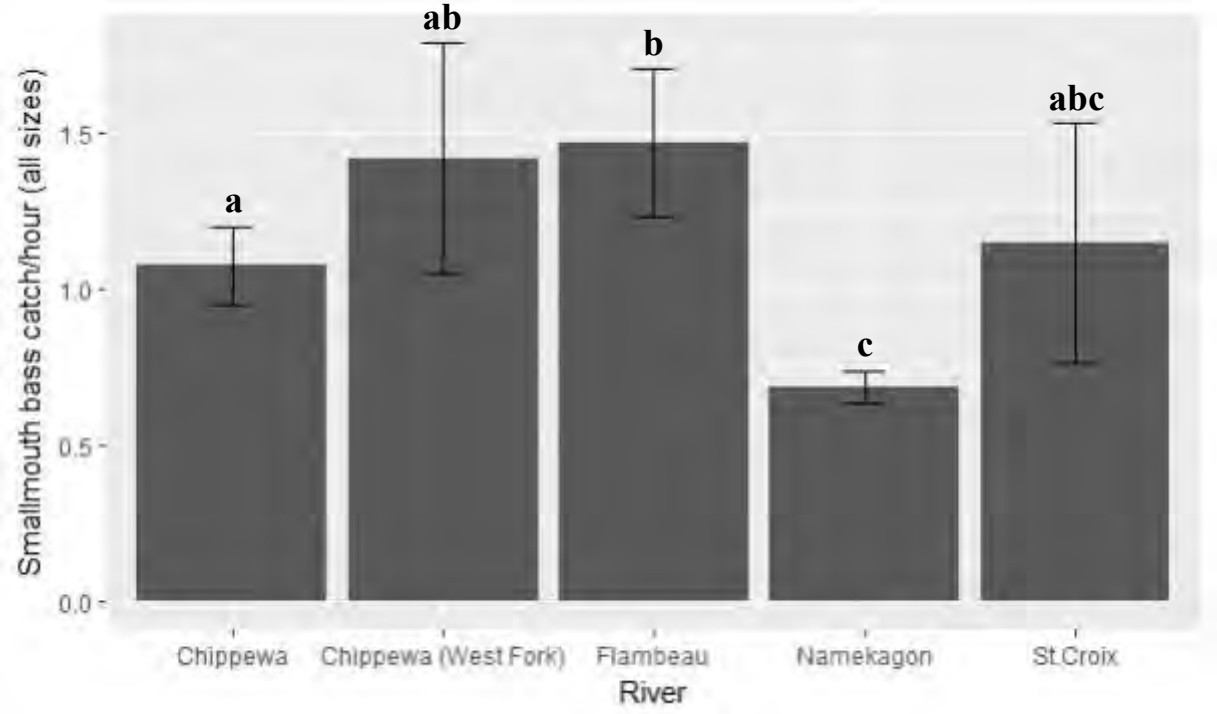


Figure 3. Skill level corrected catch rates (number of fish per hour of targeted angling effort) for smallmouth bass by river from 2012-2016. Error bars represent 95% confidence intervals. Statistically different groupings are denoted with letters.

Variation in overall catch rate of smallmouth bass among rivers is driven by variation within specific size classes. Comparing just the three rivers with the largest volume of data, the catch rates for smaller smallmouth bass was significantly higher on the Flambeau River than on the Chippewa or Namekagon (Table 3). However, catch rate for larger smallmouth bass (>17 inches) was significantly higher on the Namekagon River than the Chippewa or Flambeau. These three rivers offer differing fishing experiences. The Flambeau would be considered more of an action destination, with high overall catch rates but smaller fish, while the Namekagon is clearly more of a trophy opportunity with lower catch rates but higher catch of large smallmouth.

Table 3. Skill level corrected catch rates (number of fish per hour of targeted angling effort) of smallmouth bass by size class for three northwestern Wisconsin Rivers from 2012-2016. Statistically different groupings are denoted with letters.

Size Class	Chippewa	Flambeau	Namekagon
7-11 inches	0.38 (±0.07)[b]	0.70 (±0.16)[a]	0.10 (±0.02)[c]
11-14 inches	0.39 (±0.06)[a]	0.44 (±0.09)[a]	0.20 (0.02)[b]
14-17 inches	0.24 (±0.05)	0.30 (±0.08)	0.27 (±0.03)
>17 inches	0.07 (±0.02)[b]	0.03 (±0.02)[b]	0.11 (±0.02)[a]
All sizes	1.07 (±0.12)[b]	1.47 (±0.24)[a]	0.69 (±0.05)[c]

WDNR Comments

Smallmouth Bass Size Structure

Based on reported data from guides, size structure of smallmouth bass varied considerably among rivers. Catch in the Flambeau River was dominated by smaller bass, while catch in the Namekagon was predominantly larger fish, the Chippewa River catch was intermediate with the three smaller size classes represented fairly evenly in the catch (Figure 4). In the Flambeau, only 22% of smallmouth caught were over 14 inches, while on the Chippewa 33% were over 14 inches, and on the Namekagon 56% were over 14 inches. Interestingly, all three rivers have the same fishing regulations. It is not clear why the apparent difference in size structure among rivers exists. It appears, based on catch rate, that density of smallmouth bass is higher in the Flambeau River which may lead to slower, density-dependent growth. It is possible that prey availability differs among these three rivers independent of smallmouth bass density. Mortality may also play a role in structuring these smallmouth bass populations. If mortality of adult smallmouth bass is higher on one river compared to another it may result in differing size structure. Mortality could be due to environmental conditions, including overwintering habitat, or angler harvest, though harvest is believed to be minimal on all three rivers. A growth rate and age structure analysis would be beneficial to better understanding dynamics of these populations.

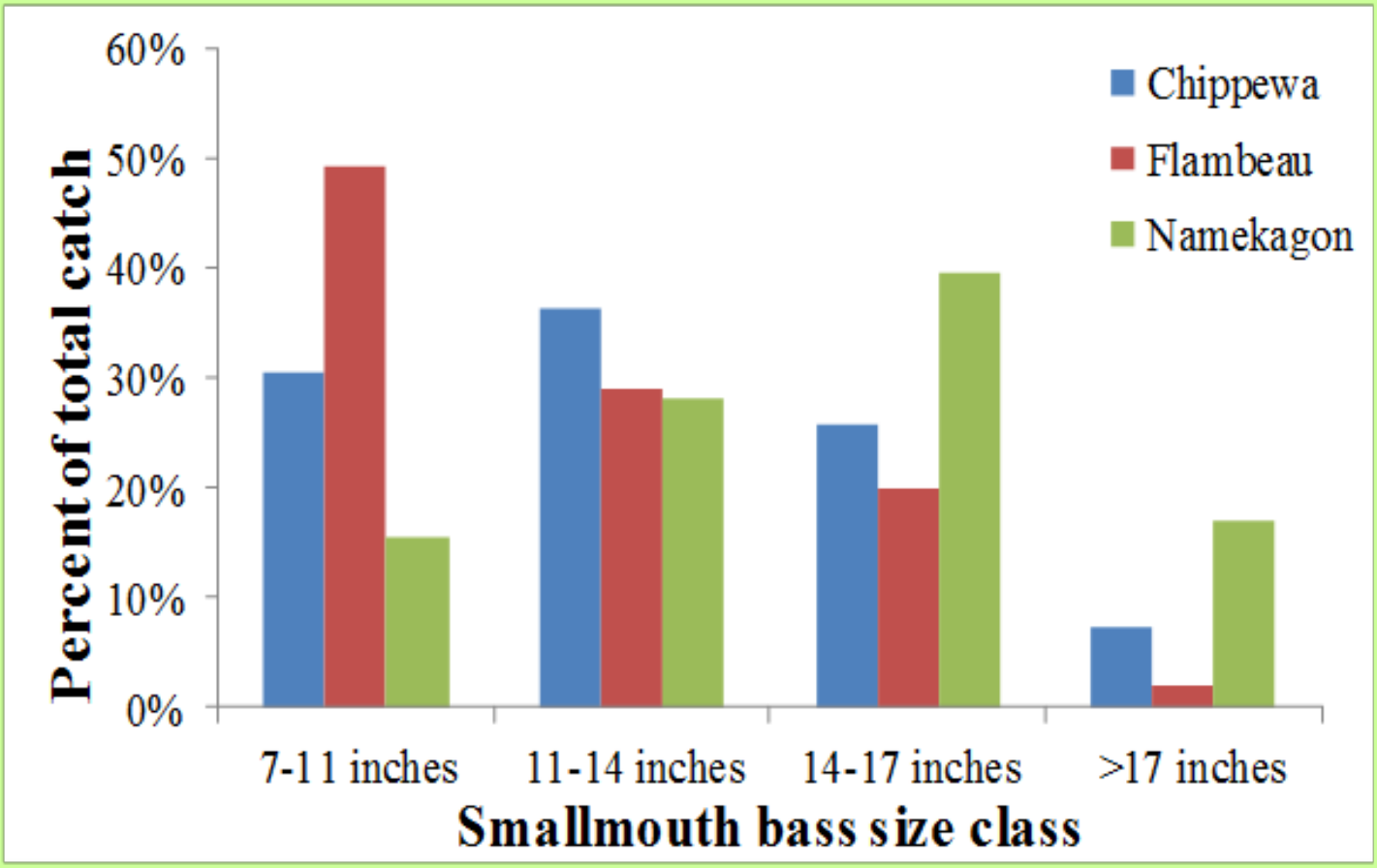
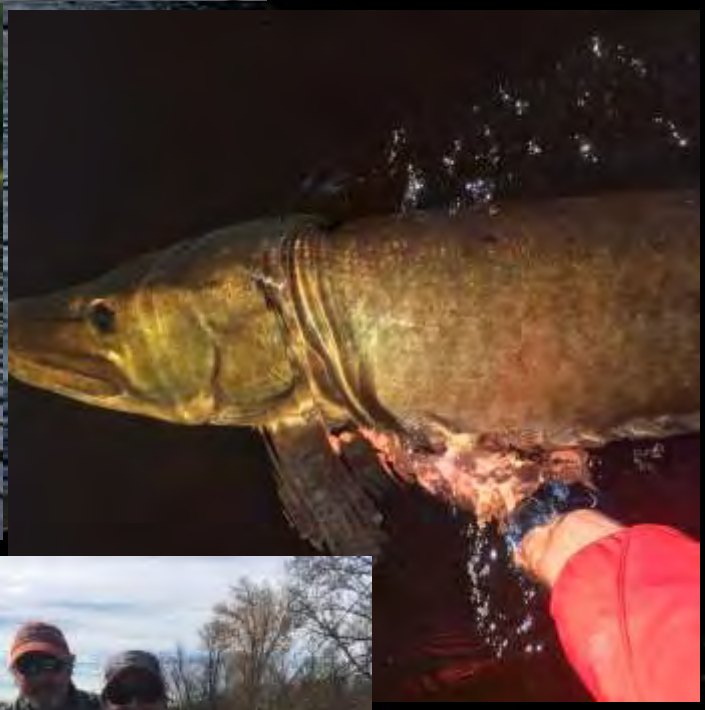


Figure 4. Smallmouth bass catch by size category for three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016.

WDNR Comments

MUSKELLUNGE ABUNDANCE AND SIZE



Muskellunge Relative Abundance and Size

Interpreting muskellunge catch rate data was made more difficult by the high degree of variation that inevitably exists when dealing with a species that occurs in low abundance and is challenging to catch. However, five seasons of data collection have provided enough data to start making statistical comparisons of muskellunge catch. Data collected by guides demonstrated significantly different catch rates for muskellunge among five northwestern Wisconsin Rivers (Figure 5). Differences in catch rate are assumed to reflect differences in abundance.

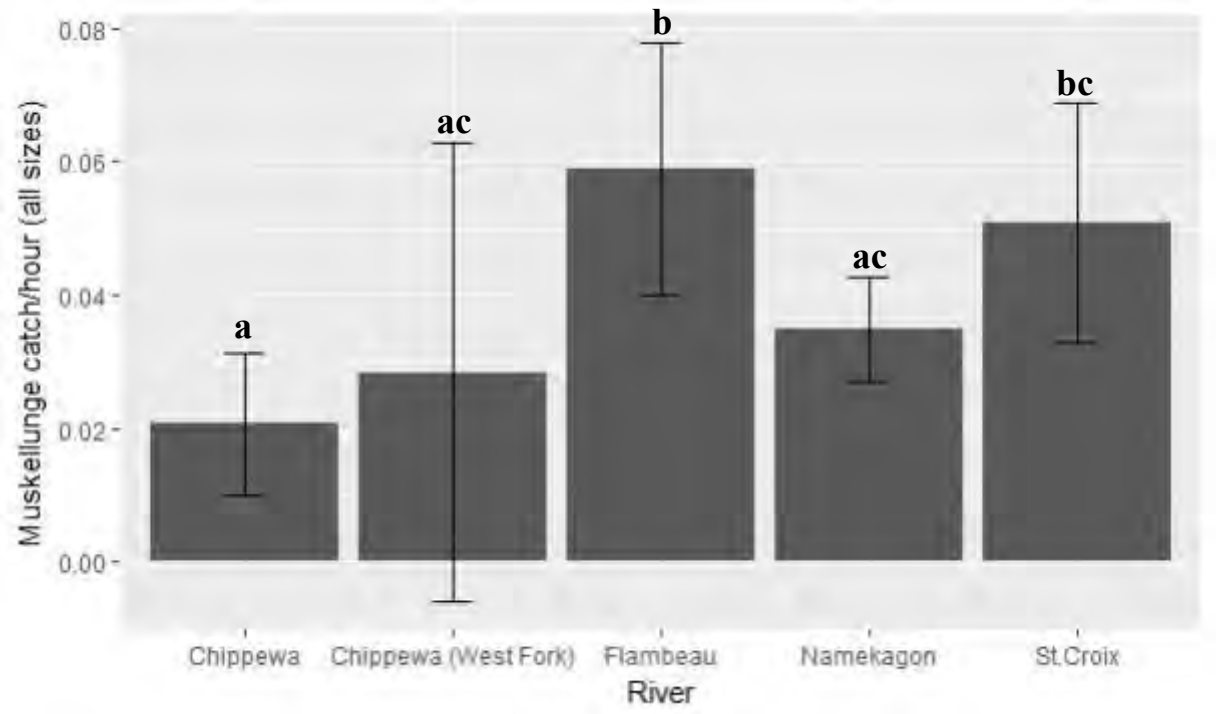


Figure 5. Skill level corrected catch rates (number of fish per hour of targeted angling effort) for muskellunge by river from 2012-2016. Error bars represent 95% confidence intervals. Statistically different groupings are denoted with letters.

Variation in overall catch rate of muskellunge among rivers was driven by variation within specific size classes. Comparing just the three rivers with the largest volume of data, the catch rates for smaller muskellunge (20-30 inches and 30-40 inches) were significantly higher on the Flambeau River than on the Chippewa or Namekagon (Table 4). However, catch rate for larger muskellunge (>40 inches) was significantly higher on the Namekagon River than the Chippewa or Flambeau. Catching a musky is rare under any circumstances, but the average catch rate of muskellunge by guided anglers as a part of this project (17.1 hours of fishing per musky) compare favorably to catch rates for anglers on lakes (~33 hours of angling per musky).

Table 4. Skill level corrected catch rates (number of fish per hour of targeted angling effort) of muskellunge by size class for three northwestern Wisconsin Rivers from 2012-2016. Statistically different groupings are denoted with letters.

Size Class	Chippewa	Flambeau	Namekagon
20-30 inches	0.008 (±0.006)^{b}	0.033 (±0.017)^{a}	0.013 (±0.005)^{b}
30-40 inches	0.011 (±0.008)^{b}	0.024 (±0.011)^{a}	0.013 (±0.005)^{b}
40-50 inches	0.002 (±0.003)^{b}	0.003 (±0.003)^{ab}	0.009 (±0.004)^{a}
>50 inches	0.000	0.000	0.001 (±0.001)
All sizes	0.021 (±0.011)^{b}	0.059 (±0.019)^{a}	0.035 (±0.008)^{b}

WDNR Comments

Muskellunge Size Structure

Based on reported data from guides, size structure of muskellunge varied slightly among rivers. Catch in all three rives is dominated by fish in the 20-40 inch range (Figure 6). The Namekagon River has demonstrated the best size potential evidenced by a larger percentage of the catch being over 40 inches and producing the only 50 inch muskellunge recorded by guides and their clients during the span of this project.

The relative infrequency of muskellunge over 40 inches being caught by guided anglers on these rivers is of interest. Many of the rivers fished as a part of this project are connected to impoundments which generally have larger fish than what was being caught in the rivers. The discrepancy in size structure between impoundments and rivers may be due to gear selectivity where fly fishing disproportionately targets the smaller sized muskellunge. But it may also be a result of habitat selection by larger fish, slower growth of fish inhabiting rivers, higher mortality of adult muskellunge in rivers, or other factors. More exploration into these trends is warranted.

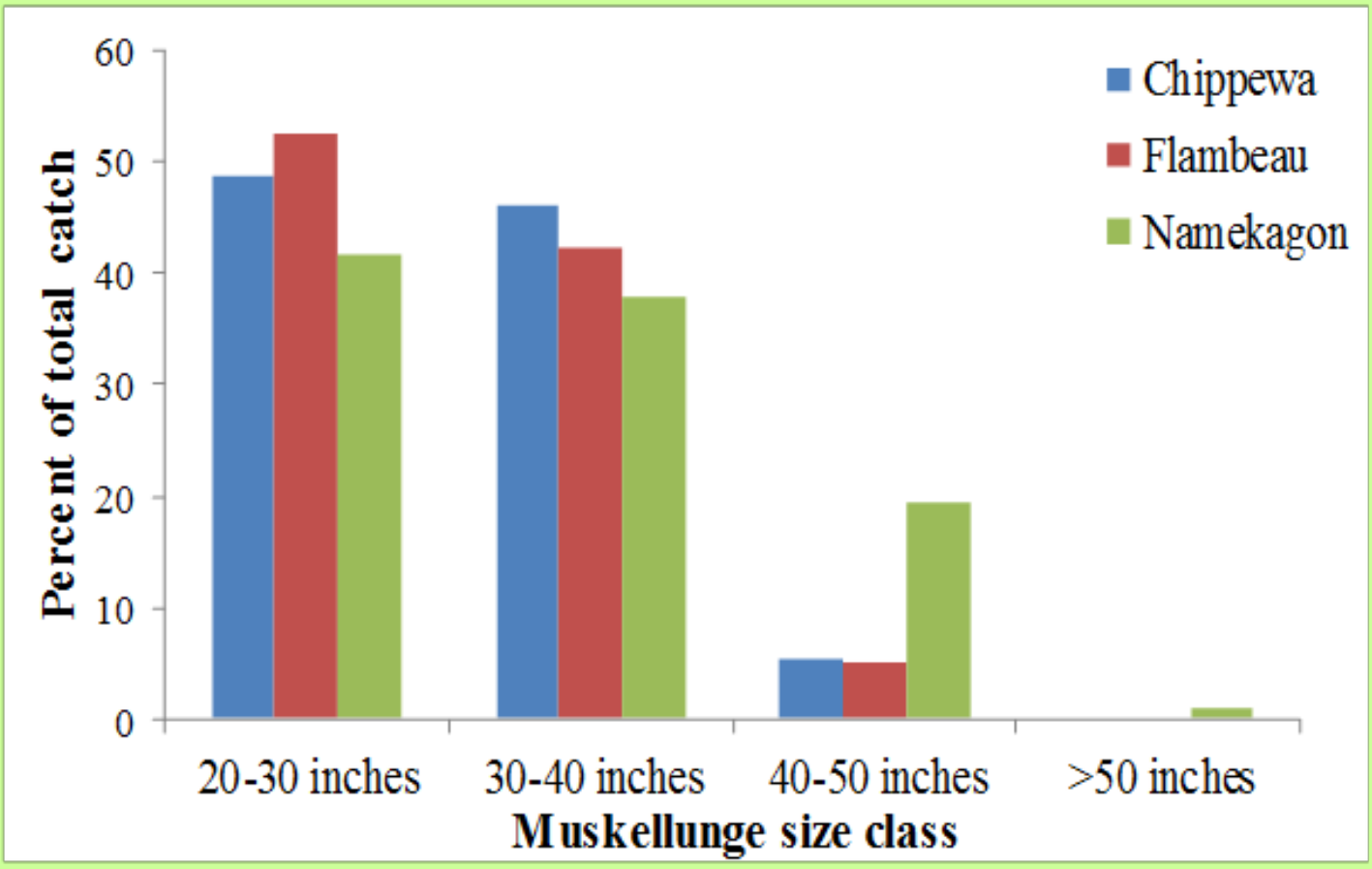


Figure 6. Muskellunge catch by size category for three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016.

WDNR Comments

TEMPORAL TRENDS IN CATCH RATES

WDNR Comments

Catch By Year

Clear trends in catch rate by year within individual rivers were not always evident for either species. Catch rate for smallmouth bass on the Namekagon has been remarkably consistent across time. Catch rate for smallmouth bass on the Flambeau River demonstrated the greatest oscillation (Figure 7). Year-to-year data for muskellunge catch rate on the St. Croix and West Fork Chippewa rivers was limiting and therefor those rivers were excluded from that analysis. Other rivers demonstrated relatively consistent catch rates for muskellunge, with some evidence of declining catch rate for the Chippewa River. Once again, catch rate data for muskellunge was marked by a high degree of variability.

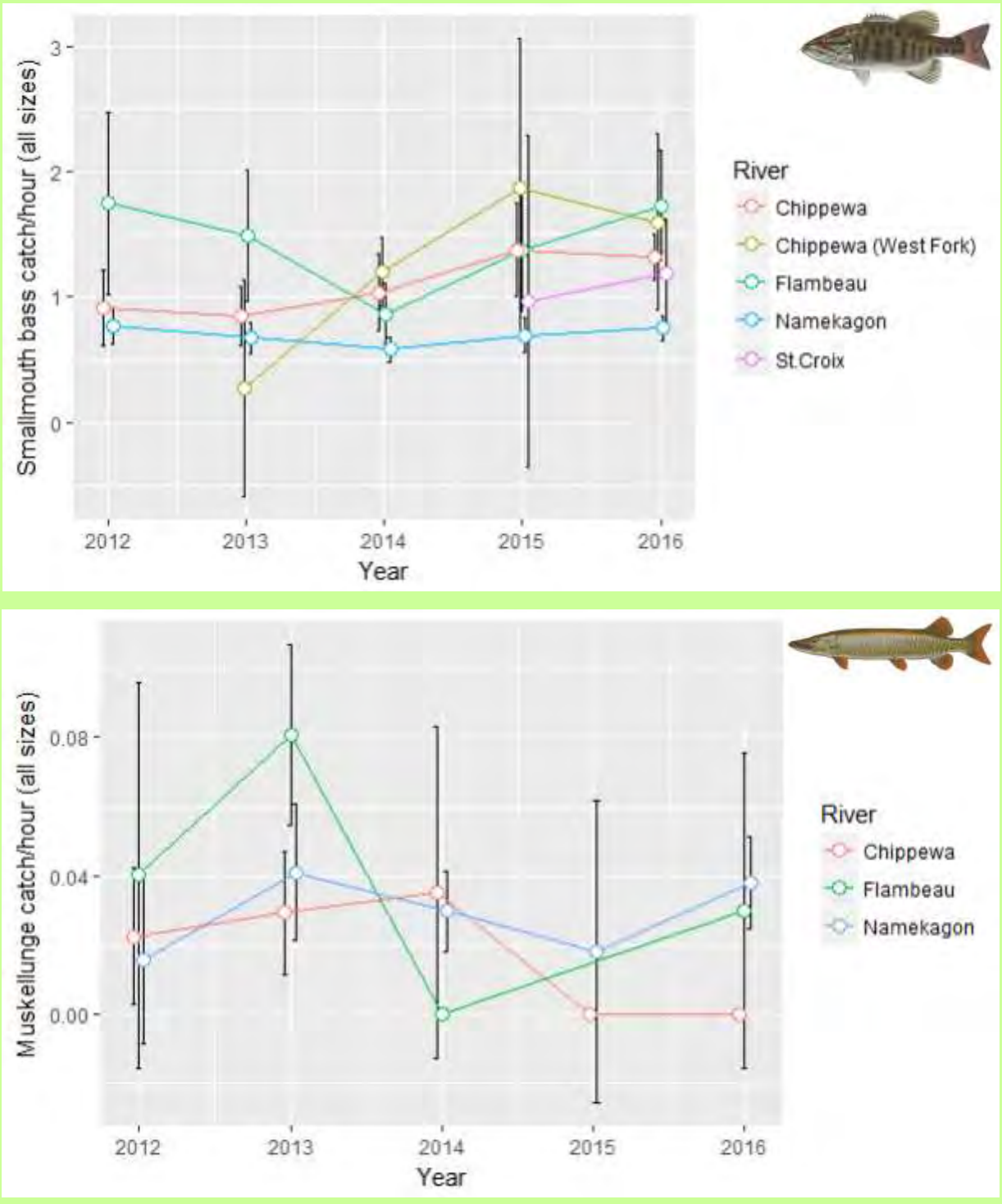


Figure 7. Smallmouth bass (top panel) and muskellunge (bottom panel) skill level corrected catch rates in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals.

WDNR Comments

Catch By Month

Catch rates by month showed interesting patterns for both smallmouth bass and muskellunge, though differences were not always statistically significant. For smallmouth, catch rate was higher in July than in the cooler months of June and September (Figure 8). Guides have anecdotally reported poor success targeting smallmouth in these rivers after September, and as a result very little smallmouth bass data exists for those months. Catch rates for muskellunge showed an inverse pattern to smallmouth, with generally higher catch in cooler months (early summer and fall), though there were not statistically significant differences among months. It should be noted that muskellunge catch data from summer months is more limited since guides are typically targeting smallmouth bass at that time. Trips targeting muskellunge in December have been rare, but successful.

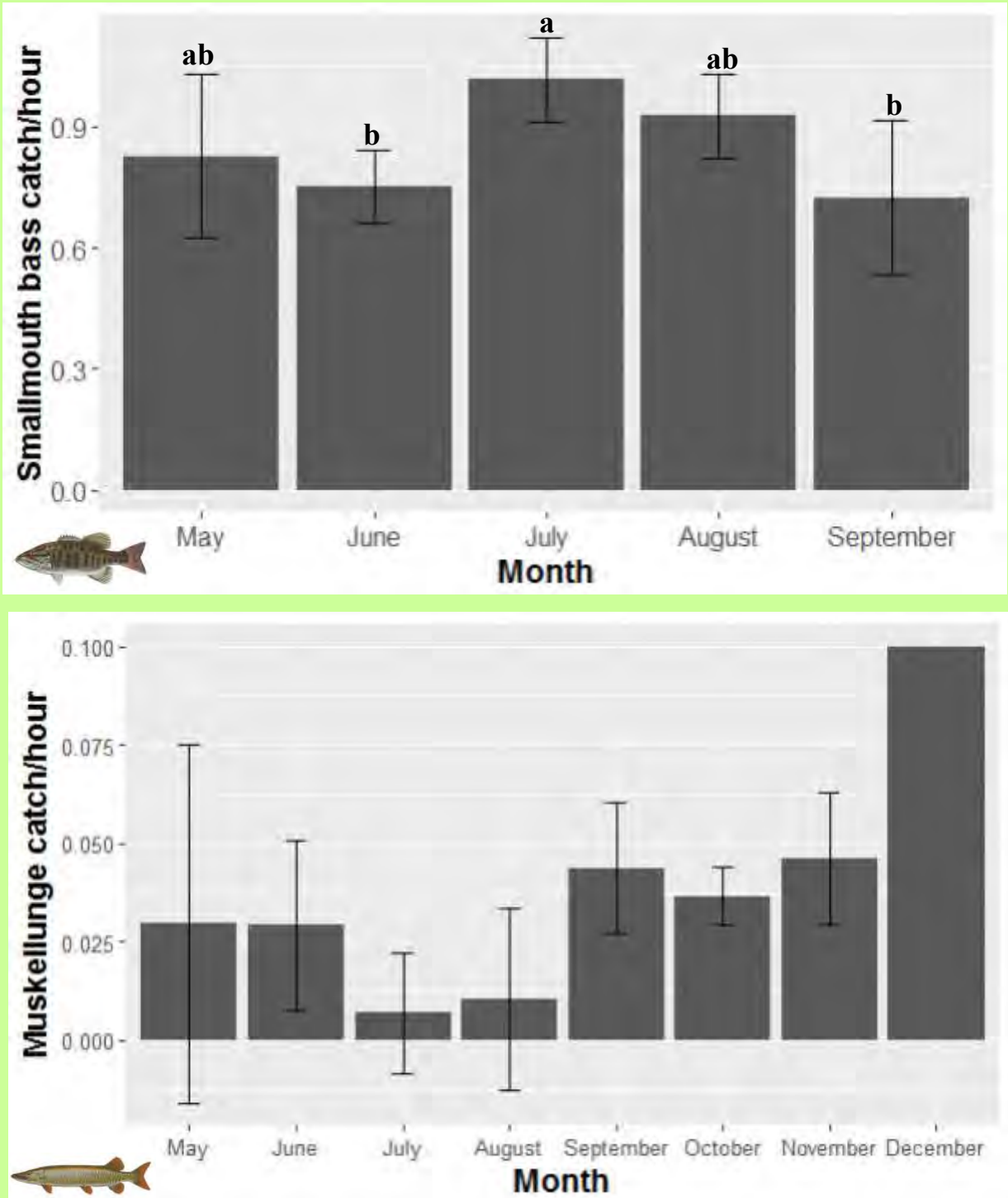
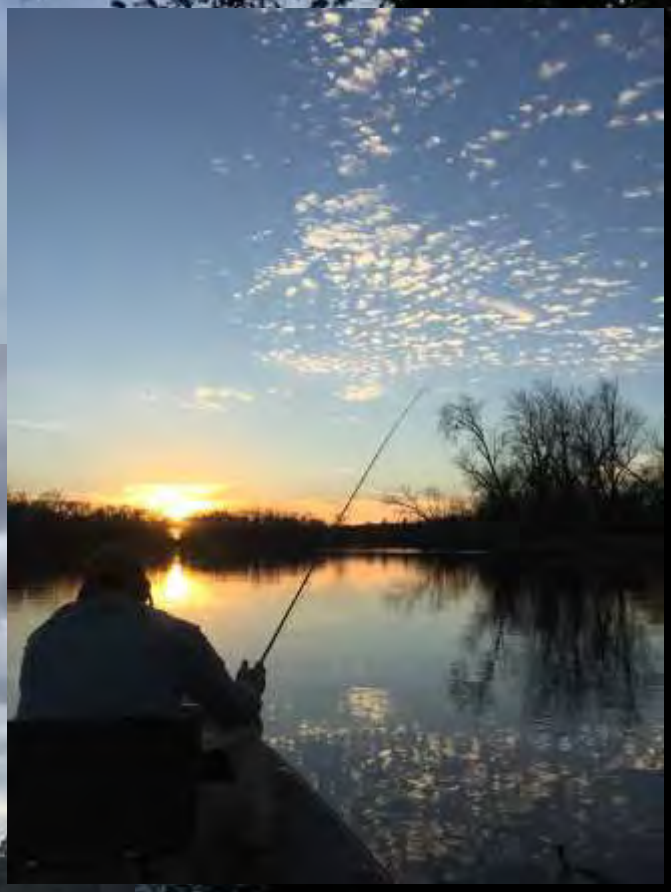


Figure 8. Smallmouth bass (top panel) and muskellunge (bottom panel) skill level corrected catch rates by month in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings.

WDNR Comments

SPATIAL TRENDS IN CATCH RATES



WDNR Comments

Smallmouth Bass Catch By River Reach

Smallmouth bass catch rate across different reaches within the same river did not reveal many consistent patterns (Figure 9). For example, there was no evidence that smallmouth bass catch rate consistently increased or decreased from upstream reaches to downstream reaches. Catch rates on the Chippewa River were significantly lower at Chip3 compared to Chip1 and Chip5, but no other trends were present. Catch rates on the Flambeau and Namekagon were statistically similar across all reaches. Given that few differences in catch rate were observed, one can conclude that smallmouth bass fishing quality is generally similar along the entire stretch of each river fished by guides as a part of this project. It also indicates that there are few major habitat issues (dams, impaired discharge, etc.) that limit smallmouth bass populations in particular reaches.

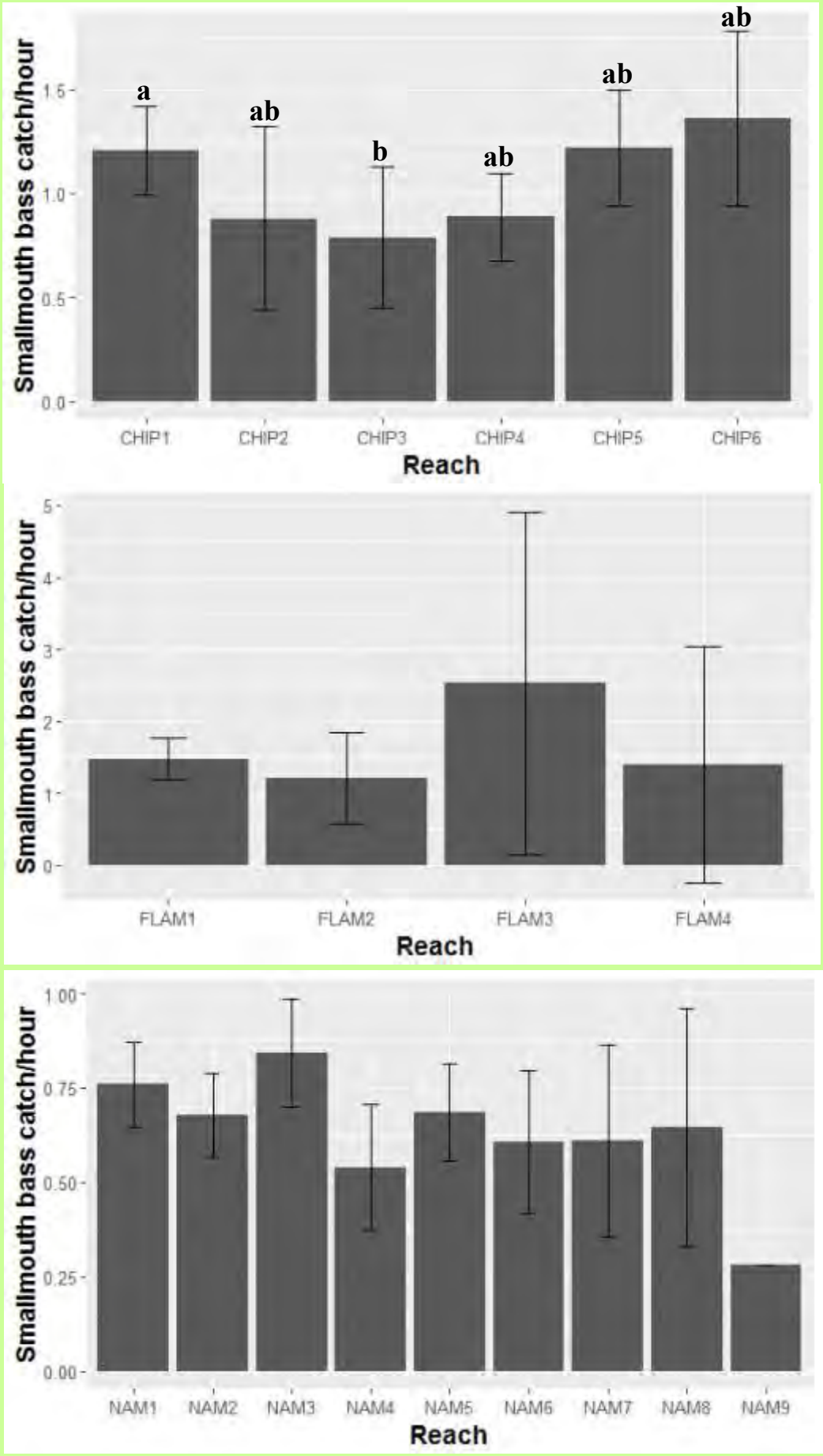


Figure 9. Smallmouth bass skill level corrected catch rates by reach in three rivers (top=Chippewa, middle=Flambeau, bottom=Namekagon) in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings. Reaches are arranged from upstream to downstream (i.e. CHIP1 is upstream of CHIP2 and so on).

WDNR Comments

Muskellunge Catch By River Reach

Muskellunge catch rate by river reach similarly did not reveal statistically significant patterns (Figure 10). However, several notable trends are present. Almost no muskellunge are caught on the Namekagon River upstream from Namekagon4. Muskellunge are known to inhabit these upper reaches and it is not clear why this pattern exists

As with other analyses in this report, the comparison of muskellunge catch by river reach was limited by high variation (see wide error bars in Figure 10) and was exacerbated by low sample size for some reaches. Perhaps the inclusion of more data from future years of fishing will allow for better comparisons of muskellunge catch within rivers.

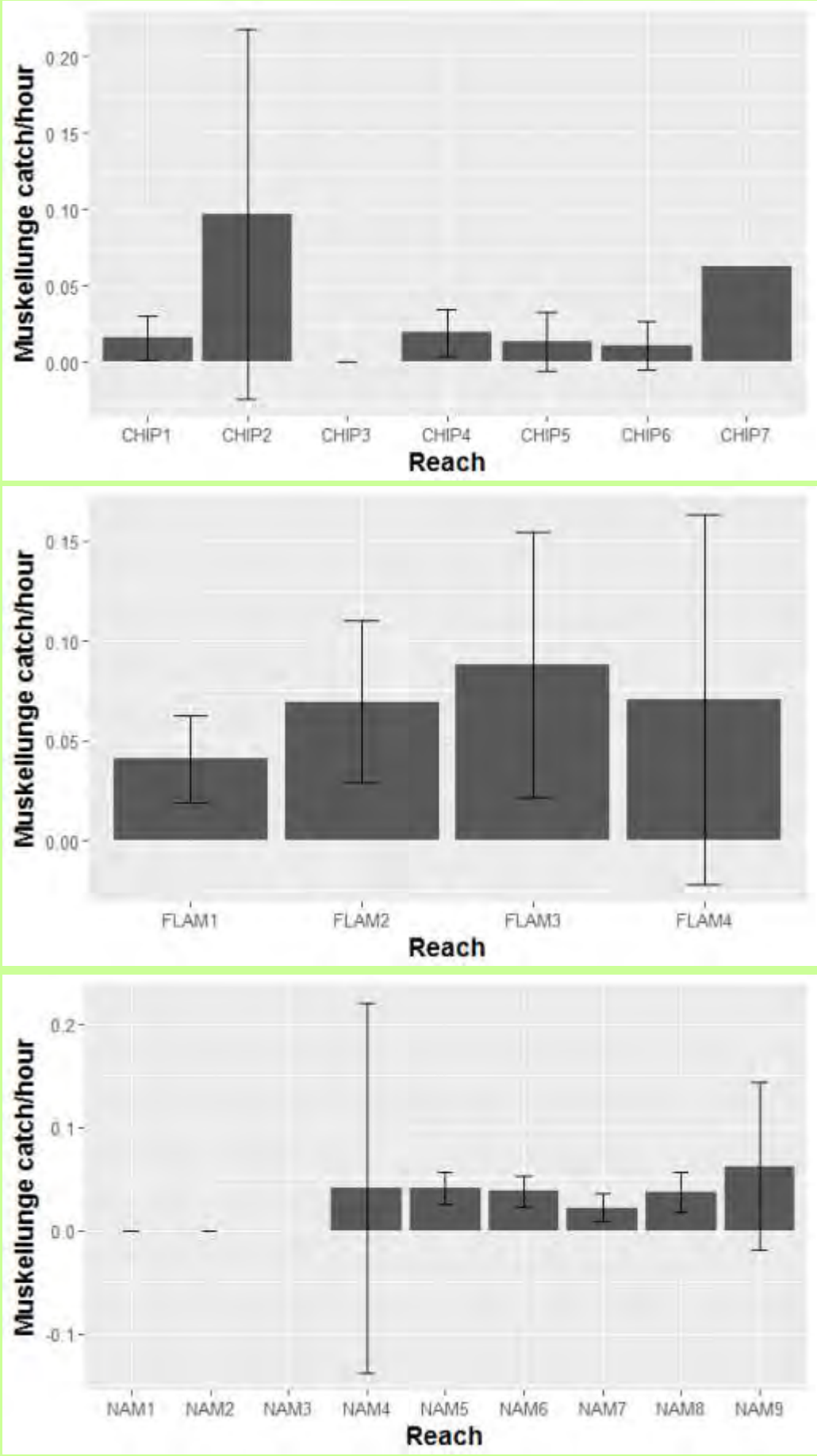
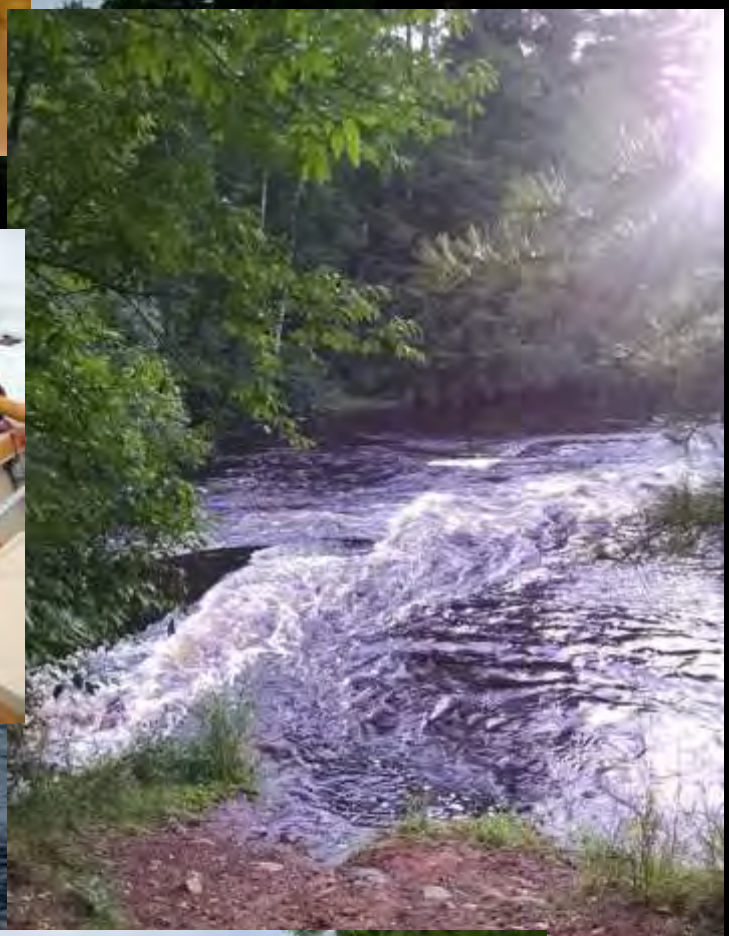
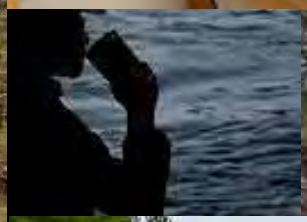


Figure 10. Muskellunge skill level corrected catch rates by reach in three rivers (top=Chippewa, middle=Flambeau, bottom=Namekagon) in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings. Reaches are arranged from upstream to downstream (i.e. CHIP1 is upstream of CHIP2 and so on).

WDNR Comments

INFLUENCE OF ENVIRONMENTAL CONDITIONS ON CATCH RATES





WDNR Comments

Catch Rates and River Discharge

The guides who participated in this project consider river discharge to have a considerable impact on fishing success. We conducted a regression analysis to compare catch rates for smallmouth bass and muskellunge with discharge. This analysis included days with mitigating conditions to capture fishing under extreme discharge. A separate model was constructed for each species x river combination. Generally speaking, catch rates for both smallmouth bass and muskellunge demonstrated a negative trend with increasing discharge. However, in all but one case (smallmouth bass in the Flambeau River) the trend was not statistically significant (Figure 11). Future data collection may allow us to better describe this relationship. Similarly, more data may allow for exploration of quadratic or nonlinear relationships, which may effectively allow for determination of "ideal" discharge conditions for catching each species.

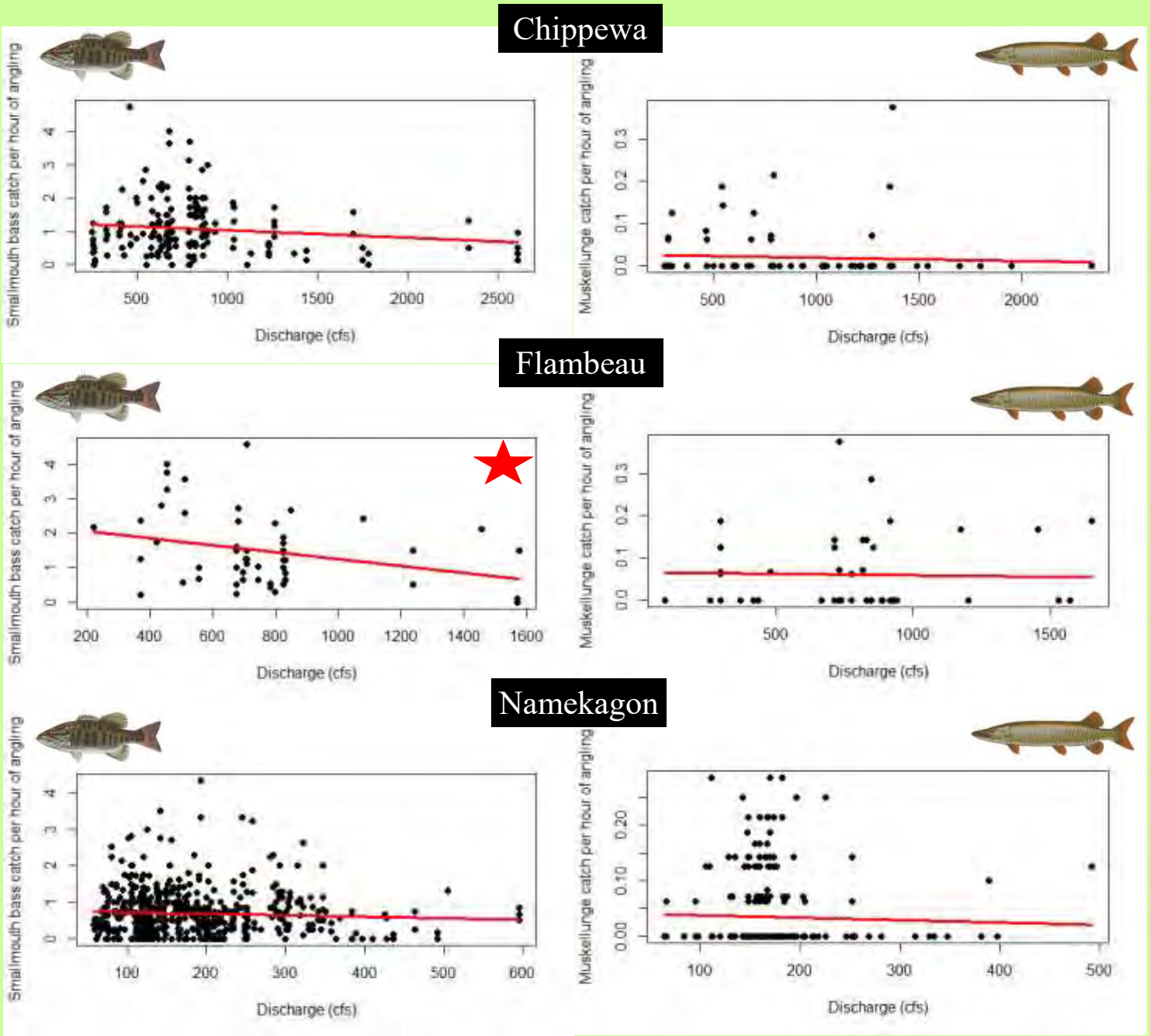


Figure 11. Comparison of skill level corrected catch rates for smallmouth bass (left column) and muskellunge (right columns) with river discharge (cubic feet per second) on the day of fishing for guided anglers on three northwestern Wisconsin rivers from 2012-2016. A red star in a panel demotes a statistically significant relationship ($P<0.05$).

WDNR Comments

Catch Rates and River Level Changes

Changing river conditions prior to a day of fishing is also considered to be an important factor determining fishing success. We compared catch rates for smallmouth bass and muskellunge from all rivers under three different conditions: falling water level (>15% drop in discharge over 3 days), flat water level (<15% change in discharge over 3 days), and rising water level (>15% increase in discharge over 3 days). Catch rates for smallmouth were significantly higher under flat water conditions compared to rising water (Figure 12). A similar pattern appears to be present for muskellunge, though it was not statistically significant.

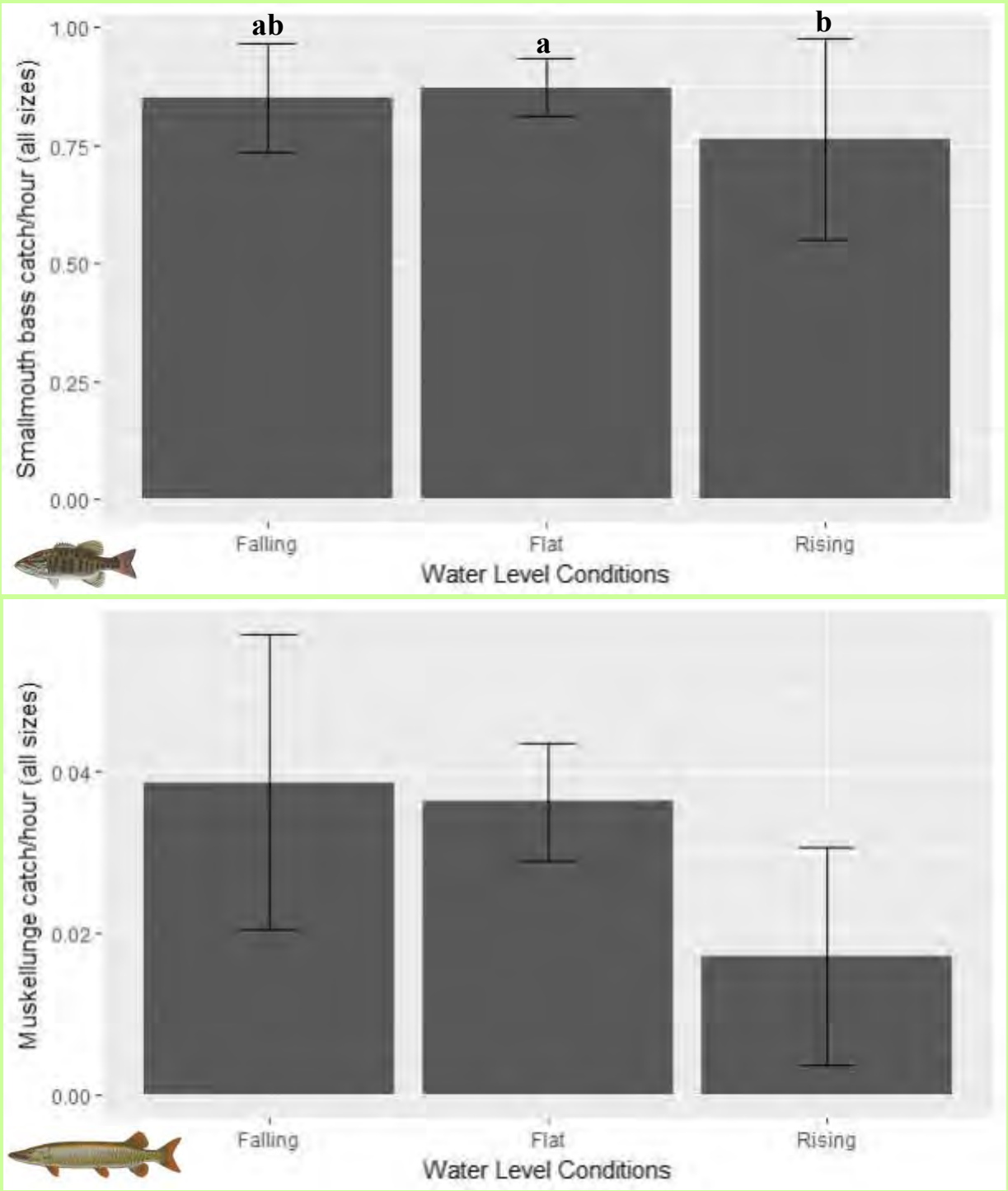


Figure 12. Skill level corrected catch rates of smallmouth bass (top panel) and muskellunge (bottom panel) under three different river conditions. Data was collected by in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals. Letters represent statistically significant groupings.

WDNR Comments

Catch Rates and Water Temperature

Water temperature is an important factor determining many aspects of fish behavior. Guides participating in this project collect daily water temperature data on-site at noon in a shaded area. We compared catch rates for smallmouth bass and muskellunge with water temperature across all rivers (Figure 13). Smallmouth bass demonstrated a significant positive relationship between water temperature and catch rate. This result matches the observed higher catch rates in peak summer months. There was no statistically significant trend between muskellunge catch rate and temperature, but there was an indication of higher catch between 50-70F.

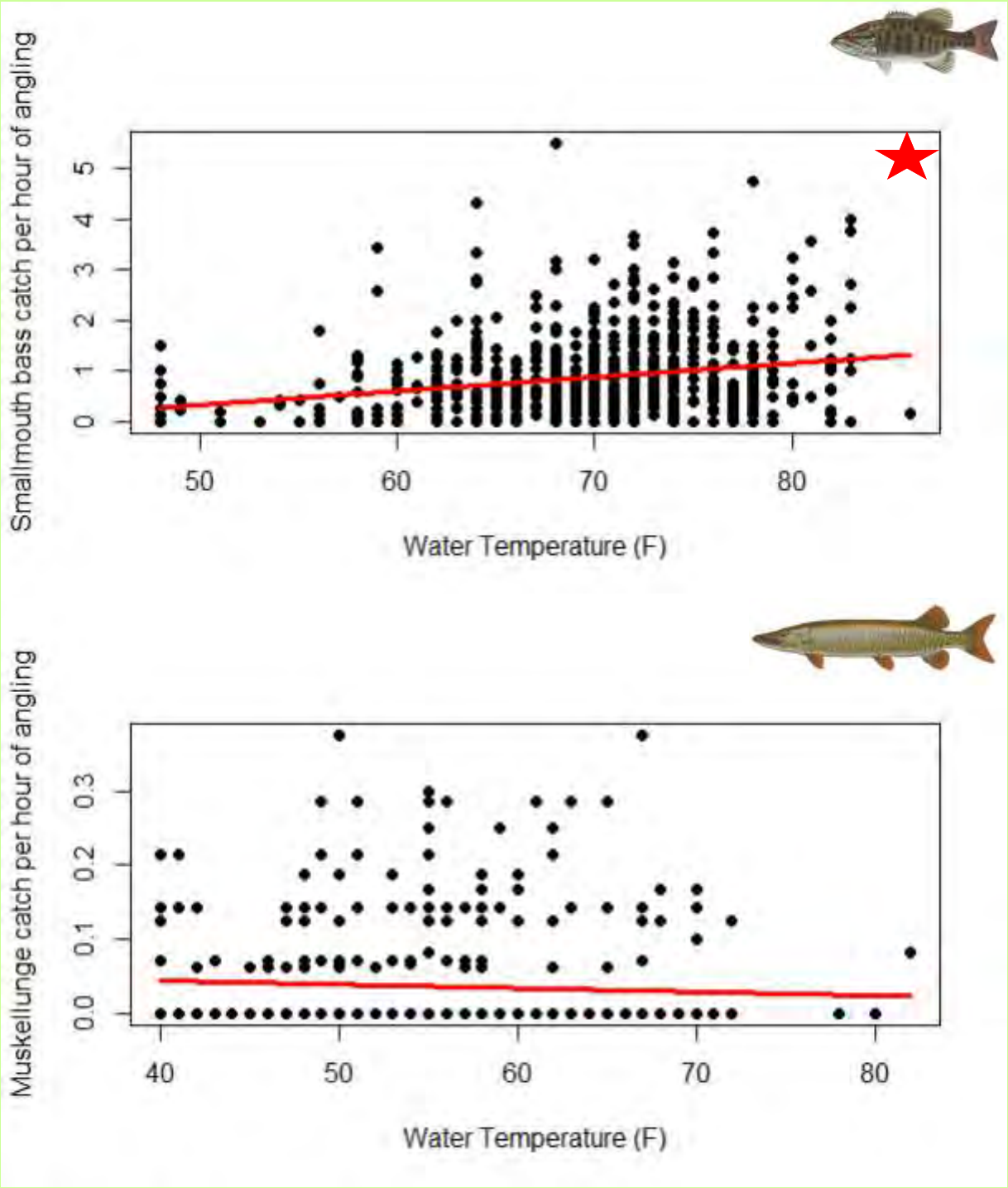


Figure 13. Comparison of skill level corrected catch rates for smallmouth bass (top panel) and muskellunge (bottom panel) with water temperature on the day of fishing for guided anglers on three northwestern Wisconsin rivers from 2012-2016. A red star in a panel demotes a statistically significant relationship ($P<0.05$).

WDNR Comments

CATCH RATES FOR OTHER SPECIES

WDNR Comments

Catch Rate of Northern Pike and Other Species

While smallmouth bass and muskellunge were the target species for all trips included in this project, other predator species were caught incidentally. Guides recorded all incidental catch which provided at least a limited amount of information on northern pike, walleye, and largemouth bass populations. Catch rates for northern pike were significantly higher on the Namekagon River in comparison to the Flambeau River, with the Chippewa River being intermediate (Figure 14). Overall, incidental catch rate of northern pike was similar to that of targeted catch rate for muskellunge. Northern pike density appears to be relatively low in these rivers in comparison to lakes in the area. Incidental catch of walleye and largemouth bass was rare. Only 22 walleye were caught in 1,486 angler days of fishing. Walleye are believed to be more common in these rivers than the low catch would indicate. As a result, we believe that fly fishing guide data may not be a representative way to sample walleye populations in rivers. Only 34 largemouth bass were captured incidentally as a part of this project. Based on their similarities to smallmouth bass we feel more confident that the low catch of largemouth bass is, in fact, representative of the populations in these rivers. Largemouth bass likely occur at a very low density in these fast, rocky rivers. Largemouth bass are generally considered to be better suited for lake environments.

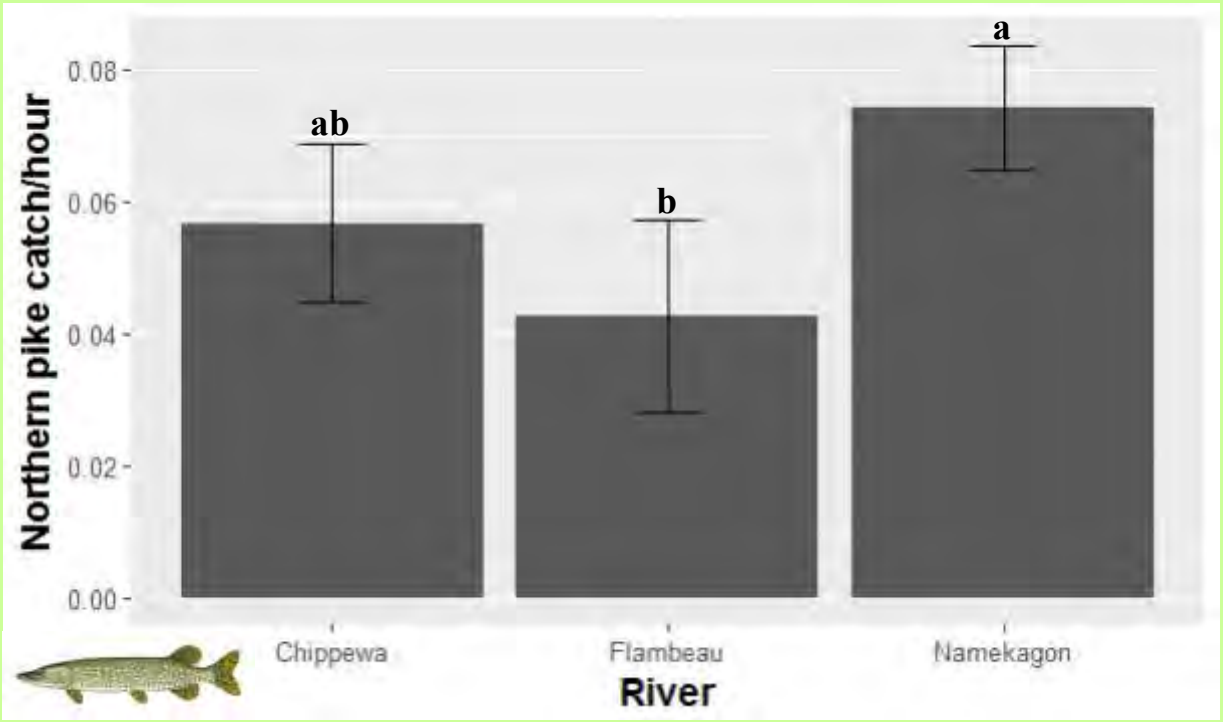


Figure 14. Northern pike incidental catch rates (number per hour of total angling) in three rivers in northwestern Wisconsin fished by guides and their clients from 2012-2016. Error bars represent 95% confidence intervals.

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Washburn	Trego	MWBC: 2712000

Sampling Objective	Number and Locations of Stations (Habitat)	
Walleye Recruitment Survey		Source
	Miles Actually Shocked = 6.0	LM
Period Fished (Dates)	Acres = 451	LM
09/20/11	Total Miles of Shoreline = 16.9	LM
	Total Miles of Shockable Shoreline = 16.9	LM

GEAR

Boomshocker (Hours)	Time	
2.6	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh Size**	**Depth**
Minnow Seine (No. of Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-ST
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	0		-	0.00 / hour	0.00 / mile
Serns Index NA YOY / acre					
Walleye (Age 1+)	7	None	7.8 - 10.7	2.69 / hour	1.17 / mile
Walleye (Other)	17	14.0-14.4	11.8 - 20.4	6.54 / hour	2.83 / mile
Smallmouth Bass	25	15.5 - 15.9	8.0 - 19.9	9.62 / hour	4.17 / mile
Largemouth Bass	8	13.0 - 13.4	9.0 - 14.9	3.08 / hour	1.33 / mile
Muskellunge	0		-	0.00 / hour	0.00 / mile
Northern Pike	35	12.0 - 12.4	8.0 - 24.9	13.46 / hour	5.83 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None 2) Weather: Clear, Wind, Warm 3) Reliabilty: Medium

4) Stocking: 16132 Walleye, 1.6 inches, 06/24/11, DNR 478 Lake Sturgeon, 7.5 inches, 10/19/11, DNR

5) Comments:

Rev. 10-70

Signed (Compiler)	Michael Keniry	Date	12/06/11

WDNR Comments

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL) Department of Natural Resources
Form 3600A-191 8-95

Lake: Trego MWB Code: 2712000 Date: 09/20/11 County: Washburn Collector(s): Bass, Wendel, Rood

Target Fish: Gamefish Survey Type: CPE Mark Given: None Water Temperature: 58°F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 110 Amps: 4.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 1951 Shocking End Time: 2240 Generator Start Hour: 118.9 Generator End Hour: 121.5

Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

Walleye < 12.0"			
Inches	Number	Inches	Number
<3.0		**7.5**	
3.0		**7.6**	
3.1		**7.7**	
3.2		**7.8**	1
3.3		**7.9**	
3.4		**8.0**	
3.5		**8.1**	
3.6		**8.2**	1
3.7		**8.3**	
3.8		**8.4**	1
3.9		**8.5**	
4.0		**8.6**	
4.1		**8.7**	1
4.2		**8.8**	1
4.3		**8.9**	
4.4		**9.0**	
4.5		**9.1**	
4.6		**9.2**	
4.7		**9.3**	
4.8		**9.4**	
4.9		**9.5**	1
5.0		**9.6**	
5.1		**9.7**	
5.2		**9.8**	
5.3		**9.9**	
5.4		**10.0**	
5.5		**10.1**	
5.6		**10.2**	
5.7		**10.3**	
5.8		**10.4**	
5.9		**10.5**	
6.0		**10.6**	
6.1		**10.7**	1
6.2		**10.8**	
6.3		**10.9**	
6.4		**11.0**	
6.5		**11.1**	
6.6		**11.2**	
6.7		**11.3**	
6.8		**11.4**	
6.9		**11.5**	
7.0		**11.6**	
7.1		**11.7**	
7.2		**11.8**	1
7.3		**11.9**	
7.4		**Total:**	8

Inches	Walleye	Northern Pike	Muskellunge	Largemouth Bass	Smallmouth Bass	Inches	Walleye	Northern Pike	Muskellunge
<1.5						**24.5-24.9**		1	
1.5-1.9						**25.0-25.4**			
2.0-2.4						**25.5-25.9**			
2.5-2.9						**26.0-26.4**			
3.0-3.4						**26.5-26.9**			
3.5-3.9						**27.0-27.4**			
4.0-4.4						**27.5-27.9**			
4.5-4.9						**28.0-28.4**			
5.0-5.4						**28.5-28.9**			
5.5-5.9						**29.0-29.4**			
6.0-6.4						**29.5-29.9**			
6.5-6.9						**30.0-30.4**			
7.0-7.4						**30.5-30.9**			
7.5-7.9						**31.0-31.4**			
8.0-8.4		1			3	**31.5-31.9**			
8.5-8.9						**32.0-32.4**			
9.0-9.4				1		**32.5-32.9**			
9.5-9.9		1				**33.0-33.4**			
10.0-10.4					1	**33.5-33.9**			
10.5-10.9				1		**34.0-34.4**			
11.0-11.4		1		1		**34.5-34.9**			
11.5-11.9		1				**35.0-35.4**			
12.0-12.4	1	5			1	**35.5-35.9**			
12.5-12.9	1	1		1	2	**36.0-36.4**			
13.0-13.4	1	2		2		**36.5-36.9**			
13.5-13.9	1	1			1	**37.0-37.4**			
14.0-14.4	3	2		1	1	**37.5-37.9**			
14.5-14.9		3		1	2	**38.0-38.4**			
15.0-15.4		3			3	**38.5-38.9**			
15.5-15.9	1	1			5	**39.0-39.4**			
16.0-16.4	1				2	**39.5-39.9**			
16.5-16.9	1	1				**40.0-40.4**			
17.0-17.4	1					**40.5-40.9**			
17.5-17.9	2					**41.0-41.4**			
18.0-18.4	1	1				**41.5-41.9**			
18.5-18.9		1			2	**42.0-42.4**			
19.0-19.4	1	1			1	**42.5-42.9**			
19.5-19.9		2			1	**43.0-43.4**			
20.0-20.4	1					**43.5-43.9**			
20.5-20.9		2				**44.0-44.4**			
21.0-21.4		1				**44.5-44.9**			
21.5-21.9		2				**45.0-45.4**			
22.0-22.4		1				**45.5-45.9**			
22.5-22.9						**46.0-46.9**			
23.0-23.4						**47.0-47.9**			
23.5-23.9						**48.0-48.9**			
24.0-24.4						**49.0-49.9**			
Totals:	16	35	0	8	25	**50.0+**			

WDNR Comments

WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

TREGO LAKE — WASHBURN COUNTY

SEC. 17, 20 T. 40 N. R. 12 E.W.

Tamarack Bog

Mixed Hardwood & Pine

Mixed Hardwood & Pine

Mixed Hardwood & Pine

Mixed Hardwood & Pine

Mixed Hardwood & Pine

Mk.

Mk.

Mk.

Sd.

Sd.

Sd.

Sd

Sd

5.3 Acres

1.1 Acres

.45 Acres

.6 Acres

.18 Acres

B.M.

Namekagon Ri.

Dam 29' Head

Power Dam

B.M. 'X' P.S.C. at power house - staffgage

Assumed elev. 100.00

Water elev. 99.75

K

Sheet 1

Sheet 2

EQUIPMENT RECORDING SONAR MAPPED JUNE (MO.) 1966 (YR.)

WATER ELEV. 99.75

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- Emergent vegetation
- Floating vegetation
- Stumps & Snags

400' 0' 400' 800' 1200' 1600' 2000'

SCALE

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by C. Busch, G. Winter, L. Sather Drawn by: C. Holt

SPECIES OF FISH	Abundant	Common	Rare
Muskie			X
N. Pike			X
Walleye		X	
L.M. Bass			X
S.M. Bass			X
Panfish	X		
Trout			
Sturgeon			X

451.1 WITHOUT IS.

AREA 460.2 ACRES

UNDER 3FT. 6.15 %

OVER 20FT. 14.0 %

VOLUME 4770.6 ACRE FT.

TOTAL ALK. 73 P.P.M.

SHORELINE 16.9 MILES

MAX. DEPTH 36 FEET

WISCONSIN CONSERVATION DEPARTMENT

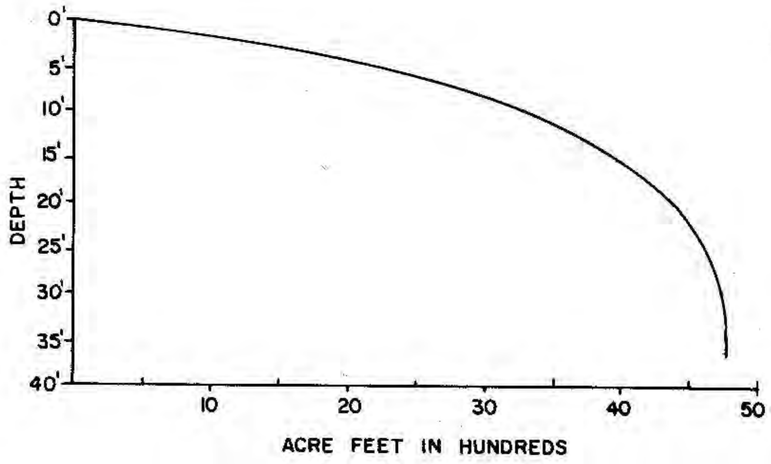
LAKE SURVEY MAP

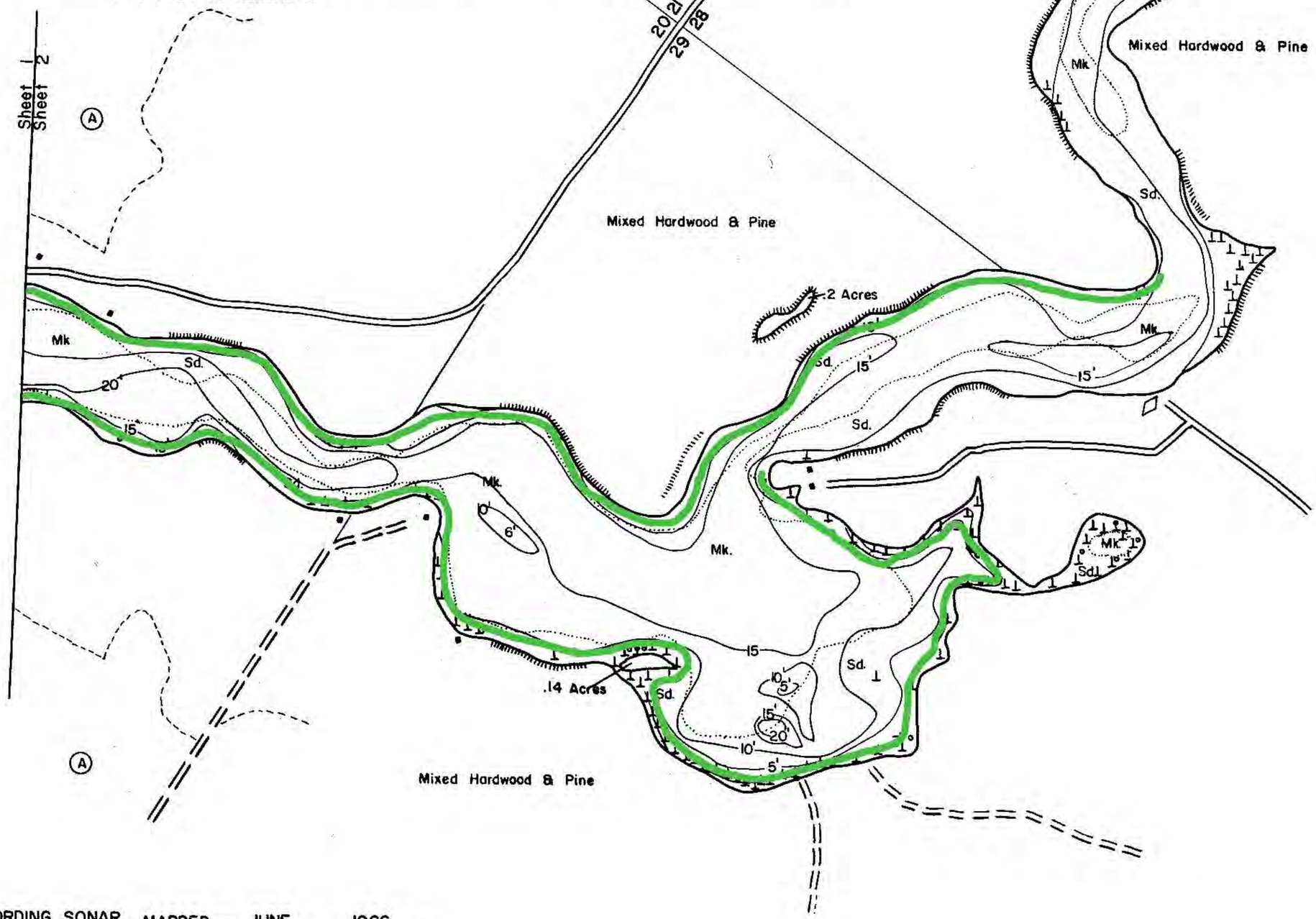
TREGO LAKE — WASHBURN COUNTY

SEC. 20,28,29 T. 40 N. R. 12 E.W.

Sheet 2 of 4

WDNR Comments





SPECIES OF FISH	Abundant	Common	Rare
Muskie			X
N. Pike			X
Walleye		X	
L.M. Bass			X
S.M. Bass			X
Panfish	X		
Trout			
Sturgeon			X

EQUIPMENT RECORDING SONAR MAPPED JUNE (MO.) 1966 (YR.)

WATER ELEV. 99.75

TOPOGRAPHIC SYMBOLS

- (B) Brush
- (PW) Partially wooded
- (W) Wooded
- (C) Cleared
- (P) Pastured
- (A) Agricultural
- B.M. Bench Mark
- Dwelling
- Resort
- Steep slope
- Indefinite shoreline
- Marsh
- Spring
- Intermittent stream
- Permanent inlet
- Permanent outlet
- Dam

LAKE BOTTOM SYMBOLS

- P. Peat
- Mk. Muck
- C. Clay
- M. Marl
- Sd. Sand
- St. Silt
- Gr. Gravel
- R. Rubble
- Br. Bedrock
- T Submergent vegetation
- ⊥ Emergent vegetation
- Floating vegetation
- Stumps & Snags

400' 0' 400' 800' 1200' 1600' 2000'

SCALE

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by C. Busch, G. Winter, L. Sather Drawn by: C. Holt

AREA 460.2 ACRES

451.1 WITHOUT IS.

UNDER 3FT. 6.15 %

OVER 20FT. 14.0 %

VOLUME 4770.6 ACRE FT.

TOTAL ALK. 73 P.P.M.

SHORELINE 16.9 MILES

MAX. DEPTH 36 FEET

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Washburn	Trego	MWBC: 2712000

Sampling Objective	Number and Locations of Stations (Habitat)		
Walleye Recruitment Survey			Source
	Miles Actually Shocked =	6.0	GPS
Period Fished (Dates)	Acres =	451	LM
09/14/16	Total Miles of Shoreline =	16.9	LM
	Total Miles of Shockable Shoreline =	16.9	LM

GEAR

Boomshocker (Hours)	Time	
2.5	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	**Time of Day**	**Trap Net (No. of Net Lifts)**	**Mesh Size**	**Depth**
Minnow Seine (No. of Hauls)	**Area Covered**	**Gill Net (No. of Feet x No. of Lifts)**	**Mesh Size**	**Depth**

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-ST
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	0			0.00 / hour	0.00 / mile
Serns modified NA YOY / acre					
Walleye (Age 1+)	16	8.0 - 8.4, 10.0 - 10.4	7.5 - 11.4	6.40 / hour	2.67 / mile
Walleye (Other)	14	None	13.0 - 19.4	5.60 / hour	2.33 / mile
Smallmouth Bass	30	None	5.5 - 19.9	12.00 / hour	5.00 / mile
Largemouth Bass	10	None	4.0 - 16.9	4.00 / hour	1.67 / mile
Muskellunge	1	None	12.5 - 12.9	0.40 / hour	0.17 / mile
Northern Pike	20	None	11.0 - 26.4	8.00 / hour	3.33 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None 2) Weather: NA 3) Reliability: Medium

4) Stocking: 142 Muskellunge, 12.0 inches, 09/14/16, DNR

5) Comments:

Rev. 10-70

Signed (Compiler)	Gene Hatzenbeler	Date	12/02/16

WDNR Comments

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL) Department of Natural Resources
Form 3600A-191 8-95

Lake: Trego MWB Code: 2712000 Date: 09/14/16 County: Washburn Collector(s): Bass, Roberts, Gorne

Target Fish: All Gamefish Survey Type: CPE Mark Given: None Water Temperature: 62°F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 160 Amps: 4.5 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 2000 Shocking End Time: 2253 Generator Start Hour: 306.1 Generator End Hour: 308.6

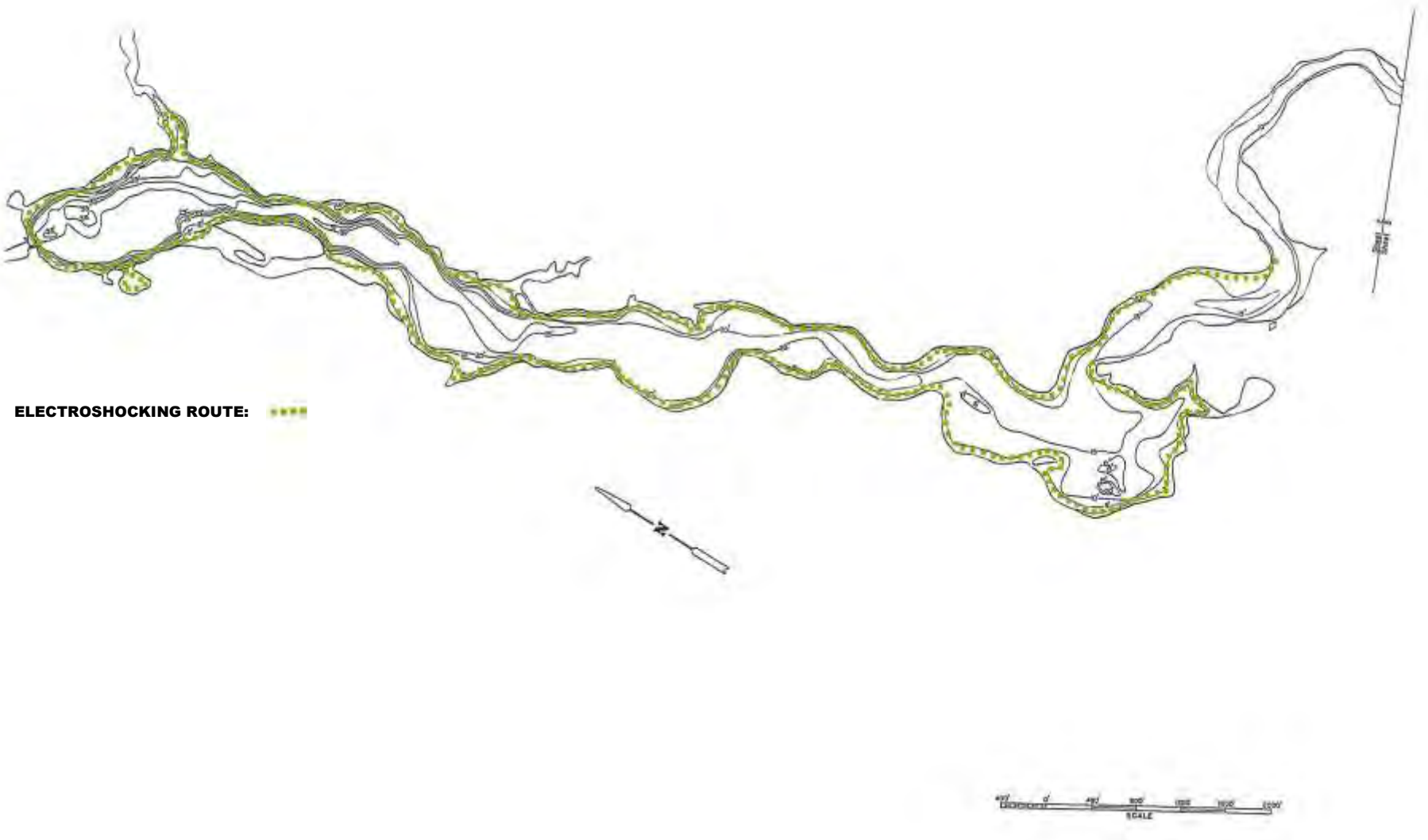
Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

Inches	Walleye	Northern Pike	Muskellunge	Largemouth Bass	Smallmouth Bass	Inches	Walleye	Northern Pike	Muskellunge
<1.5						**24.5-24.9**			
1.5-1.9						**25.0-25.4**		1	
2.0-2.4						**25.5-25.9**			
2.5-2.9						**26.0-26.4**		1	
3.0-3.4						**26.5-26.9**			
3.5-3.9						**27.0-27.4**			
4.0-4.4				1		**27.5-27.9**			
4.5-4.9						**28.0-28.4**			
5.0-5.4						**28.5-28.9**			
5.5-5.9					1	**29.0-29.4**			
6.0-6.4				1		**29.5-29.9**			
6.5-6.9						**30.0-30.4**			
7.0-7.4				1		**30.5-30.9**			
7.5-7.9	1			2		**31.0-31.4**			
8.0-8.4	4			1		**31.5-31.9**			
8.5-8.9	2					**32.0-32.4**			
9.0-9.4	1				1	**32.5-32.9**			
9.5-9.9	1				4	**33.0-33.4**			
10.0-10.4	4			1	1	**33.5-33.9**			
10.5-10.9	2					**34.0-34.4**			
11.0-11.4	1	1				**34.5-34.9**			
11.5-11.9		2			1	**35.0-35.4**			
12.0-12.4		2				**35.5-35.9**			
12.5-12.9		1	1		1	**36.0-36.4**			
13.0-13.4	1	1			1	**36.5-36.9**			
13.5-13.9		1		1	1	**37.0-37.4**			
14.0-14.4	1				1	**37.5-37.9**			
14.5-14.9	1	1			1	**38.0-38.4**			
15.0-15.4	2	2				**38.5-38.9**			
15.5-15.9	1	1		1	4	**39.0-39.4**			
16.0-16.4	1	1			1	**39.5-39.9**			
16.5-16.9	1	1		1	2	**40.0-40.4**			
17.0-17.4	2	1			2	**40.5-40.9**			
17.5-17.9	2				4	**41.0-41.4**			
18.0-18.4					2	**41.5-41.9**			
18.5-18.9	1				1	**42.0-42.4**			
19.0-19.4	1	1				**42.5-42.9**			
19.5-19.9					1	**43.0-43.4**			
20.0-20.4						**43.5-43.9**			
20.5-20.9						**44.0-44.4**			
21.0-21.4						**44.5-44.9**			
21.5-21.9						**45.0-45.4**			
22.0-22.4						**45.5-45.9**			
22.5-22.9		1				**46.0-46.9**			
23.0-23.4		1				**47.0-47.9**			
23.5-23.9						**48.0-48.9**			
24.0-24.4						**49.0-49.9**			
Totals:	30	20	1	10	30	**50.0+**			

WDNR Comments

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

TREGO LAKE
WASHBURN COUNTY
WBIC: 2712000



ELECTROSHOCKING ROUTE:

WDNR Comments

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County	Waters	
Washburn	Trego	MWBC: 2712000

Sampling Objective	Number and Locations of Stations (Habitat)		
Walleye Recruitment Survey			Source
	Miles Actually Shocked =	6.0	GPS
Period Fished (Dates)	Acres =	451	LM
09/19/19	Total Miles of Shoreline =	16.9	LM
	Total Miles of Shockable Shoreline =	16.9	LM

GEAR

Boomshocker (Hours)	Time	
2.5	√ Night	Day

Visual Hours	Time of Day	Haul Seine (Length)	Mesh Size	Area Covered
Angling (Hours)	Time of Day	Trap Net (No. of Net Lifts)	Mesh Size	Depth
Minnow Seine (No. of Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts)		Characteristics	
Boomshocker(s): 1	Mini-boomshocker(s):	Walleye Recruitment Code:	C-ST
Dip Netter(s): 2	Dip Netter(s):		

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit	
Walleye (Age 0+)	11	None	4.3 - 6.0	4.40 / hour	1.83 / mile
Serns modified NA YOY / acre					
Walleye (Age 1+)	19	7.7	7.3 - 9.4	7.60 / hour	3.17 / mile
Walleye (Other)	16	13.5 - 13.9, 15.5 - 15.9	10.7 - 20.4	6.40 / hour	2.67 / mile
Smallmouth Bass	31	15.5 - 15.9, 17.0 - 17.4	9.0 - 19.4	12.40 / hour	5.17 / mile
Largemouth Bass	8	None	2.5 - 19.4	3.20 / hour	1.33 / mile
Muskellunge	1	None	24.5 - 24.9	0.40 / hour	0.17 / mile
Northern Pike	12	None	6.0 - 25.4	4.80 / hour	2.00 / mile

OBSERVATIONS

Other Species	Abundance	Size Range	Other Species	Abundance	Size Range

1) Tank Mortality: None 2) Weather: NA 3) Reliability: Medium

4) Stocking: 383 Lake Sturgeon, 9.0 inches, 10/24/19, DNR

5) Comments:

Rev. 09-16

Signed (Compiler) Gene Hatzenbeler Date 11/26/19

WDNR Comments

LAKE ELECTROFISHING DATA COLLECTION SHEET (FALL) Department of Natural Resources
Form 3600A-191 8-95

Lake: Trego MWB Code: 2712000 Date: 09/19/19 County: Washburn Collector(s): Bass, Roberts, Gorne

Target Fish: All Gamefish Survey Type: CPE Mark Given: None Water Temperature: 68°F Station: Portion of Shoreline

Adverse Conditions: None Gear Type: Boomshocker Distance Shocked: 6.0 miles

Volts: 150 Amps: 4.0 Current Type: [X]AC [ ]DC [ ]Pulsed DC Pulse Rate: None Duty Cycle: None

Shocking Start Time: 1951 Shocking End Time: 2245 Generator Start Hour: 407.6 Generator End Hour: 410.1

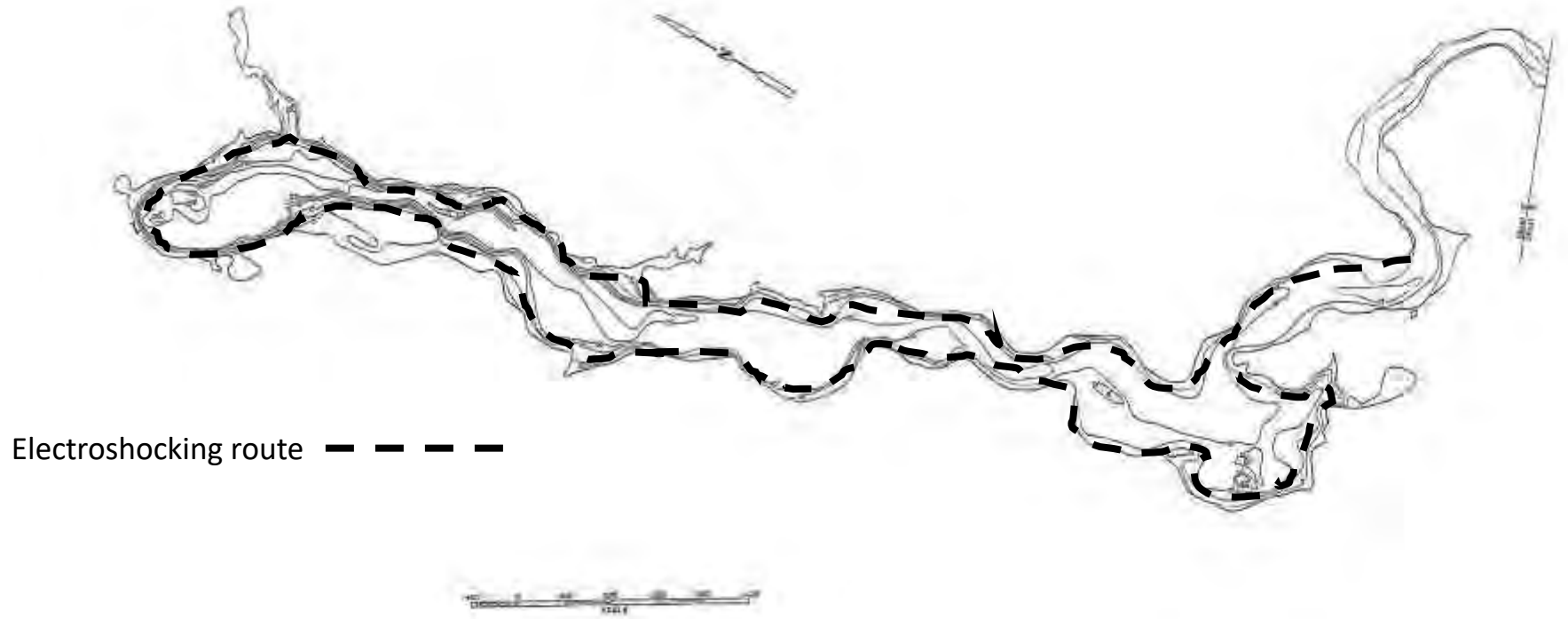
Number of Dippers: [ ]1 [X]2 Entire Shoreline Shocked: [ ]Y [X]N [ ]I Dipnet Mesh Size: 3/8 inch bar H20 Clarity: NA

Walleye < 12.0"			
Inches	Number	Inches	Number
<3.0		**7.5**	
3.0		**7.6**	
3.1		**7.7**	4
3.2		**7.8**	
3.3		**7.9**	1
3.4		**8.0**	1
3.5		**8.1**	1
3.6		**8.2**	1
3.7		**8.3**	
3.8		**8.4**	1
3.9		**8.5**	
4.0		**8.6**	1
4.1		**8.7**	2
4.2		**8.8**	1
4.3	1	**8.9**	
4.4		**9.0**	
4.5		**9.1**	1
4.6		**9.2**	1
4.7	1	**9.3**	
4.8	2	**9.4**	1
4.9	1	**9.5**	
5.0	2	**9.6**	
5.1		**9.7**	
5.2	1	**9.8**	
5.3		**9.9**	
5.4		**10.0**	
5.5		**10.1**	
5.6		**10.2**	
5.7	1	**10.3**	
5.8	1	**10.4**	
5.9		**10.5**	
6.0	1	**10.6**	
6.1		**10.7**	1
6.2		**10.8**	
6.3		**10.9**	
6.4		**11.0**	
6.5		**11.1**	1
6.6		**11.2**	
6.7		**11.3**	
6.8		**11.4**	
6.9		**11.5**	
7.0		**11.6**	
7.1		**11.7**	1
7.2		**11.8**	
7.3	1	**11.9**	
7.4	2	**Total:**	33

Inches	Walleye	Northern Pike	Muskellunge	Largemouth Bass	Smallmouth Bass	Inches	Walleye	Northern Pike	Muskellunge
<1.5						**24.5-24.9**			1
1.5-1.9						**25.0-25.4**		1	
2.0-2.4						**25.5-25.9**			
2.5-2.9				2		**26.0-26.4**			
3.0-3.4				1		**26.5-26.9**			
3.5-3.9				1		**27.0-27.4**			
4.0-4.4				2		**27.5-27.9**			
4.5-4.9						**28.0-28.4**			
5.0-5.4						**28.5-28.9**			
5.5-5.9						**29.0-29.4**			
6.0-6.4		1				**29.5-29.9**			
6.5-6.9						**30.0-30.4**			
7.0-7.4		2				**30.5-30.9**			
7.5-7.9		2				**31.0-31.4**			
8.0-8.4		1		1		**31.5-31.9**			
8.5-8.9						**32.0-32.4**			
9.0-9.4					1	**32.5-32.9**			
9.5-9.9						**33.0-33.4**			
10.0-10.4					2	**33.5-33.9**			
10.5-10.9					1	**34.0-34.4**			
11.0-11.4						**34.5-34.9**			
11.5-11.9						**35.0-35.4**			
12.0-12.4	1				2	**35.5-35.9**			
12.5-12.9	1	1			2	**36.0-36.4**			
13.0-13.4	1				2	**36.5-36.9**			
13.5-13.9	3	1			2	**37.0-37.4**			
14.0-14.4	1				1	**37.5-37.9**			
14.5-14.9					2	**38.0-38.4**			
15.0-15.4					1	**38.5-38.9**			
15.5-15.9	3				4	**39.0-39.4**			
16.0-16.4	1				3	**39.5-39.9**			
16.5-16.9					1	**40.0-40.4**			
17.0-17.4					4	**40.5-40.9**			
17.5-17.9					1	**41.0-41.4**			
18.0-18.4	1				1	**41.5-41.9**			
18.5-18.9						**42.0-42.4**			
19.0-19.4				1	1	**42.5-42.9**			
19.5-19.9						**43.0-43.4**			
20.0-20.4	1					**43.5-43.9**			
20.5-20.9		1				**44.0-44.4**			
21.0-21.4		1				**44.5-44.9**			
21.5-21.9		1				**45.0-45.4**			
22.0-22.4						**45.5-45.9**			
22.5-22.9						**46.0-46.9**			
23.0-23.4						**47.0-47.9**			
23.5-23.9						**48.0-48.9**			
24.0-24.4						**49.0-49.9**			
Totals:	13	12	1	8	31	**50.0+**			

WDNR Comments

Trego Lake
Washburn County
WBIC 2712000
Wisconsin DNR



Electroshocking route

WDNR Comments

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Monday, August 10, 2020 10:25 AM
To: Darrin Johnson
Cc: Shawn Puzen
Subject: WDNR Trego and Hayward Mussel and Wildlife Information Submission for PAD

Hi Darrin,

Please see WDNR program staff comments below, regarding mussel and wildlife information for Hayward and Trego Hydro Projects.

Wildlife Comments (Hayward)

Future study requests may relate to the following species: Blanding's Turtle, Mink Frog, Wood Turtle
Bald Eagle – there has long been a territory on Lake Hayward, with 2 nests by the Lumberjack Bowl, and a newer nest just north of Hwy 77

Wildlife Comments (Trego):

"Although I do not know exactly what water control actions would be taken, I don't have any general concerns. Of course pesticide or other waste put into the water would cause negative impact to a host of wildlife species. Runoff of chemicals and erosion, would have negative impacts to wildlife and public use of the waterway. I have no specific data to included. DNR does not own land so we do not have any wildlife or fishery area management plans for this area of land. The only survey conducted in this area was the bear snare survey (which showed we have plenty of bears). The only concerns I can think of are otter and other furbearers, if water was not managed similar to what it is now. Water management should not affect them unless the area is drained. Turtles, frogs and others would be negatively affected if water levels were drawn down after Oct 1."

Mussel Data from Namekagon River and Mussel data from Statewide Mussel Atlas (Trego)

WDNR Comments

No maps or reports specific to this location are available.
List of mussels from past surveys provided.
The occurrence of specific species is habitat dependent, river substrate dependent.
No federally or state threatened/endangered or special concern mussel species are known to occur in the impounded sections of the reservoir, however listed species may occur downstream from the dam or further upstream from the impounded reaches of the reservoir .

WDNR Comments

Washburn County - Namekagon River Native Mussels

Common Name - Scientific name (Last observed date) *Status*

Black Sandshell - Ligumia recta (2016)
Creeper - Strophitus undulatus (2016)
Cylindrical Papershell – Anodontoides ferussacianus (2016)
Deertoe - Truncilla truncata (2016)
Elktoe - Alasmidonta marginata (2016) State Special Concern
Fatmucket - Lampsilis siliquoidea (2016)
Fluted-shell - Lasmigona costata (2016)
Fragile Papershell - Leptodea fragilis (1995)
Giant Floater - Pyganodon grandis (1995)
Hickorynut - Obovaria olivaria (1988)
Mapleleaf - Quadrula quadrula (2016) State Special Concern
Mucket - Actinonaias ligamentina (2016)
Paper Pondshell – Utterbackia imbecilis (2016)
Pimpleback - Quadrula pustulosa (2016)
Pink Heelsplitter - Potamilus alatus (2016)
Plain Pocketbook - Lampsilis cardium (2016)
Purple Wartyback - Cyclonaias tuberculata (1995) State Endangered
Round Pigtoe - Pleurobema sintoxia (2016)
Salamander Mussel - Simpsonaias ambigua (1988) State Threatened
Spike - Elliptio dilatata (2016)
Threeridge - Amblema plicata (2016)
Wabash Pigtoe - Fusconaia flava (2016)

Have a good week,

Macaulay Haller
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

WDNR Comments

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Monday, August 17, 2020 8:05 AM
To: Darrin Johnson
Cc: Shawn Puzen
Subject: RE: WDNR Trego and Hayward Information Submission for PAD

Hi Darrin,

Here is the list of Native Mussels Species for Sawyer County for the Namekagon River, provided by WDNR program staff.

Black Sandshell - Ligumia recta (1987)
Creek Heelsplitter - Lasmigona compressa (1995)
Creeper - Strophitus undulatus (1995)
Cylindrical Papershell - Anodontoides ferussacianus (1987)
Elktoe - Alasmidonta marginata (1987) State Special Concern
Fatmucket - Lampsilis siliquoidea (1995)
Fluted-shell - Lasmigona costata (1995)
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Mucket - Actinonaias ligamentina (1987)
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Round Pigtoe - Pleurobema sintoxia (1995)
Spike - Elliptio dilatata (1987)
Wabash Pigtoe - Fusconaia flava (1995)

Have a good week,
Macaulay

From: Haller, Macaulay G - DNR
Sent: Tuesday, August 11, 2020 11:08 AM
To: 'Darrin Johnson' <Darrin.Johnson@meadhunt.com>
Cc: 'Shawn Puzen' <Shawn.Puzen@meadhunt.com>
Subject: RE: WDNR Trego and Hayward Information Submission for PAD

Hi Darrin,

Please see below WDNR comments on water resources and recreation for Trego and Hayward Hydro Projects.

Water Resources (Trego)

There is a SWIMS station at the upper end of the project boundary 10022021 that has some WQ data and a fish survey that looks like it was a wadeable survey and there may be a non-wadeable survey there as well. The station survey probably went US and outside the project boundary. There is a station DS of the project at CTH K (10037360) with a large river macroinvert sample from 2012. If it's a large river, there likely are not any wadeable fish surveys nearby but looks like there are large river fish surveys associated with SWIMS 10011080. Again these are outside the project boundary but may provide useful information about DS resources.

Recreation, Land Use (Hayward)

WDNR Comments

Hayward Lake has a boat ramp 0.3 miles upstream from the dam, just east of the Highway 27 crossing. Hayward Lake also has a recreational fishing pier approximately ½ mile upstream from the dam. These may be upgraded in the future to enhance recreation opportunities, but if/when is not clear from the county recreational plan.

Hayward Lake is an ASNRI Outstanding and Exceptional Stream designation. Below the dam is a PNW Musky water. The ASNRI designation also points to the Wild and Scenic River status for the Namekagon River, that is protected by federal law.

Recreation, Land Use (Trego)

Trego Lake, on the Namekagon River has designated ASRNI status as an Outstanding and Exceptional area. It also has Wild Rice present and retains the designation for that reason as well. Tribal consultation will be necessary to determine any changes to this waterbody and how it might impact wild rice.

Recreation: Just downstream from the Trego dam is a canoe landing popular with non-motorized watercraft that use the riverway. This area being national scenic riverway, this reach is managed for paddlers and camping where several primitive water-only access campsites are available. Trego Lake has two boat ramps for motorized boats, and a canoe/kayak launch on the east side of Trego. This area is extremely popular with non-motorized boats and tubes, with a large rental business on the east side of Trego.

Thank you,

Macaulay Haller
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

From: Haller, Macaulay G - DNR
Sent: Monday, August 10, 2020 10:25 AM
To: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: WDNR Trego and Hayward Mussel and Wildlife Information Submission for PAD

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Salamander Mussel - Simpsonaias ambigua (1988) State Threatened
Spike - Elliptio dilatata (2016)
Threeridge - Amblema plicata (2016)
Wabash Pigtoe - Fusconaia flava (2016)

Have a good week,

Macaulay Haller
Wisconsin Department of Natural Resources
Macaulay.Haller@wisconsin.gov

Hayward and Trego

NOI, PAD and TLP Request

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

November 27, 2020

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Preliminary Application Document, Notice of Intent, Request to Use Traditional Licensing Process, and Request for Designation of Non-Federal Representative**
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

In accordance with 18 CFR § 16.6 and Section 15 of the Federal Power Act, Northern States Power Company-Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, Licensee of the Hayward (FERC Project No. 2417) and Trego (FERC Project No. 2711) Hydroelectric Projects (Projects), is hereby electronically filing with the Commission Notices of Intent to File a License Application (NOI) and a Pre-Application Document (PAD) for the relicensing of said Projects. The current licenses for the Projects expire on November 30, 2025.

In accordance with the Commission's regulations, NSPW hereby declares its unequivocal intent to begin the relicensing process for both the Hayward and Trego Projects by filing the enclosed Notices of Intent to file applications for subsequent licenses for the Projects. Along with the NOIs, a Pre-Application Document (PAD) that includes information for both Projects is also enclosed[1].

In accordance with 18 CFR § 5.5(c), the Licensee is providing a copy of the NOI and PAD in electronic format to appropriate federal, state, and interstate resource agencies as well as Indian Tribes, local governments, and members of the public likely to be interested in the relicensing proceedings. A distribution list of all known potential stakeholders receiving copies of the NOI and PAD is enclosed. NSPW will also provide two paper courtesy copies of the NOI and PAD to Commission Staff in the Office of Energy Projects and the Office of General Counsel-Energy Projects as outlined in the Commission's filing guidelines.

Under 18 CFR § 5.3, the Licensee requests approval from the Commission for use of the Traditional Licensing Process (TLP). The TLP should provide cost and time savings to both the Licensee and stakeholders due to the limited geographic scope of the project boundaries, the limited number of anticipated stakeholders, and the lack of controversial issues brought forward in the questionnaire responses. Experience also indicates that the TLP is less costly than the Integrated Licensing Process (ILP).

Due to the limited number of responses received from the questionnaire sent out to the stakeholders and the lack of any expressed opposition, there does not appear to be any objection to the use of the TLP. There also does not appear to be any complex resource issues or anticipated controversy. Therefore, the Licensee anticipates the Commission will be able to complete the timely issuance of subsequent licenses for the Projects.

Since NSPW is the Licensee for both the Hayward and Trego Projects, one PAD for both Projects is being submitted.

Under 18 CFR § 5.3(d)(1), comments concerning this request to use the TLP must be filed with the Commission within 30 days of the filing date of this request and must include either the FERC project number or the name and address of the Licensee as depicted in the PAD.

To assist in open communication with potential stakeholders, the Licensee plans to use electronic communication as the primary method of communication when feasible. If electronic communication is not feasible, hard copy communication will be utilized. Documents filed with the Commission and provided to stakeholders will also be posted on a website at http://hydrorelicensing.com.

Under 18 CFR § 5.3(d)(2), the Licensee shall file no later than the date of this filing notices in a daily or weekly newspaper of general circulation in both Sawyer County, Wisconsin and Washburn County, Wisconsin. The notices shall include the filing date of the PAD and the request to use the TLP. The notices shall also summarize the documents filed, justification for requesting to use the TLP, Licensee's name, address, and telephone number, and indicate that comments are due within 30 days of the public notice filing date. Comments filed in response to the public notices must include the applicable project number and/or the Licensee's name and address, and state that respondents must submit comments to the Secretary of the Commission in accordance with filing procedures outlined in the Commission's website at http://FERC.gov.

The public notices shall also state that comments regarding the Licensee's request to use the TLP should address as appropriate the likelihood of timely license issuance, complexity of resource issues, level of anticipated controversy, relative cost of the TLP compared to the ILP, the amount of available information and potential for significant disputes over studies and other factors believed to be pertinent.

A public scoping meeting and site visit will be held between 30 and 60 days of the Commission's decision regarding Licensee's request to use the TLP. Written comments on the PAD must be filed with the Commission and a copy sent to NSPW within 60 days of the public scoping meeting.

Under 18 CFR § 5.5(e), the Licensee formally requests to be designated as the Commission's non-federal representative in relicensing of the Hayward Hydroelectric Project (FERC Project No. 2417) and the Trego Hydroelectric Project (FERC Project No. 2711) for the purposes of consultation under Section 7 of the Endangered Species Act and the joint regulations under 50 CFR Part 402, and National Oceanic and Atmospheric Administration under Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR § 600.920, and Section 106 of the National Historic Preservation Act and the implementing regulations under 36 CFR Part 800.

Thank you for your time and consideration in this matter. If you have any questions, please contact Matthew Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Respectfully Submitted,

Scott Crotty

Digitally signed by Scott Crotty
Date: 2020.11.24 06:26:18 -06'00'

For: James Zyduck
Director, Hydro Plants

Enclosures

cc: Distribution List

Certificate of Service

I hereby certify that I, on behalf of NSPW, a Wisconsin corporation, have this day served by First Class Mail the foregoing documents in electronic format upon each person designated on the attached distribution list.

Dated this 27th day of November 2020.

Darrin Johnson

Darrin M. Johnson
Mead & Hunt, Inc.

Hayward Hydroelectric Project Licensing
FERC Project No. 2417

Trego Hydroelectric Project Licensing
FERC Project No. 2711

Notice of Intent to Relicense
Request to Use the Traditional Licensing Process
Pre-Application Document
Distribution List

TRIBES

Mr. Chad Able, Treaty Natural Resource Administrator
Red Cliff Band of Lake Superior Chippewa
88385 Pike Rd., Hwy 13
Bayfield, WI 54814

Ms. Jamie Arsenault, THPO
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Ms. Melanie Benjamin, Chief Executive
Mille Lacs Band of Ojibwe
43408 Oodena Dr.
Onamia, MN 56359

Mr. Brian Bisonette, THPO
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI
13394 West Trepania Road
Hayward, WI 54843

Mr. Michael Blackwolf, THPO
Fort Belknap Indian Community
656 Agency Main Street
Harlem, MT 59526-9455

Ms. Amy Burnette, THPO
Leech Lake Band of Minnesota
Chippewa Tribe
190 Sailstar Drive NE
Cass Lake, MN 56633

Mr. Alden Connor, THPO
Keweenaw Bay Indian Community
107 Beartown Rd.
Baraga, MI 44908

Ms. Stacie Cutbank, THPO
Oneida Nation of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Mr. Ned Daniels, Jr., Chairman
Forest County Potawatomi Community of Wisconsin
2051 Sand Lake Rd.
Crandon, WI 54520-9801

Mr. Marvin Defoe, THPO
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
88385 Pike Road Hwy. 13
Bayfield, WI 54814

Ms. Joan Delabreau, Chairperson
Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135

Ms. Beth Drost, Chairperson
Grand Portage Band of the MN Chippewa Indians
P.O. Box 428
Grand Portage MN 55605

Mr. Kevin Dupuis, Sr., Chairperson
Fond du Lac Band of the Minnesota Chippewa Tribe
1720, Big Lake Rd.
Cloquet, MN 55720

Mr. Michael Fairbanks, Chairperson
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Mr. Gary Frazer, Executive Director
Minnesota Chippewa Tribe
P.O. Box 217
Cass Lake, MN 56633

Mr. David Grignon, THPO
Menominee Indian Tribe of WI
W3426 Cty. VV
P.O. Box 910
Keshena, WI 54135-0910

Mr. Tehassi Hill, Chairperson
Oneida Tribe of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Ms. Shannon Holsey, President
Stockbridge-Munsee Tribe of Mohican Indians
N8476 Mo He
Troy, NY 12180

Ms. Jill Hoppe, THPO
Fond du Lac Band of Lake Superior Chippewa
1720 Big Lake Road
Cloquet, MN 55720

Ms. Diane Hunter, THPO
Miami Tribe of Oklahoma
PO Box 1326
Miami, OK 74355

Mr. Farron Jackson, St., Chairperson
Leech Lake Band of Chippewa Indians
6530 U.S. Hwy. 2 NW
Cass Lake, MN 56633

Douglas Lankford, Chief
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Mr. Michael LaRonge, THPO
Forest County Potawatomi Community of Wisconsin
5320 Wensaut Lane
P.O. Box 340
Crandon, WI 54520

Ms. Edith Leoso, THPO
Bad River Band of Lake Superior Tribe of Chippewa Indians
P.O. Box 39
Odanah, WI 54862

Ms. Wanda McFaggen, THPO
St. Croix Band of Lake Superior Chippewa
24663 Angeline Ave
Webster, WI 54893

Mr. Chris McGeshick, Chairperson
Sokaogon Chippewa Community of Wisconsin
3501 Sand Lake Road
Crandon, WI 54520

Ms. Daisy McGeshick, THPO
Lac Vieux Desert Band of Lake Superior Chippewa Indians of Michigan
P.O. Box 249
Watersmeet, MI 49969

Mr. Clinton Parish, Chairman
Bay Mills Indian Community of MI
12140 W. Lakeshore Drive
Brimley, MI 49715-9319

Mr. Rick Peterson, Chairperson
Red Cliff Band of Lake Superior Chippewa
88385 Pike Rd., Hwy 13
Bayfield, WI 54814

Mr. William Quackenbush, THPO
Ho-Chunk Nation
Executive Offices
P.O. Box 667
Black River Falls, WI 54615

Mr. Jared Swader, THPO
Grand Portage Band of Chippewa Indians
PO Box 428
Grand Portage, MN 55605

Mr. Warren C. Swartz, Sr., President
Keweenaw Bay Indian Community
17429 Beartown Road
Baraga, MI 49908

Mr. Louis Taylor, Sr., Chairman
Lac Courte Oreilles Band of Chippewa Indians
13394 W. Trepania Rd., Bldg. No. 1
Hayward, WI 53843-2186

Mr. Lewis Taylor, Chairman
St. Croix Chippewa Indians of WI
24663 Angeline Ave.
Webster, WI 54893

Mr. Adam VanZile, THPO
Sokaogon Chippewa Community, Mole Lake Band
3051 Sand Lake Road
Crandon, WI 54520

Mr. Andrew Werk, President
Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
656 Agency Main St.
Harlem, Montana 59526

Ms. Natalie Weyaus, THPO
Mille Lacs Band of Ojibwe
43408 Oodena Drive
Onamia, MN 56359

Ms. Sherry White, THPO
Stockbridge Munsee Community of Wisconsin
Tribal Office
P.O Box 70
Bowler, WI 54416

Mr. Marlin WhiteEagle, President
Ho-Chunk Nation of WI
P.O. Box 667
Black River Falls, WI 54615

Mr. Michael Wiggins, Chairman
Bad River Band of the Lake Superior Tribe of the Chippewa
P.O. Box 39
Odanah, WI 54861

Mr. Joseph Wildcat, Sr., President
Lac Du Flambeau Band of Lake Superior Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538-0067

Mr. James Williams, Chairman
Lac Vieux Desert Band of Lake Superior Chippewa Indians of MI
E23968 Pow Wow Trail
Watersmeet, MI 49969

Ms. Melinda Young, THPO
Lac du Flambeau Band of Lake Superior Chippewa Indians of WI
P.O. Box 67
Lac du Flambeau, WI 54538

FEDERAL

Ms. Nannette Bischoff, FERC Coordinator, St. Paul District
U.S. Department of the Army Corps of Engineers
180 5th Street E
Suite 700
St. Paul, MN 55101

Ms. Kimberly Bose, Secretary
FERC Office of General Counsel
888 First Street NE
Washington, DC 20426

Ms. Kimberly Bose, Secretary
FERC Office of Energy Projects
888 First Street NE
Washington, DC 20426

Ms. Tokey Boswell, Regional Environmental Coordinator
U.S. Department of the Interior – National Park Service
601 Riverfront Drive
Omaha, NE 68102

Mr. Michael C. Connor
U.S. Department of the Interior-Comm. U.S. Bureau Reclamation
1849 C Street NW.
Washington, DC 20240-0001

Honorable Glenn Grothman, U.S. Representative
U.S. Representative from Wisconsin District 6
1427 Longworth H.O.B.
Washington, DC 20515

Mr. Timothy Lapointe, Regional Director
U.S. Bureau of Indian Affairs Midwest Regional Office
5600 West American Boulevard
Suite 500
Bloomington, MN 55437

Ms. Mary Manydeeds, Environmental Specialist
U.S. Department of the Interior – Bureau of Indian Affairs, Norman Pointe II Building
5600 American Boulevard W
Suite 500
Bloomington, MN 55437

Ms. Angela Tornes, Midwest Hydropower Coordinator
U.S. Department of the Interior - National Park Service
626 E Wisconsin Ave, Suite 100
Milwaukee, WI 53202

Honorable Tom Tiffany, U.S. Representative
U.S. Representative from Wisconsin District 7
1714 Longworth H.O.B.
Washington, DC 20515

Ms. Jen Tyler, Mail Code: E-19J
U.S. Environmental Protection Agency – NEPA Implementation Section, Region V
77 W Jackson Boulevard, AR-18J
Chicago, IL 60604

U.S. Department of the Interior – Fish & Wildlife Service – Green Bay Field Office
Field Supervisor
2661 Scott Tower Drive
New Franken, WI 54229

Mr. Nick Utrup, Fisheries Biologist
U.S. Department of the Interior – Fish & Wildlife Service
4101 American Boulevard E
Bloomington, MN 55425

STATE
Public Service Commission of Wisconsin
P.O. Box 7894
Madison, WI 53707

Wisconsin Cooperative Fishery Research Unit
UW Stevens Point
2100 Main Street
Stevens Point, WI 54481

Ms. Kathleen Angel, Wisconsin Coastal Management Program
Wisconsin Department of Administration
101 E. Wilson Street
10th Floor
Madison, WI 53703

Ms. Cheryl Laatsch, FERC Coordinator
Wisconsin Department of Natural Resources
502 E. Mill Street
Beaver Dam, WI 53916

Mr. Jeffrey Scheirer, Watershed Management
Wisconsin Department of Natural Resources
875 S. Fourth Ave
Park Falls, WI 54552

Wisconsin Office of the Governor
P.O. Box 7863
Madison, WI 53702

Mr. Tyler Howe, Office
Wisconsin State Historical Society
816 State Street
Madison, WI 53706

LOCAL
Mr. William Allard, Supervisor
Town of Trego
N7069 Oak Hill Rd.
Trego, WI 54888

City Manager
City of La Crosse
400 La Crosse Street
La Crosse, WI 54601

Ms. Barb Hinkfuss, Clerk
Town of Trego
W6097 River Road
Trego, WI 54880

Mr. Thomas Hoff, County Administrator
Sawyer County
10610 Main St. Suite 23
Hayward, WI 54843

Mr. Wes Huffer, Chairman
Town of Trego
N8521 Hwy 53
Trego, WI 54880

Marathon County
500 Forest Street
Wausau, WI 54403

Ms. Lolita Olson, County Clerk
Washburn County
10 4th Avenue, P. O. Box 639
Shell Lake, WI 54871

Mr. Dale Peters, City Manager
City of Eau Claire
203 S. Farwell St. P.O. Box 5148
Eau Claire, WI 54702-5148

Ms. Lisa Poppe, Clerk/Treasurer
City of Hayward
P.O. Box 969
Hayward, WI 54843

Town of Hayward
15460W State Rd 77E
Hayward, WI 54843

Town of Superior
4917 South State Road 35
Superior, WI 54880

Mr. Brian Vosberg, Supervisor
Town of Trego
N7523 Lakeside Rd.
Trego, WI 54888

OTHER
Mr. Mike Arrowwood
Chairman
Walleye for Tomorrow
2240 Auburn St.
Fond du Lac, WI 54935

Mr. Scott Crotty
Senior Operations Manager
Xcel Energy
1414 W Hamilton Ave
Eau Claire, WI 54701-7252

Mr. James Fossum
River Alliance of Wisconsin
JD Fossum Environmental Consulting
199 Janet Marie Ln.
Winona, MN 55987

Mr. Thomas Frost, Chairman
Trego Lake District
N7658 Wood Dr.
Trego, WI 54888

Mr. Matt Miller
Hydro License Compliance Consultant
Xcel Energy
1414 W Hamilton Ave
Eau Claire, WI 54701-7252

Northwest Regional Planning Committee
1400 S. River St.
Spooner, WI 54801-8692

Mr. Charlie Peterson, Board Member
Trego Lake District
5504 12th Avenue South
Minneapolis, MN 55417

Mr. James Zyduck
Director of Hydro Plants
Xcel Energy
1414 W Hamilton Ave
Eau Claire, WI 54701-7252

NOTICE OF INTENT
BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
TO FILE AN APPLICATION
FOR SUBSEQUENT LICENSE
HAYWARD HYDROELECTRIC PROJECT
FERC PROJECT NO. 2417
NORTHERN STATES POWER COMPANY-WISCONSIN, d/b/a Xcel Energy

In accordance with 18 C.F.R. § 5.5, Northern States Power Company-Wisconsin, d/b/a Xcel Energy, hereby declares its intent to file an application for a subsequent license for an existing minor hydroelectric development at the Hayward Hydroelectric Project as described below.

Information Required Pursuant to 18 C.F.R. § 5.5 and 16.6(b)

1. Potential License Applicant's Name and Address

The licensee's name and address are:

Northern States Power Company – Wisconsin (NSPW)
Attn: James M. Zyduck
Director of Hydro Plants
1414 W. Hamilton Ave.
PO Box 8
Eau Claire, WI 54702-0008
James.Zyduck@XcelEnergy.com

2. Project Number

The FERC project number is 2417.

3. License Expiration Date

The license expiration date is November 30, 2025.

4. Statement of Intent

Northern States Power Company-Wisconsin, d/b/a Xcel Energy, unequivocally intends to file an application for a subsequent license for the Hayward Hydroelectric Project (FERC No. 2417) and has requested permission to use the Commission's Traditional Licensing Process.

5. Principal Project Works and Project Description

The principal project works consist of a 424-foot long, 18-foot high dam consisting of four sections, an intake channel, a powerhouse with one generating unit, and a 0.48 kV/12.5 kV step up transformer.

The dam consists of four sections: 1) a 200-foot long right earth embankment which extends from the right bank to the powerhouse with a top width of 30 feet and a crest elevation of 1,185.5 feet; 2) an 80-foot long middle earth embankment which extends from the powerhouse to the overflow spillway section with a top width of 30 feet and crest elevation of 1,188.5; 3) a 120-foot long overflow spillway

section with 8 stoplog bays, and two slide gate bays with a crest elevation of 1,183.4 feet; and 4) a left earth embankment that extends from the left abutment of the overflow spillway to the left bank.

The intake channel includes the concrete intake structure, trashrack, steel bulkhead, access bridge, and access bridge over the channel. The 42-foot wide (upstream to downstream) intake channel varies in length from 13 feet on the upstream side to 8 feet at the intake.

The powerhouse is 18 feet long by 24 feet wide by 27.5 feet high. It contains one vertical Francis-type turbine unit manufactured by S. Morgan Smith Company with a maximum hydraulic capacity of 178 cfs that is rated at 280 hp at 17 feet of head.

The powerhouse also contains one Northwestern Electric Equipment Company, 2300-volt, 180 rpm, 0.8 power factor AC generator with a nameplate capacity of 168 kilowatts (kW).

6. Location of the Project

The location of the project is as follows:

State:	Wisconsin
County:	Sawyer County, WI
Stream:	Namekagon River approximately 60 miles upstream of its confluence with the St. Croix River and 33 miles downstream of its source at Lake Namekagon
Nearby Communities:	City of Hayward, Wisconsin; Town of Hayward, Wisconsin
Other:	Located in the City of Hayward in Sawyer County, WI; approximately 50 miles southwest of the City of Ashland, WI; and approximately 85 miles north of the City of Eau Claire, WI.

7. Installed Plant Capacity

The plant has an installed capacity of 168 kW.

8. Names and Mailing Addresses

- *Every county in which any part of the project is located, and in which any Federal facility that is used or to be used by the project is located:*

County:	Sawyer
Contact name:	Thomas Hoff, County Administrator
Mailing Address:	10610 Main St., Suite 23 Hayward, WI 54843 tom.hoff@sawyercountygov.org

The Project uses no federal facilities and occupies no federal lands.

- *Every city, town, or similar local political subdivision*

  (A) in which any part of the project is or is to be located and any Federal facility that is or is to be used by the project is located:

  Town Chairman
  Town of Hayward
  15460W State Road 77E
  Hayward, WI 54843
  townofhayward@cheqnet.net

  Lisa Poppe, Clerk/Treasurer
  City of Hayward
  PO Box 969
  Hayward, WI 54843

  The Project uses no federal facilities and occupies no federal lands.

  (B) that has a population of 5,000 or more people and is located within 15 miles of the existing proposed project dam:

  None.

- *Every irrigation district, drainage district, or similar special purpose political subdivision*

  (A) in which any part of the project is or is proposed to be located and any Federal facility that is or is proposed to be used by the project is located;

  Northwest Regional Planning Commission
  1400 S. River St.
  Spooner, WI 54801-8692

  The Project uses no federal facilities and occupies no federal lands.

  (B) that owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to be used by the project:

  None.

- *Every other political subdivision in the general area of the project or proposed project that there is reason to believe would likely be interested in, or affected by, the notification:*

  None.

- *Indian tribes:*

  Mr. Chad Able, Treaty Natural Resource Administrator
  Red Cliff Band of Lake Superior Chippewa
  88385 Pike Rd., Hwy 13
  Bayfield, WI 54814

Ms. Jamie Arsenault, THPO
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Ms. Melanie Benjamin, Chief Executive
Mille Lacs Band of Ojibwe
43408 Oodena Dr.
Onamia, MN 56359

Mr. Brian Bisonette, THPO
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI
13394 West Trepania Road
Hayward, WI 54843

Mr. Michael Blackwolf, THPO
Fort Belknap Indian Community
656 Agency Main Street
Harlem, MT 59526-9455

Ms. Amy Burnette, THPO
Leech Lake Band of Minnesota
Chippewa Tribe
190 Sailstar Drive NE
Cass Lake, MN 56633

Mr. Alden Connor, THPO
Keweenaw Bay Indian Community
107 Beartown Rd.
Baraga, MI 44908

Ms. Stacie Cutbank, THPO
Oneida Nation of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Mr. Ned Daniels, Jr., Chairman
Forest County Potawatomi Community of Wisconsin
2051 Sand Lake Rd.
Crandon, WI 54520-9801

Mr. Marvin Defoe, THPO
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
88385 Pike Road Hwy. 13
Bayfield, WI 54814

Ms. Joan Delabreau, Chairperson
Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135

Ms. Beth Drost, Chairperson
Grand Portage Band of the MN Chippewa Indians
P.O. Box 428
Grand Portage MN 55605

Mr. Kevin Dupuis, Sr., Chairperson
Fond du Lac Band of the Minnesota Chippewa Tribe
1720, Big Lake Rd.
Cloquet, MN 55720

Mr. Michael Fairbanks, Chairperson
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Mr. Gary Frazer, Executive Director
Minnesota Chippewa Tribe
P.O. Box 217
Cass Lake, MN 56633

Mr. David Grignon, THPO
Menominee Indian Tribe of WI
W3426 Cty. VV
P.O. Box 910
Keshena, WI 54135-0910

Mr. Tehassi Hill, Chairperson
Oneida Tribe of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Ms. Shannon Holsey, President
Stockbridge-Munsee Tribe of Mohican Indians
N8476 Mo He
Troy, NY 12180

Ms. Jill Hoppe, THPO
Fond du Lac Band of Lake Superior Chippewa
1720 Big Lake Road
Cloquet, MN 55720
Ms. Diane Hunter, THPO
Miami Tribe of Oklahoma
PO Box 1326
Miami, OK 74355

Mr. Farron Jackson, St., Chairperson
Leech Lake Band of Chippewa Indians
6530 U.S. Hwy. 2 NW
Cass Lake, MN 56633

Douglas Lankford, Chief
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Mr. Michael LaRonge, THPO
Forest County Potawatomi Community of Wisconsin
5320 Wensaut Lane
P.O. Box 340
Crandon, WI 54520

Ms. Edith Leoso, THPO
Bad River Band of Lake Superior Tribe of Chippewa Indians
P.O. Box 39
Odanah, WI 54862

Ms. Wanda McFaggen, THPO
St. Croix Band of Lake Superior Chippewa
24663 Angeline Ave
Webster, WI 54893

Mr. Chris McGeshick, Chairperson
Sokaogon Chippewa Community of Wisconsin
3501 Sand Lake Road
Crandon, WI 54520

Ms. Daisy McGeshick, THPO
Lac Vieux Desert Band of Lake Superior Chippewa Indians of Michigan
P.O. Box 249
Watersmeet, MI 49969

Mr. Clinton Parish, Chairman
Bay Mills Indian Community of MI
12140 W. Lakeshore Drive
Brimley, MI 49715-9319

Mr. Rick Peterson, Chairperson
Red Cliff Band of Lake Superior Chippewa
88385 Pike Rd., Hwy 13
Bayfield, WI 54814

Mr. William Quackenbush, THPO
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P.O. Box 667
Black River Falls, WI 54615
Bill.Quackenbush@Ho-Chunk.com

Mr. Jared Swader, THPO
Grand Portage Band of Chippewa Indians
PO Box 428
Grand Portage, MN 55605

Mr. Warren C. Swartz, Sr., President
Keweenaw Bay Indian Community
17429 Beartown Road
Baraga, MI 49908

Mr. Louis Taylor, Sr., Chairman
Lac Courte Oreilles Band of Chippewa Indians
13394 W. Trepania Rd., Bldg. No. 1
Hayward, WI 53843-2186

Mr. Lewis Taylor, Chairman
St. Croix Chippewa Indians of WI
24663 Angeline Ave.
Webster, WI 54893

Mr. Adam VanZile, THPO
Sokaogon Chippewa Community, Mole Lake Band
3051 Sand Lake Road
Crandon, WI 54520
Adam.VanZile@SCC-nsn.gov

Mr. Andrew Werk, President
Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
656 Agency Main St.
Harlem, Montana 59526

Ms. Natalie Weyaus, THPO
Mille Lacs Band of Ojibwe
43408 Oodena Drive
Onamia, MN 56359

Ms. Sherry White, THPO
Stockbridge Munsee Community of Wisconsin
Tribal Office, P.O Box 70
Bowler, WI 54416

Mr. Marlin WhiteEagle, President
Ho-Chunk Nation of WI
P.O. Box 667
Black River Falls, WI 54615

Mr. Michael Wiggins, Chairman
Bad River Band of the Lake Superior Tribe of the Chippewa
P.O. Box 39
Odanah, WI 54861

Mr. Joseph Wildcat, Sr., President
Lac Du Flambeau Band of Lake Superior Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538-0067

Mr. James Williams, Chairman
Lac Vieux Desert Band of Lake Superior Chippewa Indians of MI
E23968 Pow Wow Trail
Watersmeet, MI 49969

Ms. Melinda Young, THPO
Lac du Flambeau Band of Lake Superior Chippewa Indians of WI
P.O. Box 67
Lac du Flambeau, WI 54538

NOTICE OF INTENT
BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
TO FILE AN APPLICATION
FOR SUBSEQUENT LICENSE
TREGO HYDROELECTRIC PROJECT
FERC PROJECT NO. 2711
NORTHERN STATES POWER COMPANY-WISCONSIN, d/b/a Xcel Energy

In accordance with 18 C.F.R. § 5.5, Northern States Power Company-Wisconsin, d/b/a Xcel Energy, hereby declares its intent to file an application for a subsequent license for an existing minor hydroelectric development at the Trego Hydroelectric Project as described below.

Information Required Pursuant to 18 C.F.R. § 5.5 and 16.6(b)

1. Potential License Applicant's Name and Address

The licensee's name and address are:

Northern States Power Company – Wisconsin (NSPW)
Attn: James M. Zyduck
Director of Hydro Plants
1414 W. Hamilton Ave.
PO Box 8
Eau Claire, WI 54702-0008
James.Zyduck@XcelEnergy.com

2. Project Number

The FERC project number is 2711.

3. License Expiration Date

The license expiration date is November 30, 2025.

4. Statement of Intent

Northern States Power Company-Wisconsin, d/b/a Xcel Energy, unequivocally intends to file an application for a subsequent license for the Trego Hydroelectric Project (FERC No. 2711) and has requested permission to use the Commission's Traditional Licensing Process.

5. Principal Project Works and Project Description

The principal project works consist of a dam with two earthen embankment sections, a spillway section, a sluiceway section, and a powerhouse section with two generating units. Other project works include a 2.4 kV/23.9 kV step up transformer in an adjacent non-project substation.

From right to left the dam consists of five sections: 1) a 30-foot high by 380-foot long right earthen embankment section with a crest elevation of 1,040 feet; 2) 27-foot high by 56-foot long (right to left), by 112-foot wide Tainter gate spillway section with a gate sill elevation of 1,026 feet and a top of gate

elevation of 1,035.2 feet; 3) a 29-foot high by 6-foot long by 99-foot wide sluice gate spillway section with a crest elevation of 1,028 feet; 4) a 74-foot high by 59.5-foot long by 30.2-foot wide powerhouse section; and 5) a 25-foot high by 110-foot long left earthen embankment section with a crest elevation of 1,040 feet.

The powerhouse contains two vertical Francis-type turbines manufactured by the J. Leffel Company. Unit 1 has a 56-inch runner, a maximum hydraulic capacity of 140 cfs, and a rated capacity of 1,095 hp when operating at a constant speed of 164 rpm. Unit 2 has a 47.5-inch runner, a maximum hydraulic capacity of 100 cfs, and a rated capacity of 785 hp when operating at a constant speed of 180 rpm.

The powerhouse also contains two generators with a total rated capacity of 1,200 kW. Unit 1 consists of an 875 KVA, 700 kW (at 0.8 power factor), 2,400-volt, 60 cycle, 164 rpm alternator and direct connected 124-volt exciter. Unit 2 consists of a 625 KVA, 500 kW (at 0.8 power factor), 2,400-volt, 60 cycle, 180 rpm alternator and a direct connected 16 kW, 125-volt exciter.

6. Location of the Project

The location of the project is as follows:

State:	Wisconsin
County:	Washburn County, WI
Stream:	Namekagon River approximately 30 miles upstream of its confluence with the St. Croix River and 70 miles downstream of its source at Lake Namekagon
Nearby Communities:	City of Spooner, Wisconsin; Town of Trego, Wisconsin
Other:	Located in the Town of Trego in Washburn County, WI; approximately 8 miles north of the City of Spooner, WI; and approximately 81 miles north of the City of Eau Claire, WI.

7. Installed Plant Capacity

The plant has an installed capacity of 1.2 MW.
Unit 1: 700 kW
Unit 2: 500 kW

8. Names and Mailing Addresses

- *Every county in which any part of the project is located, and in which any Federal facility that is used or to be used by the project is located:*

County:	Washburn
Contact name:	Lolita Olson, County Clerk
Mailing Address:	10 4th Avenue, P. O. Box 639 Shell Lake, WI 54871 coclerk@washburn.wi.us

The Project uses no federal facilities and occupies no federal lands.

- *Every city, town, or similar local political subdivision*

  (A) in which any part of the project is or is to be located and any Federal facility that is or is to be used by the project is located:

  Wes Huffer, Town Chairman
  Town of Trego
  N8521 Hwy 53
  Trego, WI 54888
  wchuffer@gmail.com

  The Project uses no federal facilities and occupies no federal lands.

  (B) that has a population of 5,000 or more people and is located within 15 miles of the existing proposed project dam:

  None.

- *Every irrigation district, drainage district, or similar special purpose political subdivision*

  (A) in which any part of the project is or is proposed to be located and any Federal facility that is or is proposed to be used by the project is located;

  Northwest Regional Planning Commission
  1400 S. River St.
  Spooner, WI 54801-8692

  Trego Lake District
  Charlie Peterson, Chairman
  5504 12th Avenue South
  Minneapolis, MN 55417

  The Project uses no federal facilities and occupies no federal lands.

  (B) that owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to be used by the project:

  None.

- *Every other political subdivision in the general area of the project or proposed project that there is reason to believe would likely be interested in, or affected by, the notification:*

  None.

- *Indian tribes:*

Mr. Chad Able, Treaty Natural Resource Administrator
Red Cliff Band of Lake Superior Chippewa
88385 Pike Rd., Hwy 13
Bayfield, WI 54814

Ms. Jamie Arsenault, THPO
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Ms. Melanie Benjamin, Chief Executive
Mille Lacs Band of Ojibwe
43408 Oodena Dr.
Onamia, MN 56359

Mr. Brian Bisonette, THPO
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI
13394 West Trepania Road
Hayward, WI 54843

Mr. Michael Blackwolf, THPO
Fort Belknap Indian Community
656 Agency Main Street
Harlem, MT 59526-9455

Ms. Amy Burnette, THPO
Leech Lake Band of Minnesota
Chippewa Tribe
190 Sailstar Drive NE
Cass Lake, MN 56633

Mr. Alden Connor, THPO
Keweenaw Bay Indian Community
107 Beartown Rd.
Baraga, MI 44908

Ms. Stacie Cutbank, THPO
Oneida Nation of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Mr. Ned Daniels, Jr., Chairman
Forest County Potawatomi Community of Wisconsin
2051 Sand Lake Rd.
Crandon, WI 54520-9801

Mr. Marvin Defoe, THPO
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
88385 Pike Road Hwy. 13
Bayfield, WI 54814

Ms. Joan Delabreau, Chairperson
Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135

Ms. Beth Drost, Chairperson
Grand Portage Band of the MN Chippewa Indians
P.O. Box 428
Grand Portage MN 55605

Mr. Kevin Dupuis, Sr., Chairperson
Fond du Lac Band of the Minnesota Chippewa Tribe
1720, Big Lake Rd.
Cloquet, MN 55720

Mr. Michael Fairbanks, Chairperson
White Earth Band of the Minnesota Chippewa
P.O. Box 418
White Earth, MN 56591

Mr. Gary Frazer, Executive Director
Minnesota Chippewa Tribe
P.O. Box 217
Cass Lake, MN 56633

Mr. David Grignon, THPO
Menominee Indian Tribe of WI
W3426 Cty. VV
P.O. Box 910
Keshena, WI 54135-0910

Mr. Tehassi Hill, Chairperson
Oneida Tribe of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Ms. Shannon Holsey, President
Stockbridge-Munsee Tribe of Mohican Indians
N8476 Mo He
Troy, NY 12180

Ms. Jill Hoppe, THPO
Fond du Lac Band of Lake Superior Chippewa
1720 Big Lake Road
Cloquet, MN 55720

Ms. Diane Hunter, THPO
Miami Tribe of Oklahoma
PO Box 1326
Miami, OK 74355

Mr. Farron Jackson, St., Chairperson
Leech Lake Band of Chippewa Indians
6530 U.S. Hwy. 2 NW
Cass Lake, MN 56633

Douglas Lankford, Chief
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Mr. Michael LaRonge, THPO
Forest County Potawatomi Community of Wisconsin
5320 Wensaut Lane
P.O. Box 340
Crandon, WI 54520

Ms. Edith Leoso, THPO
Bad River Band of Lake Superior Tribe of Chippewa Indians
P.O. Box 39
Odanah, WI 54862

Ms. Wanda McFaggen, THPO
St. Croix Band of Lake Superior Chippewa
24663 Angeline Ave
Webster, WI 54893

Mr. Chris McGeshick, Chairperson
Sokaogon Chippewa Community of Wisconsin
3501 Sand Lake Road
Crandon, WI 54520

Ms. Daisy McGeshick, THPO
Lac Vieux Desert Band of Lake Superior Chippewa Indians of Michigan
P.O. Box 249
Watersmeet, MI 49969

Mr. Clinton Parish, Chairman
Bay Mills Indian Community of MI
12140 W. Lakeshore Drive
Brimley, MI 49715-9319

Mr. Rick Peterson, Chairperson
Red Cliff Band of Lake Superior Chippewa
88385 Pike Rd., Hwy 13
Bayfield, WI 54814

Mr. William Quackenbush, THPO
Ho-Chunk Nation
Executive Offices
P.O. Box 667
Black River Falls, WI 54615

Mr. Jared Swader, THPO
Grand Portage Band of Chippewa Indians
PO Box 428
Grand Portage, MN 55605

Mr. Warren C. Swartz, Sr., President
Keweenaw Bay Indian Community
17429 Beartown Road
Baraga, MI 49908

Mr. Louis Taylor, Sr., Chairman
Lac Courte Oreilles Band of Chippewa Indians
13394 W. Trepania Rd., Bldg. No. 1
Hayward, WI 53843-2186

Mr. Lewis Taylor, Chairman
St. Croix Chippewa Indians of WI
24663 Angeline Ave.
Webster, WI 54893

Mr. Adam VanZile, THPO
Sokaogon Chippewa Community, Mole Lake Band
3051 Sand Lake Road
Crandon, WI 54520

Mr. Andrew Werk, President
Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
656 Agency Main St.
Harlem, MT 59526

Ms. Natalie Weyaus, THPO
Mille Lacs Band of Ojibwe
43408 Oodena Drive
Onamia, MN 56359

Ms. Sherry White, THPO
Stockbridge Munsee Community of Wisconsin
Tribal Office, P.O Box 70
Bowler, WI 54416

Mr. Marlin WhiteEagle, President
Ho-Chunk Nation of WI
P.O. Box 667
Black River Falls, WI 54615

Mr. Michael Wiggins, Chairman
Bad River Band of the Lake Superior Tribe of the Chippewa
P.O. Box 39
Odanah, WI 54861

Mr. Joseph Wildcat, Sr., President
Lac Du Flambeau Band of Lake Superior Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538-0067

Mr. James Williams, Chairman
Lac Vieux Desert Band of Lake Superior Chippewa Indians of MI
E23968 Pow Wow Trail
Watersmeet, MI 49969

Ms. Melinda Young, THPO
Lac du Flambeau Band of Lake Superior Chippewa Indians of WI
P.O. Box 67
Lac du Flambeau, WI 54538

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

November 27, 2020

Sherman and Ruth Weiss Community Library
10788 State Hwy. 77
Hayward, WI 54843

Spooner Memorial Library
421 High St.
Spooner, WI 54801

Subject: Request to Display Public Copy

To Whom it may concern:

Northern States Power Company-Wisconsin, d/b/a Xcel Energy, is beginning the Federal Energy Regulatory Commission's relicensing process for its Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC No. 2711).

Therefore, it politely requests you to locate this enclosed hard copy in a location that is reasonably accessible to the public for inspection during regular business hours. Please retain this copy for public inspection until November 30, 2025.

Thank you for your time and consideration in this matter. If you have any questions, please contact me at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Respectfully Submitted,

Matthew J. Miller

Digitally signed by Matthew J. Miller
DN: cn=Matthew J. Miller, o=Xcel Energy, ou=Energy Supply, email=matthew.j.miller@xcelenergy.com, c=US
Date: 2020.11.24 22:28:40 -06'00'

Matthew J. Miller
Hydro License Compliance Consultant

Enc. NOI, PAD, and TLP Request

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

December 10, 2020

FERC Docket Nos. 2417-065 and 2711-024

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Proof of Publication of NOI, PAD, and Request to Use TLP
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

Pursuant to 18 CFR § 5.3(d)(2), Northern States Power Company – Wisconsin, d/b/a Xcel Energy, licensee for the Hayward Project (P-2417) and the Trego Project (P-2711), published notices in newspapers of general circulation in Sawyer County and Washburn County, Wisconsin regarding our filing of the Notices of Intent (NOI), Pre-Application Document (PAD), and requests to use the Traditional Licensing Process (TLP) for said Projects. The notices were published in the Sawyer County Record on November 25, 2020 and the Spooner Advocate on November 26, 2020. Copies of both public notices and Affidavits of Publication are enclosed.

Should you have any questions, please contact Matthew Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Sincerely,

James M Zyduck

Digitally signed by James M Zyduck
Date: 2020.12.10 15:23:52 -06'00'

James M. Zyduck
Director, Hydro Plants

Enclosures

Cc: Shawn Puzen, Darrin Johnson – Mead & Hunt, Inc. (via e-mail)
Project Files

EDITOR'S INBOX

Give thanks for our community library

Editor:

Recently, I opened a drawer and noticed a library receipt that said "you just saved $25.00 by using the library today." I thought about how many books I have borrowed since the COVID "stay at home" order in March, and it has been at least 12.

Wow, that is a savings of at least $250 over the purchase price! I want to take a moment to express gratitude for having a responsive library that will get the books I want to read. Even during these tough times, the staff found a way to make the books available.

The library is a community asset for which we should be thankful.

Martha Zych Hayward

Women speak up for the earth

Editor:

I attended the planning committee meeting on Nov. 12 at Hayward's city hall. I noticed it was women who spoke on behalf of our local farmer's market and against the clear-cutting and brutal biomass removal between Hospital Road and Havenwood Lane.

Ever since witnessing chloroplasts moving in circles on a scraped leaf in botany class, I've been awed by the process of photosynthesis on which our lives depend. In the past year I've learned of the mycorrhizal relationships between fungi in the soil and tree root tips. (Trees communicate with each other via these underground connections.) Whether on the basis of scientific observation or compassion for a 30-40-year-old tree being bowled over by a tough machine, it seems women are willing to speak up for non-human neighbors on earth. I wish we had women on the city council and planning committee to speak for co-existence.

Hazel Jonjak Hayward

Is climate change really controversial?

Editor:

I am encouraged that climate change was an issue in this last election. And I appreciated U.S. Supreme Court Justice Amy Coney Barrett's statement that climate change is a controversial issue.

It's controversial that there were 16 U.S climate disasters in the U.S. in the first nine months of this year whose losses exceeded a billion dollars. These 16 events resulted in the deaths of 188 people and had significant economic effects on the areas impacted. Yet many leaders (but not most of the public) don't want to believe the science that clearly shows this increase in natural disasters is a result of climate change, so our country left the Paris Climate Accord and eliminated regulations that would have reduced carbon emissions.

It's controversial that the U.S. continues to subsidize the fossil fuel industry directly and indirectly, but our individual ability to receive tax incentives for renewable energy infrastructure, such as solar or wind, decreased this year and will be gone after next year.

I think it's controversial that many of our national leaders don't seem to care that we are leaving our children and grandchildren to pay the price of climate change. I have hope, though, that our citizens will push for action to reduce carbon emissions at all levels of government. I hope for incentives that will grow our renewable energy industry and allow us to significantly reduce fossil fuel use.

I have hope we will think about our grandchildren and make sacrifices ourselves to reduce their risks of facing a looming climate crisis.

Pam Dryer Mason

The Hayward senior center needs your help

Editor:

I am writing this because of the Hayward senior center. The Hayward senior center has done so much for the people in Hayward, and now it is our time to help them. The bus they have is getting to be a costly item. Working with Marketplace Foods, they have put together a coupon book to be used at the store; with it you can save money and even get some free items.

Money raised from the sale of the books will go towards a new bus and we are hoping to get a lot of help from the people here. Do you know that the center delivers 125 or more meals every day?

You can pick up a book at the Senior Center from 9 a.m. till 4 p.m. for $20 and the book has more than $100 worth of coupons. I want to say these would be a great stocking suffer or you may know of someone who could use one that may be in need, a great idea to help a person or couple.

I am hoping if you do not take a coupon book please send a donation. Every dollar counts. You will find coupon books at Lori's Cards and Gifts, Price Rite Liquor and the Senior Center.

We are here to serve anyone needs to have lunch; we still bring lunch to your door. Please call for information, 715-634-3000 or 715-634-4680. The senior center is located at 15856 5th Street, Hayward WI 54843.

MaryAnn Sebek Hayward

OFF THE TOP OF MY HEAD

Thankful to become the 'crazy old man'

BY **PAUL MITCHELL,**
General Manager

Oh, these are strange times we're living in, aren't they?

A few days ago I woke up early, started my coffee, went downstairs to the family room and plopped on the couch. I pulled out my phone and checked my email.

And there was one from my friend (and occasional contributor to the Record) Mel Kelly. The subject line was alarming: "I am sad to let you know that."

Oh, no. Why was Mel sad? What was she letting me know? I assumed it was something having to do with COVID. The email had come in at 4:46 a.m.

I opened the email:

"Our mother, Mel Lytle Kelly, died in Carrabelle, FL on ------ ------. She wanted us to let you know because she thought so highly, so fondly of you."

It went on to say that there would be no services, etc. , and that Mel's remains would join those of her beloved late husband, Tom.

Oh, Mel, I thought. I had just shared a few emails with her within the past couple of weeks. Was it COVID, I wondered? How odd that the date she died was blank. Weren't they sure when she actually died?

Oh, Mel, so full of life and banter and fun conversation. How could she be gone?

And then I noticed at the bottom there was a second email. I scrolled down.

"Please excuse me – this was sent in error – glad to report that Mel Kelly is still very much alive."

Oh, Mel.

She was setting up a way for her children to alert her widespread circle of friends in the event that, at SOME POINT, she passes beyond the veil. And instead of just saving the email, Mel accidentally sent it out to her widespread circle of friends.

Oh, Mel.

Thoughtful?

Yes.

Disturbing?

Kind of.

Hilarious?

Totally.

So Mel's little snafu becomes perfect Thanksgiving fodder because, of course, her friends and family are so very thankful that she's not really dead. And her family now has another story for the family archives. "Remember the time Mom told everyone she was dead?"

Last night Vaughan and I watched a movie from 1995, "Home for the Holidays." Do you know it? The movie stars Holly Hunter and Anne Bancroft and Robert Downey Jr. It's about adults going home to their crazy parents' house for Thanksgiving, where family dynamics wreak havoc on everyone.

We watched, relating to the adult children going home, and all of a sudden the truth hit me.

We're not the adults going home to the parents; our parents are gone. We have no "home" to return to.

We are now the crazy parents.

Our home is the one the adult children have to return to. They didn't grow up in our home because we've moved since my kids all went out on their own, but still. Our parents' home is always "home," even if we never lived in it.

And now Vaughan and I are the crazy old people that the kids have to struggle to relate to.

Do we have strange habits the kids don't understand?

Do we make them crazy with the nonsense that comes out of our mouths? Do we tell them stories that we think are hilarious, yet they can't even begin to relate to?

When we host holidays, do they sneak off to a corner of the basement and whisper about how nuts we are? Will I start wearing a wig and support hose soon?

Wow. What a realization, one that I'm sure that many of you — given the demographics of newspaper readers — can relate to.

We are the crazy old people that add ridiculous humor to every holiday movie.

Perhaps this Thanksgiving, given the fact that there'll be just the two of us at the table thanks to COVID, we can pretend for one more year that we're just a couple of young adults counting our blessings and stuffing our faces.

But next Thanksgiving, when things, hopefully, are back to normal and we have to once again put the leaves in the table to accommodate the crowd, I think I'm going to put on my Crazy Old Man hat and wear it with pride. I'll count not only blessings, but also the grimaces of my children as I say crazy stuff. If I need inspiration, I'll just fondly remember my father, the ultimate "Crazy Old Man."

I remember years ago, my former mother-in-law stating proudly that she had reached the age where she could say anything she darned well pleased. At that time she was probably all of 60 years old. (She's still saying her piece today at 89.)

I remember thinking, "Good lord, don't ever let me hit the point where I'm going to say whatever I want to say, people's opinions of me be damned."

But I think I'm getting there.

This Thanksgiving, I'm thankful for a lot. I'm thankful that my kids are healthy, that I have a wonderful husband to share my life with, that I have wonderful friends and co-workers to share my days with (even at a distance) and that I'm still breathing.

I'm thankful Mel's alive.

And I'm also thankful that I get to be the crazy old person. It actually sounds like fun.

Now, don't take this wrong, Mel, but sending out that email is just what I'm talking about. If I accidentally send out an email telling everyone I'm dead, get over it.

I know for a fact that Mel embraces her current station in life. Me? I'm only 54, but with my cardiac issues, perhaps 54 is the new 70. I'm going to enjoy it.

Happy Thanksgiving to all of our readers.

As always, we are most thankful for all of you. Thanks for reading, thanks for subscribing and thanks for keeping us going another year. This one hasn't been easy, but we've almost made it through.

Have a safe and healthy holiday.

Spooner Advocate

Nov 26 2020 Page A02 Clip resized 27%

Progress made at park, big project pending

BY TERRI REITER

Lighting has been added to the new pavilion at Railroad Park in Spooner, expanding its usage.

TERRI REITER

It's been a tough year as COVID-19 greatly challenged the landscape of our lives. We are grateful and thankful, however, that despite the challenges, the Friends of the Railroad Park (FORRP) has made a lot of progress at the Spooner Railroad Park, which is located across the tracks from the Railroad Memories Museum.

We've worked hard this past summer and fall to bring a little piece of local history to life. Thankfully, after some postponements, our contractors were able to complete the Railroad Park Picnic Pavilion in time for Hunter safety and yoga classes and lots of picnics and relaxing at the Park!

FORRP wishes to thank our community, donors, and partners (thank you to Schmitz's Economart for its help with the pavilion and brick restoration), contractors and invested businesses, and the city crew for our many blessings.

FORRP aspires to provide diverse year-round leisure opportunities through the preservation of Spooner's rich railroad history, open green space, and park settings for its community and visitors. Spooner Railroad Park encourages revitalization and community pride by stimulating economic, culturally enriched experiences, and activities within and around the park.

Here are our most recent accomplishments: The restored weigh station/scale is nearly complete! It was used heavily in the '40s to mid-'70s to weigh railcars to price product to transport as well as making sure the railcar wasn't overloaded.

Ken Stoney and Brad Patchin have taken over where Del Salquist left off in restoring it back to its original state, both inside and out. Looking through the windows, you'll see pictures illustrating the similarities.

The Railroad Park Picnic Pavilion is complete with outlets, lights, and three donor benches adjacent, acknowledging our awesome Yard Master donors. The volleyball court has been moved north, with much landscaping by the city crew in place.

Our plans for the future include: further landscaping both at the weigh station and the park; creating historic preservation status for the Roundhouse; installing an ATV path from the Wild Rivers Trail to the parking lot, signage indicating where ATVers can park, a walkway from the parking lot to the pavilion, "in-use" sign at the pavilion, four more historic signs; and our greatest project for spring of 2021 is to preserve and secure six critical areas of the exterior brickwork of the Roundhouse.

Lastly, we've approved the request from the Spooner Pickle Ball Fun Addicts Club to reserve space to build a pickle ball/tennis court north of the weigh station for a two-year period at Railroad Park.

We need your help to continue! FORRP is humbly asking for donations to make this a beautiful, welcoming site for all to enjoy. Here are our immediate and ongoing needs:

• Crucial need to repair and secure six areas on the roundhouse this spring, to save and preserve the building and keep bricks intact. It's a tough, old building and built like a tank, but it urgently needs the repair to secure it so exterior cleaning and spot tuck pointing can be done at a later time with more fundraising – $25,000.

> Portable toilet expense for the park: $1,500/year.

> Website and marketing: $600/year.

Spooner Railroad Park Donation Levels:

> Gandy Dancer – $250: Recognition on website

> Engineer – $250-$999: Recognition on website and 4-by-8 recognition brick

Conductor – $1,000-$4,999: Logo and recognition on website and 8-by-8 recognition brick

Yard Master – $5,000+: Logo and recognition on website, 8-by-8 recognition brick, a tree or bench

Donations can be mailed to: Friends of the Railroad Park (FORRP), PO Box 348, Spooner, WI 54801.

If you would like to know more or how to donate, please call Terri Reiter, Chair of at 715-416-2955. Blessings to you, and I thank you again, for your incredible generosity.

PUBLIC NOTICE

On or before November 30, 2020, Northern States Power Company - Wisconsin (NSPW), d/b/a Xcel Energy, 1414 West Hamilton Avenue, P.O. Box 8, Eau Claire, Wisconsin 54702-0008, 715-737-1353 will file Notices of Intent to File a License Application (NOI) and a Pre-Application Document (PAD) for Subsequent Licenses for Minor Waterpower Projects for the Hayward Hydroelectric Project (FERC Project No. 2417) and the Trego Hydroelectric Project (FERC Project No. 2711) with the Federal Energy Regulatory Commission (FERC).

The NOIs and PAD provide details of the Hayward and Trego Hydroelectric Projects as well as NSPW's intent to seek subsequent licenses for their continued operation. The Hayward Project is located on the Namekagon River in the city of Hayward in Sawyer County, Wisconsin. The Trego Project is located on the Namekagon River in the town of Trego in Washburn County, Wisconsin. NSPW will be requesting permission from the FERC to use the Traditional Licensing Process (TLP) for both Projects.

The NOIs, PAD, and requests to use the TLP for the Projects will be available for public review and reproduction at the Sherman and Ruth Weiss Community Library (10788 State Hwy. 77 in Hayward, WI) and the Spooner Memorial Library (421 High Street in Spooner, WI) during normal business hours. The documents will also be available for public review on the Xcel Energy Hydroelectric Project Website at http://hydrolicensing.com and upon appointment at the Xcel Energy office at 1414 West Hamilton Avenue in Eau Claire, WI.

Comments can be filed with the FERC within 30 days of the filing date and respondents must submit comments to the Secretary of the Commission in accordance with filing procedures outlined in the Commission's website at http://FERC.gov. Comments on the request to use the TLP should address as appropriate the likelihood of timely license issuance, complexity of resource issues, level of anticipated controversy, relative cost of the TLP compared to the integrated process, the amount of available information and potential for significant disputes over studies, and other factors believed to be pertinent.

Xcel Energy

ROP AFFIDAVIT

December 04, 2020

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand: **Order #: 20114MX0**

ATTN: Darrin White WI/Hayward SCR
WI/Hayward Sawyer County Record
15464 County Rd. B
Hayward, Wisconsin 54843

V: 715.699.3998 F: Email: dwhite@sawyercountyrecord.net

WI/Hayward Sawyer County Record (Hayward, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Wed 11/25/20	3.00 X 10.00	**Special Instructions:** 5" x 10"	5A

This is to certify that the ROP advertising scheduled to run in your newspaper ran as per the placement details above. Please sign and verify that all information is accurate and correct.

Signed by CNA Media Department (Advertising Manager)

Sworn to and subscribed before me this 4th day of December 2020, 2019.

Notary Public

LAURA JEAN NIEMI
Notary Public
State of Minnesota
My Commission Expires
January 31, 2022

ROP AFFIDAVIT

December 04, 2020

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand: **Order #: 20114MX0**

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Spooner Advocate
251 East Maple St.
Spooner, Wisconsin 54801-0338

V: 715-635-2181 F: 1-715-635-2186 Email: mcarlson@spooneradvocate.com

WI/Spooner Advocate (Spooner, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Thu 11/26/20	3.00 X 10.00	**Special Instructions:** 5" x 10"	A02

This is to certify that the ROP advertising scheduled to run in your newspaper ran as per the placement details above. Please sign and verify that all information is accurate and correct.

Signed by CNA Media Department (Advertising Manager)

Sworn to and subscribed before me this 4th day of December 2020, 2019.

Notary Public

LAURA JEAN NIEMI
Notary Public
State of Minnesota
My Commission Expires
January 31, 2022

Hayward and Trego

NPS Meeting-Post JAM

Darrin Johnson

From: Tornes, Angela M. <Angie_Tornes@nps.gov>
Sent: Friday, March 12, 2021 9:24 AM
To: Shawn Puzen; Darrin Johnson; Miller, Matthew J; Crotty, Scott A
Cc: Zyduck, James M; Brauna Hartzell; Jen Schuetz; cheryl.laatsch@wisconsin.gov; wchuffer@gmail.com; cjpetersen@msn.com; Haller, Macaulay G - DNR; Antonuk, Connie J - DNR; Galonska, Juliet L; Yager, Lisa A; joan.harn; Arianna Schmidt
Subject: Hayward and Trego JAM/ River Access Planning Guide

Here's the link to the RAPG I mentioned in yesterday's meeting: https://www.nps.gov/articles/river-access-planning-guide-a-decision-making-framework-for-enhancing-river-access.htm

Another boating access resource: examples from around the country: https://www.nps.gov/articles/river-access-planning-guide-a-decision-making-framework-for-enhancing-river-access.htm

River Access Planning Guide: A Decision-Making Framework for Enhancing River Access (U.S. National Park Service)

The River Access Planning Guide is an online and downloadable resource for planning river access. The step by step process guides planning for river access with recreation users in mind. This guide can assist the challenging task of providing for a variety of uses while protecting natural resources in rivers and other waterways.

www.nps.gov

From: Shawn Puzen
Sent: Thursday, February 4, 2021 9:43 AM
To: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Cc: Zyduck, James M <james.zyduck@xcelenergy.com>; Brauna Hartzell <brauna.hartzell@meadhunt.com>; Jen Schuetz <jen.schuetz@meadhunt.com>; Tornes, Angela M. <Angie_Tornes@nps.gov>; cheryl.laatsch@wisconsin.gov <cheryl.laatsch@wisconsin.gov>; wchuffer@gmail.com <wchuffer@gmail.com>; cjpetersen@msn.com <cjpetersen@msn.com>; Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>; Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>; Galonska, Juliet L <Julie_Galonska@nps.gov>; Yager, Lisa A <Lisa_Yager@nps.gov>; joan.harn@verizon.net <joan.harn@verizon.net>; Arianna Schmidt <Arianna.Schmidt@meadhunt.com>
Subject: [EXTERNAL] Hayward and Trego Joint Agency Meeting
When: Thursday, March 11, 2021 10:00 AM-1:00 PM.
Where: Microsoft Teams Meeting

I am very sorry to announce that we have to change the meeting date to March 11th.

I apologize for any inconvenience this will cause.

Additional Information, including an agenda will be provided before the meeting.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)
+1 872-240-1286,,798844818# United States, Chicago

Phone Conference ID: 798 844 818#
Find a local number | Reset PIN

Learn More | Meeting options

Darrin Johnson

Subject:	Meeting with NPS-Hayward/Trego
Location:	Microsoft Teams Meeting
Start:	Fri 3/19/2021 1:00 PM
End:	Fri 3/19/2021 2:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Darrin Johnson
Required Attendees:	Angela Tornes; joan.harn; Shawn Puzen
Optional Attendees:	Crotty, Scott A; Matt Miller

Meeting to discuss NPS questions on Hayward and Trego Projects

---

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)
+1 872-240-1286,,887646054# United States, Chicago
Phone Conference ID: 887 646 054#
Find a local number | Reset PIN

Learn More | Meeting options

Darrin Johnson

From: Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Sent: Friday, March 26, 2021 1:41 PM
To: Tornes, Angela M.; Miller, Matthew J
Cc: Shawn Puzen; Darrin Johnson
Subject: RE: lighting at Trego
Attachments: streetworks-caretaker-roadway-spec.pdf

Angie as requested, here is the lighting information for Trego, thanks.

Scott Crotty
Xcel Energy
Sr. Operations Manager - Hydro East/Wheaton
1400 Western Ave Eau Claire WI 54702-0008
P: 715-737-1428 C: 715-225-2576 F: 715-737-1077
E: scott.a.crotty@xcelenergy.com

From: Tornes, Angela M. <Angie_Tornes@nps.gov>
Sent: Monday, March 22, 2021 9:24 AM
To: Crotty, Scott A <scott.a.crotty@xcelenergy.com>; Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: lighting at Trego

EXTERNAL - STOP & THINK before opening links and attachments.

Good morning, Scott and Matt,

Scott, thank you again for discussing additional issues associated with the Trego and Hayward projects after the Joint Agency Meeting. As discussed, would you please send me information about the type of new LED lighting fixtures and bulbs installed at the Trego project a couple of years ago, mentioned by Ricky at the JAM? The NPS has a management goal to protect night skies and has experts that can recommend best practices. Best practice guidance is available at: https://www.nps.gov/subjects/nightskies/practices.htm

- Angie ....·´¯`·.....><((((*> ...·´¯`·......><(((((*> ...·´¯`·.......><(((((*>

Angie Tornes National Park Service - Department of Interior Regions 3, 4, and 5

Rivers, Trails, and Conservation Assistance (RTCA) Program, Wisconsin Field Office Manager

Hydropower Assistance Program, Manager, DOI Regions 3, 4, & 5

(414) 297.3605 **desk** (414) 944.3957 **fax**

626 E. Wisconsin Ave., Suite 400, Milwaukee, WI 53202

RTCA: http:\\www.nps.gov/rtca Hydropower Assistance: http://nps.gov/hydro

DESCRIPTION

The Caretaker LED roadway luminaire combines high performance, low maintenance and easy installation in a simple, extremely economical package. Designed for years of worry-free operation, the Caretaker luminaire is ideal for municipal streetlighting retrofits requiring superior optical performance and fast payback on capital.

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Cast-aluminum housing and door. Access is via a single captive screw; tool-less access option available. Hinged removable power tray door for easy maintenance.

Optical
Injection-molded optics available in two full-cutoff distributions with wide, uniform light delivery. Fully compatible with standard NEMA refractor/reflector assemblies. 4000K CCT, minimum 70 CRI standard. Optional 3000K and 5000K CCT available.

Electrical
LED driver mounted to removable die-cast aluminum door. Standard driver is non-dimming, 120V only, optional dimming driver is 120-277V. Both drivers have 6kV onboard surge protection. 10kV/10kA surge protection options (meeting IEEE C62.41.2-2002 Location category C, High Exposure) are available. Luminaire is designed for efficient thermal management; heat is transferred away from the LEDs for optimal efficiency, light output, and life. Three-position tunnel-type compression terminal block. Lumen maintenance of 86% at 36,000 hours for 8-LED version. LED module is IP66 enclosure rated.

Mounting
Two-bolt slipfitter for mounting on 1-1/4" to 2" standard pipe (1-5/8" to 2-3/8" O.D.). Also available with a bracket for mounting to wood poles or walls without a pipe.

Finish
Unfinished raw aluminum standard. Optional five-stage super TGIC polyester powder coat paint, 2.5-mil nominal thickness for superior protection against fade and wear. Consult your lighting representative at Cooper Lighting Solutions for a complete selection of standard colors.

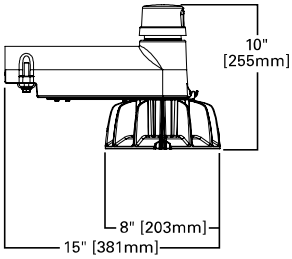
Warranty
Five-year warranty.

CRTK-R
CARETAKER LED

8 or 12 LEDs
Solid State LED

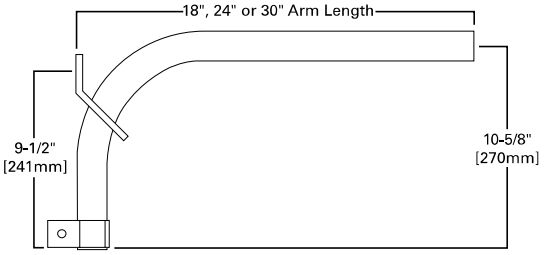
ROADWAY LUMINAIRE

DIMENSIONS



OPTIONAL WOOD POLE PIPE ARM

18", 24" or 30" Pipe Arm



CERTIFICATION DATA

ISO 9001
IP66 LED Array
3G Vibration Rated

ENERGY DATA

Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120/60Hz
-40°C Minimum Ambient Temperature Rating
+40°C Maximum Ambient Temperature Rating

EPA

Effective Projected Area: (Sq. Ft.) 0.67

SHIPPING DATA

Approximate Net Weight:
8.0 lbs. (3.6 kgs.)

POWER AND LUMENS

Light Engine		48W (8 LEDs)	73W (12 LEDs)
Type II	3000K Lumens / 80 CRI	3,469	4,916
	4000K Lumens / 70 CRI	4,447	6,302
	5000K Lumens / 70 CRI	4,614	6,538
	BUG Rating	B1-U0-G1	B2-U0-G2
Type V	3000K Lumens / 80 CRI	3,755	5,390
	4000K Lumens / 70 CRI	4,814	6,910
	5000K Lumens / 70 CRI	4,994	7,169
	BUG Rating	B3-U0-G1	B3-U0-G1

LUMEN MAINTENANCE (8 LEDS)

Ambient Temperature	TM-21 Lumen Maintenance (36,000 Hours)	Theoretical L70 (Hours)
25°C	> 86%	87,000
40°C	> 84%	72,000

LUMEN MAINTENANCE (12 LEDS)

Ambient Temperature	TM-21 Lumen Maintenance (36,000 Hours)	Theoretical L70 (Hours)
25°C	> 83%	69,000
40°C *	> 82%	66,000

* Painted Only.

ORDERING INFORMATION

Sample Number: CRTK-R-A08-E-120-5

Product Family	Lumen Package	Driver	Voltage	Distribution
CRTK-R=Caretaker Roadway Luminaire	**A08**=8 LEDs **A12**=12 LEDs [1]	**E**=Non-Dimming **D**=Dimming (0-10V) [2,3]	**120**=120V **U**=(120-277V) [2]	**2**=Type II **5**=Type V

Options (Add as Suffix)		**Color**	**Accessory** (Order Separately)
S=Shorting Cap **4N7**=NEMA 7-PIN Twistlock Photocontrol Receptacle [4] **5**=120V NEMA Photocontrol Included **10K**=10kV UL 1449 Surge Protection Device [5] **10MSP**=10kV MOV Surge Protector	**B18**=18" Wood Pole Pipe Arm **B24**=24" Wood Pole Pipe Arm **B30**=30" Wood Pole Pipe Arm **TH**=Tool-less Door Hardware **WPBKT**=Wall or Pole Mounting Bracket **V**=(2) 5' #14 Leads **3000**=3000K CCT (80 CRI) **5000**=5000K CCT (70 CRI)	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White **A**=Raw Aluminum Unfinished (Standard) [1]	**LLPC**=Long-life Photocontrol [6] **LLPC-FO**=Long-life Photocontrol (Fail Off) [6]

NOTE:

1. Paint required for 12 LED at 40°C ambient. Maximum ambient temperature for 12 LED unpainted is 25°C.
2. Dimming and universal voltage must be ordered together.
3. Dimming leads will be capped except when 4N7 option is specified.
4. Only available with dimming driver.
5. Not available with dimming or universal voltage.
6. Sold as accessory. Not covered under luminaire warranty.

Hayward and Trego

Comments on PAD and Study Requests

United States Department of the Interior
NATIONAL PARK SERVICE
Interior Regions 3, 4, 5
Wisconsin Field Office
626 E. Wisconsin Ave., Suite 400W
Milwaukee, WI 53207

December 28, 2020

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Preliminary Application Document, Notice of Intent, Request to Use Traditional Licensing Process, Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

The National Park Service (NPS) respectfully submits the following comments in response to Xcel Energy's (the Applicant's) filing of Preliminary Application Document (PAD), Notice of Intent, Request to Use Traditional Licensing Process, Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711) dated November 27, 2020.

We offer the following comments and recommendations pursuant to section 10(a) of the Federal Power Act (18 CFR 4.38(a), 5.41(f)(4)-(6), and 16.8(a); the Outdoor Recreation Act (Public Law 88-29); the National Park Service Organic Act (39 Stat. 535); and the National Wild and Scenic Rivers Act (Section 11(b)). The projects are located on the Namekagon River within the St. Croix National Scenic Riverway. Relatively free-flowing and unpolluted, the Namekagon and St. Croix Rivers flow through some of the most scenic and least developed country in the Upper Midwest. In 1968, Congress established the St. Croix National Scenic Riverway, which includes the Namekagon River, as one of the original eight rivers protected under the national Wild and Scenic Rivers Act.

It is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to relicensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. Identifying opportunities to improve the recreation experience is consistent with NPS policy and FERC guidelines to identify future potential recreation needs.

COMMENTS

Under 18 CFR § 5.3, the Applicant requested approval from the Federal Energy Regulatory Commission (FERC) to use the Traditional Licensing Process (TLP) for the Hayward and Trego Projects (Projects). Pursuant to the Commission's regulations under this Section, a potential license applicant requesting authorization to use the TLP must address the following considerations: (1) likelihood of timely license

issuance; (2) complexity of the resource issues; (3) level of anticipated controversy; (4) relative cost of the TLP compared to the default Integrated Licensing Process (ILP); (5) the amount of available information and potential for significant disputes over studies; and (6) other factors believed by the applicant to be pertinent. We address each of these considerations below.

Likelihood of timely license issuance: Due to the complexity of legal issues surrounding uncertain jurisdiction within a National Wild and Scenic River corridor and potentially complex riverway resource impacts, the level of anticipated controversy is likely to be high. Significant disputes are likely to evolve over legal determination as well as the need for studies described in the following sections. Consequently, we recommend using the default ILP as outlined in 18 CFR § 5.3 as the more appropriate proceeding and the process more likely to provide a timely license issuance. The ILP is intended to provide a streamlined licensing process that engages FERC staff and stakeholders early in the process to collaborate in issue identification and study resolution upfront. This process avoids costly time and financial expense in conducting post-filing studies and establishes a clear framework for project management.

Complexity of the resource issues: The NPS identified park management objectives based on protecting specific resource values for each of many segments of the St. Croix and Namekagon National Wild and Scenic River. The resource values and management objectives for each river segment relevant to these proceedings needs to be evaluated, related studies determined, and appropriate mitigation identified.

Aquatic Resources. The St. Croix and Namekagon Rivers provide one of the most extensive and exemplary aquatic species assemblages within the Upper Mississippi River basin and contain naturally reproducing populations of 41 native freshwater mussels, 5 of which are federally listed, and 100 native fish species. Determining studies to assess project impacts and enhancements on selected specie populations and/or migration is likely to be complex and controversial, warranting the ILP.

Recreation Resources. Each year demand for river recreation in the Riverway increases stressing resources and management of those resources. The recreation use and condition data in the PAD is five years old (2015) and is likely outdated due to recent trajectories in outdoor recreational use particularly in paddle sports such as kayaking and stand-up paddling. The PAD includes recreation needs identified by local public land manager but lacks current facility use and condition data necessary to determine project impacts. No study is proposed yet a well-designed study tailored to recreation facilities within project boundaries is warranted. The ILP process best suits study definition leading to an assessment of potential impacts and enhancement alternatives.

Level of anticipated controversy: The St. Croix National Scenic Riverway was established when the enabling legislation, the Wild and Scenic Rivers Act, was signed into law on October 2, 1968. The purpose of the St. Croix National Scenic Riverway is to preserve, protect, and enhance the values of the St. Croix and Namekagon Rivers and their immediate environment for the benefit and enjoyment of present and future generations. The values for which the Riverway has been designated as a wild and scenic river are its free-flowing character, exceptional water quality, and the aquatic, riparian, recreational, cultural/historic, geologic, scenic, and aesthetic values present in the rivers.

It is unclear whether FERC has jurisdictional authority to issue mitigation license articles for new hydropower license for projects within a designated National Wild and Scenic River. The resolution of this issue will likely require significant investment of time and may generate considerable controversy.

Relative cost of the traditional process compared to the integrated process The ILP would be more appropriate than a TLP for these projects since a complicated jurisdictional issue needs to be resolved; complex resource issues and related studies need to be defined.

The amount of available information and potential for significant disputes over Studies: Extreme wet weather events are an insidious threat to the resources protected by the Riverway and flooding impacts on Riverway natural and cultural resources are not yet understood. Catastrophic floods in

2018 affected a large geographic area in the adjacent Lake Superior Watershed resulting in loss of life and extensive infrastructure damage to highways, bridges, streets and harbors. Similarly, record floods this year breached two hydropower dams on the Tittabawassee River in Central Michigan, forcing 11,000 residents to evacuate and left several municipalities with severe flood damage. Recommending a study to determine impacts of extreme wet weather flooding on these dams and surrounding communities is likely to be source of significant dispute. The ILP which is more suited to addressing complex issues such as extreme weather impacts.

CONCLUSION

In summary, presented with the complexity of issues state above we conclude that deviating from the default Integrated Licensing Process is not justified. The Applicant has not met the comprehensive standard for the Traditional Licensing Process set in 18 CFR §5.3(c)(1) that requires "justification for the request."

We look forward to providing additional comments on the Pre-Application Document and submitting study requests according to the schedule outlined in the licensing process determined by the Commission.

Should you have any questions regarding these comments, please feel to contact either myself at angie_tornes@nps.gov or 414.708.7075 or Ms. Julie Galonska, St. Croix National Scenic Riverway Superintendent, at Julie_Galonska@nps.gov or 715.483.2270.

Sincerely,

Angela M. Tornes

Angela M. Tornes, Interior Region 3, 4, 5 Manager
Hydropower Assistance Program

Cc:

Julie Galonska, NPS
Nick Utrup, USFWS
Cheryl Latsch, Wisconsin Department of Natural Resources
Allison Werner, River Alliance of Wisconsin
Jim Fossum, River Alliance of Wisconsin

United States Department of the Interior
NATIONAL PARK SERVICE
Interior Regions 3, 4, 5
Wisconsin Field Office
626 E. Wisconsin Ave., Suite 400W
Milwaukee, WI 53207

December 28, 2020

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Preliminary Application Document, Notice of Intent, Request to Use Traditional Licensing Process, Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711)

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CONCLUSION

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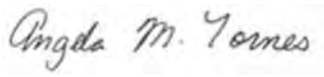
We look forward to providing additional comments on the Pre-Application Document and submitting study requests according to the schedule outlined in the licensing process determined by the Commission.

Should you have any questions regarding these comments, please feel to contact either myself at angie_tornes@nps.gov or 414.708.7075 or Ms. Julie Galonska, St. Croix National Scenic Riverway Superintendent, at Julie_Galonska@nps.gov or 715.483.2270.

Sincerely,



Angela M. Tornes, Interior Region 3, 4, 5 Manager
Hydropower Assistance Program

Cc:

Julie Galonska, NPS
Nick Utrup, USFWS
Cheryl Latsch, Wisconsin Department of Natural Resources
Allison Werner, River Alliance of Wisconsin
Jim Fossum, River Alliance of Wisconsin

United States Department of the Interior

NATIONAL PARK SERVICE
601 Riverfront Drive
Omaha, NE 68102

10.A.(MWR-FPI)

February 8, 2021

To: Federal Energy Regulatory Commission
Laura Washington
(202) 502-6072
Laura.Washington@ferc.gov

From: Christine Gabriel
Regional Environmental Coordinator

Re: Docket ID Number: P-2711-024
Notice of Intent to File License Application, Filing of PAD, Approving Use of TLP for the Trego Hydroelectric Project, FERC No. 2711-024, Washburn County, Wisconsin

Dear Ms. Washington,

The National Park Service has reviewed the above project and is submitting the following comments:

The Trego project, along with Hayward Project, are within the St. Croix National Scenic Riverway, a unit of the National Park Service. The National Park Service will provide comments throughout the Traditional Licensing Process (TLP); comments have not been solicited by the licensee at this time as prescribed in the TLP.

For more information contact Hector Santiago, Regional Rivers Coordinator at hector_santiago@nps.gov or (402) 661-9112.

Thank You,

CHRISTINE GABRIEL Digitally signed by CHRISTINE GABRIEL
Date: 2021.02.08 14:46:10 -06'00'

Christine Gabriel

Document Content(s)

2021 02 08_NPS Comments_ER-21-0024.PDF.....1

United States Department of the Interior

NATIONAL PARK SERVICE
601 Riverfront Drive
Omaha, NE 68102

10.A.(MWR-FPI)

February 8, 2021

To: Federal Energy Regulatory Commission
Laura Washington
(202) 502-6072
Laura.Washington@ferc.gov

From: Christine Gabriel
Regional Environmental Coordinator

Re: Docket ID Number: P-2417-065
Notice of Intent to File License Application, Filing of PAD, Use TLP for the Hayward Hydroelectric Project, FERC No. 2417-065, Sawyer Country, Wisconsin

Dear Ms. Washington,

The National Park Service has reviewed the above project and is submitting the following comments:

The Hayward project, along with Trego Project, are within the St. Croix National Scenic Riverway, a unit of the National Park Service. The National Park Service will provide comments throughout the Traditional Licensing Process (TLP); comments have not been solicited by the licensee at this time as prescribed in the TLP.

For more information contact Hector Santiago, Regional Rivers Coordinator at hector_santiago@nps.gov or (402) 661-9112.

Thank You,

CHRISTINE GABRIEL Digitally signed by CHRISTINE GABRIEL
Date: 2021.02.08 14:47:56 -06'00'

Christine Gabriel

United States Department of the Interior
NATIONAL PARK SERVICE
Interior Regions 3, 4, 5
601 Riverfront Drive
Omaha, NE 68102

April 27, 2021

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC. 20426

Electronic Filing

Re: National Park Service Comments on the Preliminary Application Document and Study Requests for Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711)

Dear Secretary Bose:

The National Park Service (NPS) respectfully submits the following comments on the Preliminary Application Document (PAD) for the Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711). The NPS is also submitting the following study requests: 1)Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego).

The NPS has authority to consult with the Federal Energy Regulatory Commission (FERC) and applicants concerning a project's effects on outdoor recreation resources under the Federal Power Act (18 CFR 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (Pub Law 88-29), and the NPS Organic Act (39 Stat. 535), and the National Wild and Scenic Rivers Act (Section 11(b)). The projects are located on the Namekagon River within the St. Croix National Scenic Riverway, a unit of the National Park System.

The St. Croix National Scenic Riverway (SACN) was established when the enabling legislation, the Wild and Scenic Rivers Act, was signed into law on October 2, 1968. The purpose of the St. Croix National Scenic Riverway is to preserve, protect, and enhance the values of the St. Croix and Namekagon rivers and their immediate environment for the benefit and enjoyment of present and future generations. The values for which the Riverway has been designated as a wild and scenic river are its free-flowing character, exceptional water quality, and the aquatic, riparian, recreational, cultural, geologic, and scenic-aesthetic values present in the rivers.

In addition to the NPS's responsibility to manage the SACN according to national wild and scenic river policies and best management practices, it is the policy of the NPS to represent the national interest regarding recreation to assure that hydroelectric projects subject to the FERC

licensing process incorporate the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. Investigating opportunities to improve the recreation experience is consistent with NPS policy and FERC guidelines to identify potential future recreation needs.

We submit the following comments on the PAD and the three study requests, attached as appendices.

A. NPS COMMENTS ON THE PAD

3.3.2 Trego Project Boundary (Proposed)

The PAD states:

The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary.

This characterization of the impacts of the project is misleading and is not technically correct. Although FERC regulations link impoundment boundaries to the maximum operating elevation, the regulations also recognize the potential need to include other areas for project purposes, such as public recreation, shoreline control, or protection of environmental resources. The effects of the project are related to velocity, gradient (or slope) and hydraulic head. Those effects extend well beyond the maximum operating elevation. The NPS is requesting a study to determine whether the upstream reach is impacted by the project and is needed for project purposes.

4.8 Recreation and Land Use

The Applicant recently provided a 2021 "Draft Recreation Report" for each impoundment as required every six years throughout the 30-year license period. The applicant proposes to use information from these reports for relicensing purposes and proposes not to conduct a recreation study.

The 2020 Wisconsin Outdoor Recreation Economy Report found a 12% increase in outdoor recreation use and spending between 2012-2017 while overall state Gross Domestic Product grew by 7%. However, there is no *current* detailed user information for either impoundment in the Draft Recreation Report(s) that reflects this trend in increased recreation. While we agree that the Draft Recreation Reports adequately provided the *condition* of existing formal recreation facilities, the NPS finds the methodology used to determine *recreation use* in the 2021 reports insufficient for determining baseline information, mitigation and enhancement measures for the new 40-year license application.

We provided these comments regarding the 2021 reports in anticipation of relicensing activities:

> We have concerns that the methodology used to determine recreation use in 2020 may not adequately reflect current user demand since annual recreation counts were based on information collected in 2013–2014 and extrapolated using population trends.
>
> The 2013-2014 daytime recreational use information is an estimate "extrapolated from multiple sources including trail counters, estimates from outfitters, NPS usage numbers, and estimates from overnight facilities." It is not clear how trail counters related to water-based impoundment recreation use; if outfitter estimates referred to impoundment and/or river use; and if NPS usage numbers referred to impoundment and/or river use. In addition, extrapolation for 2020 recreation estimates using population change estimates may not adequately reflect outdoor recreation trends over the period. Outdoor recreation use has increased significantly over the past decade in all regions of the state, likely outpacing population growth estimates for the three local counties for which the average population increase rates was used for extrapolation.

In addition to our prior comments, the report(s) lack important information such as opportunities to modify existing facilities to improve accessibility, dispersed/informal recreational use, and the closure of two access sites that may be within the undefined existing project boundary for Trego Lake. Please note that we use existing place names of "Trego Town Park" for the access site east of Highway 53 and "Trego Landing" for the access site midway on Trego Lake's south side. We recommend including the following recreational components as part of relicensing:

- Recent closure of two paddle craft access points – the popular Wisconsin Department of Transportation site on the south side and the NPS site on the north - located in the upper impoundment area upstream/East of Highway 53 will likely divert recreational use to the Trego Park Landing, Trego Landing, or both. The impact of increased recreational pressure on the remaining two access sites has yet to be determined.
- On Hayward Lake, the popular winter recreation use of ice fishing and impacts of use on informal access were not evaluated in the report. The Hayward Recreation Report describes traffic congestion caused by parking on Chippewa Trail in winter when anglers seek to ice fish on Bartz's Bay. The congestion was identified as problematic and a recommendation was made to consider providing designated parking areas.
- On Hayward Lake, reference to the put-in downstream of the dam was omitted from the PAD and should be included in the study and report.

Lastly, the proposed boundary change excludes Trego Town Park and its landing, the sole remaining access site out of three that provides access to the upper impoundment. It is unclear from the PAD maps if this park and landing are within the existing undefined project boundaries. We note that contemporary references (2021 Trego Recreation Report) and historic documents (described below) reference this site as important for recreational access *to the impoundment* as well as experiencing project impacts of sedimentation and flooding.

Historical reports on sediment deposition in the headwaters of Trego Lake document that these sediments impact access to existing boat launches at Trego Town Park and the resort and campground across the river, both located upstream of Highway 53:

> "Although accessibility would generally be improved it is likely that in certain areas, such as that near immediately above the resort and at the site near the mouth of the bay area opposite the resort, additional sediment would have to be physically removed to achieve desired results" (Trego Flowage Study, Wisconsin Department of Natural Resources, 1989)
>
> "It is doubtful that deposition in the lake is only a recent problem. The photographs seem to indicate that the Delta extends a good way downstream of Rowan's Resort" (U.S. Army Corps of Engineers, Trego Flowage Study, WDNR 1989).

In response to the Applicant's questionnaire, the Town of Trego representative stated that the boat landing is unusable due to aquatic vegetation and that flooding recently impacted the Trego Town Park. Consequently, we include the Trego Park Landing in our Recreation Study and Hydraulics, Sedimentation, and Channel Change Study (Trego) requests to evaluate project related impacts and inform proposed boundary change decisions.

4.10 Historical and Cultural Resources

The NPS St. Croix National Scenic Riverway staff requests to be a formal consulting party with the State Historic Preservation Officer on the Programmatic Agreement addressing Section 106 of the National Historic Preservation Act.

5.1.2.2 Water Resources Trego Project

The PAD attributes flooding concerns raised by the Town of Trego to occasional ice jams in the vicinity of the Highway 53 bridge. This perspective fails to address the effects of continued sedimentation caused by the project on local river hydraulics and flooding. Annual precipitation and heavy rain events are expected to increase in Wisconsin over the life of the new license (NOAA, 2017). The NPS is requesting a study to evaluate the effect of the project on flood inundation under alternative climate scenarios.

NOAA National Centers for Environmental Information, 2017. Accessed 4/11/2021 https://statesummaries.ncics.org/chapter/wi/

5.3 Mitigation Enhancement

The Applicant proposes existing conditions of run-of-river operations, target elevations, minimum flows, and maintaining existing recreational access around their dams as mitigation and enhancement. We disagree with this definition because these measures are baseline standards: 1) run-of-river operation, target elevation, and minimum flows are required in the

State of Wisconsin's Clean Water Act Section 401permit, and 2) the existing Commission Approved Project Recreational Facilities and surrounding area are included in the existing license articles.

The NPS will use study report results to inform development of mitigation and enhancement recommendations for inclusion in the new license articles.

Corrections

Section 4.8.2.1: Correction on ownership of river landing. This site on the south side belongs to WisDOT and will be removed as part of Hwy 53/63 interchange project.

Figure 4.8.2.1-1: NPS River Access (South Side). Correct caption: This belongs to WisDOT.

Section 4.9.2.4: Correct the name of the visitor center to "Namekagon River Visitor Center"

Section 5.4: Include the St. Croix National Scenic Riverway General Management Plan (1998) as a Federal Comprehensive Waterway Plan; this plan was recently filed with FERC.

B. STUDY REQUESTS

The NPS submits as appendices the following study requests: 1) Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego).

C. CONCLUSION

The NPS appreciates the opportunity to provide comments on the PAD and request three studies for Hayward and Trego Hydroelectric Project relicensings. We look forward to working with the licensee, stakeholders, and FERC on this license application. For more information please contact Susan Rosebrough at susan_rosebrough@nps.gov or (206) 220-4121 should you have questions.

Sincerely,

RICHARD CLARK

Digitally signed by RICHARD CLARK
Date: 2021.04.27 15:33:32 -05'00'

Richard A. Clark
Deputy Regional Director

NPS STUDY REQUEST #1: RECREATION STUDY

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS proposes a multi-step focused recreation study; several aspects of these steps have already been completed as evidenced in the 2021 Recreation Report for each of the projects. In addition, the number of sites to be evaluated in this study is a subset of the total number of recreation facilities identified in the PAD and 2021 Recreation Reports.

The information from the comprehensive recreation study is necessary to determine potential future improvements to or new recreation facilities within the existing and proposed project boundaries. The objective of this recreation study is to determine the condition of certain existing recreational facilities, their capacity to address current and future user demand, user preferences, and to provide the basis for making recommendations for improving/enhancing recreation opportunities.

The first step involves a detailed inventory and assessment of targeted recreation facilities within the existing project boundaries to evaluate whether recreation needs are being met. These steps are followed by a demand analysis which contributes to the overall recreation study: comparing demand to the inventory and condition assessment and user preferences allows further evaluation of existing and projected recreation needs within the project areas. This recreation study will be comprised of the following elements for targeted sites:

1) Recreational Facility Inventory and Condition Assessment
2) Recreational Facilities Accessibility Assessment
3) Recreation Use and Demand Assessment
4) Recreation Needs Assessment

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS Organic Act; NPS General Authorities Act; Code of Federal Regulations, Title 36; Americans with Disabilities Act; Architectural Barriers Act; Rehabilitation Act; and NPS Management Policies 2006 (§1.4, 8.1) all address the importance of park units being available to all Americans to enjoy and experience.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System and is included in the St. Croix National Scenic Riverway. The NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and the Namekagon tributary in a natural condition, to protect and enhance the exceptional natural, scenic, and cultural resources of the riverway and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS, 2017).

The presence of the hydropower projects is recognized as the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values must be identified so that protection and enhancement measures can be implemented.

In addition, it is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. It is in the public interest to analyze impacts, provide mitigation to these impacts, and evaluate opportunities for recreation in the future. The FERC guidelines and the Federal Power Act also provide direction to give equal consideration to other non-hydropower resources including recreation. As federal agencies operating in the public interest, both NPS and FERC are charged with making resource management decisions based on sound information about public needs and interests including interests in recreation resources. (18 C.F.R. 4.61).

Criteria 3: Resource Agency Status of Requestor and Relevant Public Interest 18 CFR (§5.9(b)(3))

The National Park Service is a resource agency**.**

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§5.9(b)(4))

The PAD for each project provides information on developed recreation facilities within the existing project boundary including Commission Approved Project Recreation Facilities owned and maintained by the Applicant as well as facilities owned and managed by others. In addition, the Applicant recently prepared a "2021 Recreation Report" for each project. The PAD and Report include recreation facility condition descriptions; the Report includes estimates on recreation demand and needs based on estimates made in 2013.

The methodology used to determine recreation use in 2020 for the 2021 Reports likely do not adequately reflect current user demand because annual recreation counts were based on information collected in 2013–2014 and extrapolated using population trends.

The 2013-2014 daytime recreational use information is an estimate "extrapolated from multiple sources including trail counters, estimates from outfitters, NPS usage numbers, and estimates from overnight facilities. Extrapolation for 2020 recreation using population change estimates likely do not adequately reflect outdoor recreation trends over the period. Outdoor recreation use has increased significantly over the past decade in all regions of the state, outpacing population growth estimates for the three local counties for which the average population increase rates was used for extrapolation. In addition, recreation use influence by ecotourism – the Twin Cities, Minnesota, are a two-hour drive from Trego Lake - and second home use are not reflected in the average population growth of the three surrounding counties.

> "The Great Northwest Region has an abundance of natural resources such as Lake Superior, the Namekagon and St. Croix rivers, numerous inland lakes, and large forest blocks. Not surprisingly, tourism is a large and growing industry within the region. In addition to Wisconsin residents, visitors from the Twin Cities and surrounding suburban

> areas, utilize the region's recreational resources. Seasonal home development, particularly along rivers and lakes, has increased dramatically within the region." (Wisconsin Statewide Outdoor Recreation Plan 2019-2023)

The PAD does not include recreational use impacts of recent or imminent permanent closures of two access sites in the upper Trego impoundment east of U.S. Highway 53, leaving only one, which experiences limited water access due to sedimentation/vegetation, in the upper impoundment. The PAD does not include the informal access to Bartz's Bay, a popular ice fishing area in Lake Hayward.

In addition, while the PAD identifies that Americans with Disabilities Act (ADA) needs are accommodated on the Hayward impoundment it does not identify opportunities for the disabled to access its tailwaters, nor Trego Lake and its tailwaters. These opportunities need to be identified to understand current and future user accessibility needs.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

A clear nexus exists between the project and recreational opportunities on the Hayward and Trego impoundments as the recreational facilities are located adjacent to the Project features and are used by visitors during their visit to the Project. Recreation is an important benefit of hydroelectric projects and FPA regulations require consideration for protection and enhancement of recreational opportunities. FERC's policies include ensuring that the ultimate development of recreation resources at licensed projects is consistent with area recreation needs and with the primary project purpose. To plan for future needs for recreation, data on existing recreation facilities and their needs and demands is necessary to make informed decisions about the development needs required through the term of the new FERC project license.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

An inventory of recreation opportunities and facilities; determining recreation demand using field observations, user surveys, and focus groups; and estimating recreation needs based on the data gathered is consistent with generally accepted practices employed during hydroelectric licensing proceedings. Evaluating outdoor recreation facilities per the Architectural Barriers Act Accessibility Guidelines is a common technique to establish the level of accessibility at outdoor recreation areas and recreation facilities.

The Applicant recently provided in the Recreation Reports (February 2021) for each project condition descriptions of Commission Approved Project Recreation Facilities as well as other facilities within the project boundaries. This study will identify additional information not provided in the Recreation Reports.

a. Study Area

The area of focus for the recreation facilities condition assessment and demand analysis consists of existing targeted formal and informal recreation areas within the existing project boundaries. The Applicant proposes to change the Trego Lake project boundaries therefor it is important to

include recreation facilities within the existing project boundaries in the evaluation of recreation needs and proposed project boundary changes.

b. Study Sites

The facilities and recreation sites to be inventoried for the Recreation Study should include targeted developed recreation sites and an informal access site. The inventory should identify current use, current conditions, and any impacts that the project might have on these. The study report should identify which Trego Lake recreation facilities would be omitted if the proposed project boundaries were approved.

Trego Lake: Recent permanent closures of two access sites east of U.S. Highway 53, one managed by the NPS and the other, Wisconsin Department of Transportation, leaves the Trego Town Park as the only public access site to the headwaters. The only other remaining Trego Lake access is Trego Landing located mid-impoundment, approximately 1.75 miles away. These Trego sites are recommended for study:

- Trego Town Park Landing
- Trego Landing
- Xcel's Trego Lake canoe access and nearby shoreline (possible angling)
- Xcel's tailwater fishing access (north and south)

These Hayward Lake sites are recommended for study:

- Commission approved project recreation facilities including the canoe portage, carry-in access on the impoundment, and informal shoreline fishing area
- Hayward Lake Bartz's Bay: undeveloped and informal ice fishing access site off Chippewa Trail

c. Study Methods

This recreation study has four components: (1) facility inventory and condition assessment, (2) recreational facilities accessibility assessment, (3) a recreation use and demand analysis, and (4) a recreation needs assessment.

1) Facility Inventory, Condition Assessment

The facility inventory and condition assessment portion of this recreation study consists of two steps: (1) site facility inventory and (2) field reconnaissance/condition assessment. The facility inventory and condition assessment inform the demand analysis and evaluates the condition of each of the facilities at the listed recreation sites. The inventories done in preparation for the 2021 Recreation Reports will form a base upon which to build more information.

Step 1 –Site Inventory

The existing facility inventory should include identification and location of parking spaces, picnic units, boat landings/ramps, bathrooms, and other facility components (e.g., informational

signage). Informally created user trails and sites (i.e., sites along shorelines frequented by recreation users but not identified as designated facilities) will also be identified and assessed.

Step 2 – Field Reconnaissance/Condition Assessment

The field reconnaissance should include a physical condition inspection of existing recreation facilities and trails, as identified under Step 1. The reconnaissance should also identify observable use patterns and field verify if recreation amenities are constructed and in a condition that serves user needs. Informal user created sites should be identified for observable use and wear patterns.

The following steps should be taken to complete the facilities inventory:

1. Complete reconnaissance level field research: conduct fieldwork to create a detailed inventory on the conditions of existing recreation facilities and other user created sites within the study area

2. Assemble the results and create maps of data collected in the field.

The condition assessment will be qualitative based on a range of repair/replacement/ maintenance needs to acceptable appearance and function to evaluate the condition of recreation facilities. Photos should be taken of facilities, all signs, trailheads, etc., and cataloged based on feature type or location. Other user created sites with observable wear patterns within the project areas should be cataloged for further evaluation within the recreation study.

2) Facility Accessibility Assessment

The inventory of targeted sites should identify features that do not meet current Americans with Disability Act (ADA) accessibility standards, Architectural Barriers Act (ABA), and Universal Design Principles as well as opportunities for modifications to improve accessibility.

3) Recreation Use and Demand Component

The Recreation Use and Demand Component of this Recreation Study consists of 6 steps: (1) observational survey; (2) visitor use questionnaire; (3) interviews with user/friend's groups and recreation providers; (4) review of research publications and existing information; (5) assessment of regional uniqueness and significance of the project areas' primary recreation opportunities; and (6) regional demand assessment. The steps are described in more detail below.

Step 1 – Observational Survey

Observed recreation use occurring in the project area based on observational surveys should be used to estimate existing use. Observational surveys should be conducted during seasons of use for each location e.g., winter surveys for ice fishing at Bartz's Bay on Lake Hayward. Timing and sampling frequencies should be based on estimated use levels and the survey should be conducted at peak times during the day (e.g., peak angler time of day, dawn and dusk; water skiing, afternoon), on different types of days (weekday, weekend, holiday, or opening of fishing season). The observation data that should be recorded includes vehicle counts, angler counts,

counts of each type of watercraft (canoes, kayaks, pontoons, fishing, Stand Up Paddleboards, tubes), and day use/picnic area usage.

Step 2 – Visitor Use Questionnaire

A concise questionnaire focusing on visitor use and experience should be mailed to Trego Lake riparian landowners and be fielded at the identified recreation sites when people are most likely to be present. The survey should be conducted during various days during the survey period including weekdays and weekend as well as holidays. A review of past visitor data should be assessed to determine appropriateness of target survey dates with considerations for current season use patterns and any potential unexpected conditions or events taken into account. The questionnaire should be crafted to collect information from recreationists about recreation, activity participation, accessibility needs, areas visited, user conflicts, perceived crowding and safety, visitor profile, visual impressions, and satisfaction with or desire for recreational opportunities and facilities including level and quality of interpretation and posted information in the project areas.

The questionnaire should provide an opportunity for visitors to express any potential concerns over the current condition of and future possibilities for recreation and recreation facilities in the project areas. Recommended questions for the questionnaire are provided at the end of the study request. The draft questionnaire should be shared with NPS and other interested stakeholders for comment.

Step 3 – Interviews with User Groups and Recreation Providers

Interviews should be conducted with a variety of identified regional and local recreation providers, user groups, and outdoor recreation tourism organizations associated with recreation in the project areas and in the project vicinity. Examples include Trego Lake District and the Chambers of Commerce and tourism organizations of local communities. These entities should be interviewed to gather additional information on current use, user preferences and needs, perceived regional uniqueness and significance of recreation opportunities within the project areas, existing data, and observations in the project areas for both existing and potential future users.

Step 4 – Review of Research Publications and Existing Information

Recent relevant Wisconsin-based user preference surveys and other outdoor recreation surveys about recreation demand in the project areas should be gathered and reviewed. These include the most recent state and county recreation management plans identified in the PAD including the Wisconsin Statewide Comprehensive Outdoor Recreation Plans (SCORPs). The Applicant should also search for more current surveys that analyze the project and facility areas' outdoor recreation participation rates and growth needs in northern Wisconsin to help address how the project recreation facilities are helping to meet demands of the greater area. This includes increasing population growth in the Twin Cities, Minnesota, Metropolitan Statistical Area, a two-hour drive, ecotourism and second home use trends. The newly created state Office of Outdoor Recreation in Wisconsin may provide contemporary information. Demand and user

preference studies at various scales covering Wisconsin, but especially those addressing northern sections of the state, should be reviewed for their applicability to the project areas. Recreation activity and participation trends information should be examined from the existing demand studies and reports.

Step 5 – Assessment of Regional Uniqueness and Significance of the Project Areas' Primary Recreation Opportunities

Regional uniqueness and significance of the project areas' primary recreation opportunities should be evaluated. Site-specific factors that contribute to the uniqueness of the project areas can inform the demand analysis and needs assessment. Where available, information should be gathered for sites including types of designation including water/canoe trail designation, types of recreation opportunities available, visitation statistics (including information on visitors' origin), and general popularity for regional outdoor recreation areas.

Step 6 – Regional Demand Assessment

The recreation demand analysis should compare demand with the existing supply of recreation opportunities and use patterns. A gap analysis should be performed by comparing relative demand to supply, with consideration for trends and variations in user groups based on research and forecasts of population growth. By comparing this information to a detailed inventory of existing recreation opportunities and using information gathered in the observational surveys, visitor use questionnaires, structured interviews, and focus groups, it will be possible to determine whether there is a need for modifications to existing facilities and/or for the development of additional facilities and recreation amenities.

4) Recreation Needs Assessment

A needs assessment is an analysis of all recreation-related study results. Consequently, the methods to complete the needs assessment consist of all the methods used to complete the elements of this Study Description as well as methods described in the NPS Study Request #3: Hydraulics, Sedimentation, and Channel Change Study (Trego).

d. Analysis

The information gathered by the recreation study will assess the suitability of targeted facilities in terms of meeting the changing needs of recreation users in the project areas. The analysis will include developing existing and projected visitor-use estimates, along with existing and projected demand (including unmet demand) for recreational opportunities over the 40 to 50-year license term. The facility inventory assessment data collected should be analyzed to identify short- and long-term improvement needs of the new license. The recreation demand analysis should provide relevant information about user preferences and needs as related to the targeted recreation facilities provided by the Project. The Draft Recreation Report should include recommendations for monitoring every 6 years of recreation use, visitor demand evaluation, and facility condition over the life of the license. A courtesy copy of the Draft be shared with NPS and other interested stakeholders for comment.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7)

The cost would be contingent on Applicant staff availability and/or the billing rate arrangement with the Applicant's consultants (rate is not known).

In summary, this recreation study would provide necessary information regarding the project-related recreation facilities, visitor use and demographics, demand and needs at targeted recreation facilities.

This study requests additional visitor counts and survey collection to adequately address existing use in the Project Vicinity and ensure that the results for each Recreation Area can be characterized. An alternative study on recreation has not been proposed.

Requested Survey Questionnaire

SECTION 1 - YOUR TRIP CHARACTERISTICS

1. On the enclosed map, please place an X on the location where you received this survey.

2. Below is a list of activities available. Please indicate:

(A) Which of these activities have you participated in **on your current visit** to the (area name)

(B) Which **ONE** of these activities is your **PRIMARY ACTIVITY** on this trip to the area?

ACTIVITY	(A) Participated in ON THIS TRIP (Check all that apply)	(B) PRIMARY ACTIVITY (Check only one)
Shoreline/tailwater fishing		
Fishing from a boat		
Motorized boating		
Non-motorized boating		
Swimming		
Picnicking		
Wildlife Viewing		
Other (specify)		

3. (A): Were there any activities that you and your group wanted to do on this visit to (area name) that you were not able to?

☐ NO

☐ YES

(B) If YES: What was it? _____ (open-ended)

(C) Which of the following reasons, if any, explain why you did not engage in the activity?

- ☐ Rules or regulations did not allow for activity
- ☐ Area was temporarily closed to the public
- ☐ Not enough time
- ☐ Safety concerns
- ☐ Not enough information about the activity
- ☐ Too crowded
- ☐ Difficult road or trail access
- ☐ No road or trail access
- ☐ Unsatisfactory conditions of facilities
- ☐ Resource damage due to overuse
- ☐ No facilities or services
- ☐ Bad weather
- ☐ Flooding or other natural hazard
- ☐ Other (please specify)

4. Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services?

- ☐ Yes
- ☐ No

If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in? (Please describe): _____

SECTION 2 - EXISTING CONDITIONS

5. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir? [Select one number for each or indicate it was not applicable to your visit.]

LOCATION/AREA

1) Not at all crowded 2) Slightly crowded 3) Moderately crowded 4) Very crowded
5) Extremely crowded (check box)Not applicable t the place you received this survey

	1	2	3	4	5	☐
In parking areas	1	2	3	4	5	☐
On the trails	1	2	3	4	5	☐
At a developed campground	1	2	3	4	5	☐
At a boat-in campsite	1	2	3	4	5	☐
While fishing from the shoreline	1	2	3	4	5	☐
While boating/fishing from a boat	1	2	3	4	5	☐

(B) If you felt crowded, did you modify your recreation plans because you felt crowded?
☐ YES ☐ NO

(C) If YES, what did you do?

☐ Moved to a new location ☐ Chose not to recreate
☐ Changed the time of day ☐ Continued with current plans
☐ Changed your activity ☐ Other:_____ _

6. During the planning process for your visit, how did the possibility of crowds affect your trip plans? (Please select one response)

☐ It did not affect my plans
☐ I visited at a time of day I thought would be less crowded
☐ I visited on a day of the week I thought would be less crowded

☐ I avoided places here I thought would be crowded today

☐ Other (please specify)

7 Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ NO ☐ YES. If YES, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)		
	Proximity	Loudness	Other (specify)
Motorized boaters	☐	☐	☐ _____
Non-motorized watercraft	☐	☐	☐ _____
Vehicles	☐	☐	☐ _____

8. How satisfied were you with the following **amenities** at this recreation facility/reservoir today.

***Important**: Please only circle a number for the items **that you used during your current visit** to this specific recreation facility/reservoir. Also, please **check** the "Did Not Use" box, if you did not use the item or it does not exist at the specific recreation facility.*

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very [illegible]	Did Not Use	If you were dissatisfied for any reason, please explain why:
FACILITIES AND	Restroom	1	2	3	4	5	☐	
		1	2	3	4	5	☐	
	Picnic sites	1	2	3	4	5	☐	
		1	2	3	4	5	☐	
		1	2	3	4	5	☐	
	Trash receptacles	1	2	3	4	5	☐	

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very [illegible]	Did Not Use	If you were dissatisfied for any reason, please explain why:
	Vehicle parking areas	1	2	3	4	5	☐	
	Boat launch parking area	1	2	3	4	5	☐	
	Boat launch	1	2	3	4	5	☐	
	Boat dock	1	2	3	4	5	☐	
	Other:_____	1	2	3	4	5	☐	
	Roads to the facility	1	2	3	4	5	☐	
	Trails	1	2	3	4	5	☐	
	Signage to the facility	1	2	3	4	5	☐	
	Signage within the facility	1	2	3	4	5	☐	
	Other:_____	1	2	3	4	5	☐	

9. How did you obtain information to plan your current trip? (Please select all that apply)

☐ Federal or State website
☐ City, local, or municipal website
☐ Xcel website
☐ Other websites
☐
☐ Maps, brochures, pamphlets
☐ Visitor bureaus/centers
☐ Previous visits
☐ Word of mouth
☐ Social media (e.g., Facebook, Twitter, etc.)
☐ Travel guides and tour books
☐ Newspaper/magazine article
☐ Radio/TV broadcasts
☐ Other (specify): _____

SECTION 3 - ABOUT YOU

10. What is the ZIP code where you live or country if not in the United States?

ZIP code: _____ or, country (if not the United States):

11. What is your Age: _____.

12. What is your Gender? ☐ Male ☐ Female ☐ Non-binary

13. Which of these categories best indicates your race and ethnicity? Answer only for yourself. Please select **one or more**.

☐ American Indian/Alaskan	☐ Asian	☐ White
☐ Native Hawaiian/other Pacific	☐ Hispanic or Latino	☐ Don't know
☐ Black/African-American	☐ Not Hispanic or	

14. Please let us know if you have any additional comments regarding your recreation experience during your visit: (contact information)

NPS STUDY REQUEST #2: SHORELINE SURVEY

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS proposes a comprehensive shoreline study that involves a detailed inventory of shoreline erosion, erosion controls, docks, and aquatic vegetation limiting recreational access to the shoreline within the project boundaries. The objective of this study is to determine the existing shoreline conditions and to provide the basis for making recommendations for protecting and enhancing the project shorelines.

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System; the river is part of the St. Croix National Scenic Riverway. Resource management goals are to protect and enhance free flow, water quality and outstandingly remarkable river values (values) that led to the designation of the river into the NWSRS in 1968. Values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS 2017).

The presence of the hydropower projects is recognized in the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values should be identified so that protection and enhancement measures can be implemented. In addition, the FERC guidelines and the Federal Power Act provide direction to give equal consideration to non-hydropower resources including scenic, recreational, and other environmental values of the project. As federal agencies operating in the public interest, both NPS and FERC are charged with making resource management decisions based on sound information about public needs and interests.

The NPS is responsible for reviewing shoreline protection measures that require Federal authorization to ensure that standards under Section 7 of the Wild and Scenic Rivers Act are satisfied. The applicable standard is that the project would not have a direct and adverse effect on the values for which the river was designated.

Criteria 3: Resource Agency Status of Requestor 18 CFR (§5.9(b)(3))

The NPS is a resource agency.

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§518 CFR.9(b)(4))

The PAD description of aesthetic resources/visual character is very broad and does not provide detail about the visual experience for recreational users, boating or fishing on the reservoirs. The PAD provides very general information about the current land use, vegetative cover, and amount of development of the shoreline. There is no specific mention of bank stabilization measures on the impoundments although photos of project facilities included in the PAD show rock rip rap on the dams and embankments including around the Hayward canoe access.

It appears there has been significant growth in the number of structures along the Trego impoundment within a limited area causing an increase in structure density. Cumulatively, these developments may change the scenic values for which the impounded segments of the Namekagon are managed:

- DNR, 1989 – Identifies approximately 120 homes, cottages, and resorts adjacent to the Trego flowage with development comprising 25% of the shoreline.
- C. Peterson, Trego Lake District, pers. Comm. March 26, 2021 – 240 residences on the lake; there are relatively few bank stabilization measures, including some 'walls'.

Aquatic vegetation management has been a continuing activity under the current license. There is no evidence of detailed mapping to document changes over time, although the PAD identifies additional species of aquatic invasive plants that were addressed in the current license and an increase in the presence of highly valued wild rice. Maps included in the required annual 'Purple Loosestrife' Monitoring Reports for Article 410 of the Hayward project are very general, using the 1964 bathymetric map as a base; these are insufficient to determining changes over time.

Shoreline surveys by qualified archeologists are planned in accordance with Historic Properties Programmatic Agreements for the Trego and Hayward projects. To date, periodic surveys have not identified erosion concerns. Including inventory of other shoreline resources as part of these periodic assessments may enhance efficiencies.

The NPS needs more detailed information on shoreline condition and changes to coordinate with the licensee, local jurisdictions, and landowners to address management needs within the Park, including the specific requirements associated with review of water resources projects on a Wild and Scenic River.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

The current licenses for Hayward and Trego include standard articles for the use and occupancy of project lands and waters. This gives the licensee authority to authorize measures such as riprap and small boat docks without approval by the FERC. However, such authorization must be consistent with the purposes of protecting and enhancing the scenic, recreational, and environmental values of the project (FERC, 2012). Although the project boundary does not include a shoreline buffer, the resources to be studied extend into the water and thus have a clear nexus to project operations.

The requested study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license.

Review of shoreline protection measures implemented by the licensee, such as the use of riprap and other construction as part of their robust program for dam safety in collaboration with the FERC Dam Safety Office, have not routinely included consultation with the NPS. The NPS has responsibility to review such water resources projects under Section 7 of the Wild and Scenic Rivers Act.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

Study Method Part 1 – The NPS recommends conducting a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still). The High-Definition Stream Survey (HDSS) method (Trutta, 2019) is one method used in recent FERC hydropower licensing proceedings, which enables mapping and a visual record of stream and shoreline characteristics and data from a variety of sensors. The approach has been used to classify streambank condition, ranging from fully functional, functional, slightly impaired, and non-functional (Connell et. al. 2019). It has been used to classify streambank modification in terms of native/unmodified, modified, and highly modified. It also has been used to classify unique manmade or natural features based on type, condition, and location similar to Yetman (2001) and could be used to identify sedimentation features such as in-channel bars, vegetated islands, and in-channel vegetation. In addition, the approach has also been used with side-scan sonar to create cross-sectional bathymetric transects. Such an approach could also be integrated in the NPS requested sediment study.

Evaluate, quantify, photograph and map shoreline conditions on the Hayward and Trego project boundary shorelines, including:

- Streambank condition
- Bank stabilization types and condition
- Docks/piers
- Public access locations
- Presence/extent/type of aquatic vegetation (especially nuisance and invasive plants, but also highly valued wild rice)

Objectives include:

1. Create georeferenced photographic database and map of shoreline conditions.
2. Identify areas in need of management attention for shoreline erosion, cultural resource protection, vegetation management, and public access.
3. Facilitate evaluation of change over time to ensure protection of visual/scenic/aesthetic, recreation, cultural, and natural resources.
4. Facilitate communication between the licensee, NPS, shoreline property owners, and local jurisdictions about shoreline protection practices and NPS Wild and Scenic River Act requirements to review shoreline treatments and to protect and enhance river values.

Study Method Part 2 – In addition, the NPS recommends that the licensee review its records to document changes in shoreline conditions on lands owned by the licensee within the project boundaries that have occurred over the life of the current licenses.

Objectives include:

1. Compare existing shoreline conditions with past conditions available from the licensee's records.
2. Create a list and brief description of shoreline stabilization and other construction projects conducted by the licensee.
3. Identify whether consultation with the NPS was conducted for licensee activities.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7))

Study Method Part 1 - The complete cost for field work, video production, classification and reporting can range from approximately $2,000 to $4,000/mile. The longer the segment surveyed decreases overall per mile costs, while the overall number of different classifications requested increases the per mile cost. An alternative study incorporating a comprehensive shoreline review and assessment has not been proposed.

Study Method Part 2 – This would likely require a few hours of staff time by the licensee.

References:

Connell, B. A., Ayers, P., Ludwig, A., Neff, K., & Parham, J. E. (2019). Georeferenced Video Mapping to Classify Streambank Erosion Susceptibility. *Journal of Spatial Hydrology, 15*(2).

FERC, Guidance for Shoreline Management Planning at Hydropower Projects, July 2012. Last accessed 3/31/2021 https://www.ferc.gov/sites/default/files/2020-04/smpbook.pdf

NPS St. Croix National Scenic Riverway, *Foundation Document*, 2017. Accessed 4/5/2021 https://www.nps.gov/sacn/learn/management/foundation-document.htm

Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021: https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850582&accessionnumber=20200410-5091

WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage,* May 1989. Accessed 3/27/2021 https://elibrary.ferc.gov/eLibrary/docinfo?document_id=13774147

Yetman, K.T. 2001. Stream Corridor Assessment Survey. Watershed Restoration Division Chesapeake & Coastal Watershed Services Maryland Dept. of Natural Resources Annapolis, MD.

NPS STUDY REQUEST #3: HYDRAULICS, SEDIMENTATION, AND CHANNEL CHANGE

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS requests a study to evaluate the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology. The primary goal of this study is to determine whether the area proposed for removal from the Trego boundary in the vicinity of the U.S. Highway 53 bridge is influenced by project operations and is needed for project purposes such as public recreation, shoreline control, or protection of environmental resources as described in FERC regulations (18 CFR 4.41(h)(2); 18 CFR 4.51(h)(2)); 18 CFR 4.61(f)). This proposal will characterize changes in channel planform and shoreline position; update the 1989 WI DNR study, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage* and bathymetry available from 1966; and build upon this existing data to determine the effects of continued hydropower project operations on sedimentation and flooding in the Namekagon River and Trego Lake. Study results will also help inform recommendations related to potential flooding and ongoing management activities (e.g., dredging and vegetation management) that are used to mitigate sediment deposition, the growth of nuisance and invasive aquatic vegetation and the related loss of recreation access particularly under changing climate scenarios.

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and of the National Park System and is included in the St. Croix National Scenic Riverway. The NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and the Namekagon tributary in a natural condition, to protect and enhance the exceptional natural, scenic, and cultural resources of the riverway and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS, 2017).

The presence of the hydro projects is recognized as the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values must be identified so that protection and enhancement measures can be implemented.

Criteria 3: Resource Agency Status of Requestor and Relevant Public Interest 18 CFR (§5.9(b)(3))

Requestor is a resource agency.

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§5.9(b)(4))

The PAD presents information about prior studies identifying sediment sources and references studies that the sediment load is small compared with other WI rivers. However, the upper end of Trego Lake has experienced sedimentation issues and aquatic plant problems since at least the 1980s (US Corps of Engineers, as referenced by WI DNR, 1989). A 1989 evaluation of the sedimentation processes for the Trego flowage was conducted by the Wisconsin Department of Natural Resources. The 1989 study noted that without further action sedimentation problems in the inlet area, increased nuisance aquatic vegetation, and loss of recreational access would continue. The PAD includes comments from the Town of Trego and others stating that aquatic vegetation limits access to the Trego Town Park Landing upstream of U.S. Highway 53.

The PAD presents recent topographic data to justify proposed boundary changes. This raises questions about whether the upstream extent of the maximum operating elevation of the project has changed since the boundary was originally surveyed (either through reservoir sedimentation or floodplain deposition).

The PAD attributes flooding concerns raised by the Town of Trego to occasional ice jams in the vicinity of the Highway 53 bridge. This perspective fails to address the effects of continued sedimentation caused by the project on local river hydraulics and flooding. Annual precipitation and heavy rain events are expected to increase in Wisconsin over the life of the new license (NOAA, 2017).

Available information about sediment dynamics and bathymetry dates from the late 1980s and 1960s, respectively. Given continuing issues related to sediment deposition, the proposed boundary change, and changing climate conditions, updated bathymetric data and analysis is needed to evaluate the ongoing impacts of the hydropower project and provide the basis for making recommendations about hydraulic and sediment-related issues.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

Reservoir sedimentation is a complex process that varies with watershed sediment production and mode of deposition. The impoundment of water associated with hydropower operations can lead to reduced flow velocities, alter sediment transport and deposition, and cause the formation of deltas at the upstream end of reservoirs. Formation of deltas may cause aggradation of sediment further upstream, elevate channel bed levels and increase flood risks. In addition, sedimentation in the reservoir can result in the establishment of nuisance aquatic vegetation and cause negative effects on recreational opportunities and access. Sedimentation and aquatic vegetation encroachment at the head of the reservoir above Trego dam have been an ongoing issue for more than 30 years. The licensee has worked cooperatively with all stakeholders under the current license to address these issues. The continuing need to address sediment-related issues under the new license requires thorough investigation.

Hydraulic and sedimentation studies can be used to answer questions pertaining to many aspects of a hydropower project including the effects on upstream and downstream geomorphic and ecological systems. Results will help determine whether or not the boundary change proposed in the PAD is justified and evaluate the need to update management plans and practices used to mitigate for ongoing impacts associated with sedimentation, such as growth of aquatic vegetation, loss of recreation access, and potential flooding.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

The NPS recommends conducting a study to update existing data on the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology in the Namekagon River upstream of Trego Lake. The study consists of four components: (1) analysis of existing aerial imagery; (2) collection of bathymetric data; (3) hydraulic modeling; and (4) synthesis.

Specific tasks and proposed standard methods include the following:

1. Channel and shoreline change analysis:
    a. Analyze aerial imagery for the period of record, available from the University of Wisconsin map library, to evaluate change in channel planform and shoreline position through time along the reservoir and upstream from the U.S. Highway 53 bridge. Channel margins and reservoir shoreline should be digitized using geographic information system (GIS) software and applying standard methods (Gilvear and Bryant, 2003).
    b. Quantify information on patterns in sediment deposition, bank/shoreline erosion, delta growth, and changes in aerial extent of aquatic vegetation through time.

2. Bathymetric survey and analysis:
    a. Acquire a sufficiently detailed channel and lake bathymetry upstream from Trego dam to evaluate changes in bed elevation and support subsequent hydraulic modeling. Bathymetric data should be acquired using single-beam sonar integrated with GNSS positioning system and can be integrated with existing LiDAR to develop a high-resolution terrain model of the project area.
    b. Bathymetric transects should be compared to previous surveys to:
        i. Quantify volumes of sediment deposition and erosion that have occurred in the flowage since 1988 (WI DNR, 1989), and
        ii. Estimate average rate of reservoir sedimentation since 1988 and compare this rate to the rates reported previously by WI DNR for the period from dam construction to 1988.

3. Hydraulic modeling and analysis:
    a. Using data obtained from the bathymetric survey, apply the US Corps of Engineers HEC-RAS model (or similar) to develop a one-dimensional hydraulic

model extending a sufficient distance upstream from the U.S. Highway 53 bridge to accurately model hydraulics through the project site including backwater effects due to Trego hydropower project.

b. Evaluate the effect of the project on flood inundation under alternative climate scenarios. Methodologies to evaluate the impact of increasing precipitation and rainfall intensity are evolving and should be selected in consultation with the NPS.

4. Synthesis - The final study report should address the following licensing issues:
   a. Evaluate whether the upstream reach of the Namekagon River proposed for removal from the project boundary is impacted by the project and contributes to problems associated with sediment deposition in the reservoir and/or channel; vegetation growth and loss of recreation access; and flood risk to existing infrastructure and public access areas.
   b. Recommend updates to management plans and activities for sedimentation and vegetation (e.g., existing license Article 405; Barr Engineering, 1994; and WI DNR, GP-NO-2019-66-03813), and identify alternate methods to mitigate the impact of sediment deposition on aquatic plant growth, recreation access, and flooding.
   c. Evaluate the need for more detailed hydraulic and sediment transport modeling to quantify effects of sediment deposition on flood risk upstream from Trego dam.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7))

Although costs and level of effort depend on who would be conducting the work, a rough estimate is presented here:

- Channel and shoreline change analysis: $5,000
- Bathymetric surveys and analysis: $20,000 (this cost could potentially be reduced if combined with the longitudinal survey of the river and its banks, requested as part of the NPS Shoreline Survey.)
- Hydraulic modeling: $10,000
- Synthesis/Final report: 1-2 weeks of staff time.

An alternative study on channel changes and sedimentation has not been proposed. The NPS is potentially interested in partnering with the licensee and other stakeholders for a more comprehensive evaluation of hydropower power operations on river hydraulics, sediment transport, and channel processes, and the impacts on flooding, recreations uses and access, and the aquatic and riparian ecosystem.

References:

Barr Engineering, *Trego Flowage Macrophyte Survey and Vegetation Plan,* November 1994. Accessed 3/27/2021 https://tregolakedistrict.com/wp-content/uploads/2019/04/1994-Trego-Flowage-Lake-Plan.pdf

Gilvear, D. and Bryant, R., 2003, *Analysis of Aerial Photography and Other Remotely Sensed Data*, in Kondolf, F.M., and Piegay, H., Tools in Fluvial Geomorphology, John Wiley & Sons, Ltd. pp. 133-168.

NOAA National Centers for Environmental Information, 2017. Accessed 4/11/2021 https://statesummaries.ncics.org/chapter/wi/

University of Wisconsin Map Library. Accessed 4/08/2021 https://geography.wisc.edu/maplibrary/aerial-photography/

WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage,* May 1989. Accessed 3/27/2021 https://elibrary.ferc.gov/eLibrary/docinfo?document_id=13774147

WI DNR, General permit to maintenance dredge in a previous dredged area in Trego Lake, GP-NO-2019-66-03813, February 12, 2019. (Typo in permit, date corrected to February 12, 2020)

WI DNR, *Trego Lake - Washburn County, Wisconsin DNR Lake Map, Jun 1966.* Accessed 3/27/2021 https://dnr.wi.gov/lakes/maps/DNR/2712000a.pdf

Document Content(s)

NPS Comments Hayward and Trego Hydroelectric Projects.PDF 1

TREGO LAKE DISTRICT

PO Box 184 TREGO WISCONSIN 54888

May 6, 2021

Ms. Kimberly D. Bose,
Secretary Federal Energy Regulatory Commission
888 First Street, NE
Washington DC. 20426

Electronic Filing

Re: Support of National Park Service Comments on the Preliminary Application Document and Study Requests for Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711)

Dear Secretary Bose,

The Trego Lake District Board of Commissioners supports the request for studies and comments by the National Park Service (NPS) regarding the Preliminary Application Document (PAD) for the Trego Hydroelectric Project (FERC Number P-2711). Trego Lake District encourages the completion of the three studies outlined in the NPS study requests: 1) Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego). See TLD Resolution attached.

Our comments on the proposed NPS studies will focus on their impact to Trego Lake and Trego Lake riparian owners who make up the membership of the Trego Lake District. Trego Lake District respectfully requests to be included in any future discussions regarding the finalizing of study plans.

Trego Lake is a 383-acre lake in Northwest Wisconsin created by the Trego Dam operated by Xcel Energy. Trego Lake offers a variety of activities to the general public including boating, canoeing/kayaking, fishing, swimming and other recreational activities. Trego Lake District (TLD) was first formed as an association in the 1980s but quickly was incorporated into a Lake District in 1989 for the protection and rehabilitation of Trego Lake. TLD is a local unit of government committed to improving and enhancing the lake and recreation by protecting fish, maintaining water quality, marking navigation channels, controlling weeds and aquatic invasive species, and reducing sedimentation buildup. TLD works to enhance the lake for the general public and riparian landowners. Trego Lake District includes the riparian landowners on Trego Lake from the Trego dam to U. S. Highway 53. We will review the NPS Study Requests in reverse order based on their importance to TLD.

Support of NPS Study Request #3: Hydraulics, Sedimentation, and Channel Change Study

An average of 2000 cubic yards of sediment accumulate in Trego Lake each year, as NPS notes in its study request[1]. Sediment creates an enormous issue for Trego Lake users and land owners. The information gathered in the NPS study would be invaluable to identify issues and develop actions to mitigate sediment

[1] WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage,* May 1989.

build-up, control growth of aquatic plants including aquatic invasive species (AIS) resulting from sedimentation buildup, and prevent the loss of recreational opportunities for people visiting the lake or living on the lake.

Since its creation, TLD has worked to address the sedimentation build-up and its impact on the lake. The sediment build-up creates recreational challenges for boating, making it impossible to access certain areas of the lake. Additionally, it has led to an increase in aquatic plant growth including AIS: curly leaf pond weed and hybrid/Eurasian water milfoil. Since a 1995 Federal Energy Regulatory Commission (FERC) modification of the Trego Dam license, Xcel Energy (in 1995 Northern States Power, NSP) and TLD have worked in partnership to improve recreation by harvesting aquatic vegetation that reduces the recreation opportunities of the lake for all and particularly impedes residents from fully utilizing the value of Trego Lake. TLD organizes the harvesting and Xcel pays for one harvest per year. The cost varies: $2500 in 2020 to $8000 in 2019, depending on service availability and time of harvest.

For over 35 years, TLD has been addressing sediment build up in the lake. Management of sediment and aquatic vegetation is an ongoing problem that was considered as part of the current license for Trego Dam and should be considered in its relicensing. A variety of options have been discussed including drawdowns, sediment traps, and dredging. In 2016, after a number of years developing a workable proposal, TLD was able to dredge channels to allow for a variety of power boat traffic. During this process, TLD worked with and received permits and/or approval from the various oversight agencies including: Wisconsin Department of Natural Resources (WDNR), Army Corps of Engineers, NPS, tribes and others. Landowners in the area and others recreating on Trego Lake were able to easily access the full lake. After a significant rain event 2 years later, the channels filled in creating problems accessing the lake. The TLD has recently purchased a small suction dredge to spot-dredge problematic areas within designated channels (permitted by the WDNR, and authorized by the Army Corps of Engineers) to allow for minimal power boat traffic. This summer will be our initial effort. Nearly a quarter of the landowners on the lake (roughly 60 properties) are impacted by the sediment buildup making some areas impassable.

Support for NPS Study Request #2: Shoreline Survey

The shoreline survey will identify erosion problem areas and aquatic vegetation on Trego Lake. As we note, sedimentation is a crucial issue, likely driven by erosion and resulting in excessive aquatic vegetation. Studies will help us understand and mitigate these issues.

TLD respectfully requests a more comprehensive look at sediment sources. Specifically, we ask you to extend the shoreline study to cover the Namekagon River between Hayward and Trego. This will help determine if the amount of sediment entering Trego Lake has increased and identify sources of sediment. This, coupled with NPS Study Request #3 will provide a greater overall picture of sediment problems. With this information, mitigation actions can be reviewed and developed to improve recreational opportunities for Trego Lake and the Namekagon River.

Support for NPS Study Request #1: Recreation Study

The recreation study proposed by NPS will set the stage for future improvements or enhancements of recreation opportunities on Trego Lake. TLD is happy to support and be involved in developing the picture this study creates. In the past, the recreation survey used by Xcel and its agents relied on a questionnaire at the Trego Town Landing. However, the study method was too narrow. The people using the lake most frequently, those living around it, were not methodically surveyed. Studying this crucial issue, as part of Xcel receiving a 40-year license to continue operating the dam, would ensure the entire lake formed by the dam is available for a range of recreational activities.

The recreation study proposed by NPS would offer a more complete picture of recreation on the lake. It includes a mailed survey to each riparian landowner on Trego Lake. Gathering this information provides more complete input to determine the needs and opportunities for recreating on Trego Lake. If TLD can assist in this survey process in any way, we would be happy to do so.

Support for certain NPS comments regarding the PAD.

As NPS has noted, TLD questions the reasoning behind Xcel's proposed change in the Trego Project Boundary as part of this 40-year relicensure. TLD is concerned about this proposed change because it could impact the sedimentation issue. Could a change in the project boundary permit Xcel to avoid its obligation to address sedimentation?

Additional input on NPS comments regarding the PAD.

As noted by NPS in their comments, a concern is the closing of the Wisconsin Department of Transportation access site on the Namekagon River in Trego because of the re-routing of the intersection of U. S. Highways 63 and 53. TLD is also concerned about these closures. The loss of this access point may divert recreators to the Trego Town Park landing which is congested with sediment and aquatic plants. In addition to the closed landings being used by those coming down the Namekagon River, it was also used by Trego riparian landowner canoeist, kayakers, and tubers to access the upper portions of Trego Lake. We think the three studies proposed by NPS are likely to document a need for improved access with the potential for modifications at the Trego Town Park landing.

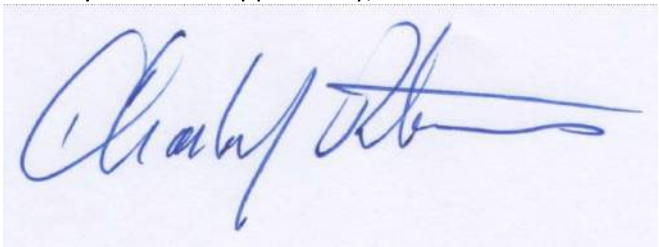
Conclusion

The TLD appreciates the opportunity to provide input on the relicensing of the dam and to support the study requests of NPS. TLD and Xcel Energy are currently in partnership to improve recreation on the lake by harvesting aquatic plants that impede boat travel and reduce the use of the lake to the general public and residents on the lake. With the discovery of AIS in the area, this effort is even more critical today.

Additionally, TLD is thankful for the work of NPS in responding to the PAD and its subsequent study requests. Their effort has been invaluable as we work to protect and rehabilitate Trego Lake. As noted earlier, TLD requests to be included in any future discussions regarding the finalizing and/or conducting of these studies.

Finally, if TLD can be of any assistance in these studies, we would be happy to do so. TLD has a website that includes current and historic documents about the lake: https://tregolakedistrict.com
If you have any question or comments, please do not hesitate to contact the district at: tld@trego.net

Thank you for this opportunity,



For the Board. . .
Charlie Petersen
TLD Board Chair

Attachment

Resolution Authorizing Trego Lake District Board of Commissioners to Support and Provide Information on National Park Service Study Requests Regarding the Relicensing of Trego Dam April 2021

WHEREAS, the Trego Lake District (TLD) is interested in the relicensing of Xcel Energy's hydroelectric dam creating Trego Lake.

WHEREAS, the process has begun for re-licensure of the dam and part of the Federal Energy Regulatory Commission's (FERC) process for re-licensure includes a request for possible areas to study that the dam project may affect.

WHEREAS, the National Park Service (NPS) has drafted three study proposals that identify key issues relating to Trego Lake and TLD concerns. The studies include: 1) Recreation Study, 2) Shoreline Survey, and 3) Hydraulics, Sedimentation, and Channel Change Study.

NOW, THEREFORE, BE IT RESOLVED, that the Trego Lake District Board of Commissioners is authorized to act in support of these study requests and submit a letter to FERC as testimony to this support. Additionally, the TLD will participate with NPS, and other interested parties, in providing information on these study areas to NPS and FERC as needed and/or requested.

Adopted this 17th day of April 2021.

Document Content(s)

TLD letter to FERC in support of NPS study requests.PDF.....1

Darrin Johnson

From: Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>
Sent: Friday, May 7, 2021 2:40 PM
To: Miller, Matthew J
Cc: Laatsch, Cheryl - DNR; Haller, Macaulay G - DNR; Antonuk, Connie J - DNR; Shawn Puzen; Darrin Johnson; Nick Utrup; Susan Rosebrough (susan_rosebrough@nps.gov)
Subject: WDNR Comments on Hayward and Trego PAD and Study Requests - Filed with FERC
Attachments: WDNR Study Requests for Hayward and Trego.pdf

Hello,

Please find attached WDNR's comments on Xcel Energy's Hayward and Trego PAD and study requests for relicensing that was filed with FERC this afternoon.

Thank you,

Macaulay Haller
Energy Project Liaison, Office of Energy
Wisconsin Department of Natural Resources
Cell Phone: PENDING
Macaulay.Haller@wisconsin.gov

dnr.wi.gov

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DEPARTMENT OF NATURAL RESOURCES
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Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
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TTY Access via relay - 711

May 7, 2021

Federal Energy Regulatory Commission
Kimberly D. Bose, Secretary
888 First Street, N.E.
Washington, DC 20426

Matthew J. Miller
Hydro License Compliance Consultant
Northern States Power Company-Wisconsin, Xcel Energy
1414 W Hamilton Avenue, PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Comments on Preliminary Application Document for the Hayward Hydroelectric Project P-2417 and Trego Hydroelectric Project P-2711

Dear Mr. Miller:

The Wisconsin Department of Natural Resources (department) appreciates the opportunity to participate in the process to relicense the Hayward and Trego hydroelectric dams as proposed in the Preliminary Application Document (PAD). These dams are licensed by Xcel Energy (Xcel), under projects P-2417 and P-2711.

The Hayward Project is located in the City of Hayward, Sawyer County, Wisconsin. The Trego Project is located in the Town of Trego, Washburn County, Wisconsin.

The department has limited information regarding natural resource information associated with the hydroelectric dams and their project areas. Studies associated with Hayward and Trego relicensing have different purposes, from a short term, long term, and cumulative impact. The department has carefully considered our responsibilities under the Clean Water Act and Navigable Waters Public Trust Doctrine for the proposed relicensing of Hayward and Trego.

We are providing comments to the PAD and are recommending that the following studies be completed. Each study is presented as appropriate for the various alternatives that could be evaluated as part of the comprehensive review and assessment of the project area. Our requests for information and studies focus on the continued operation of the Hayward and Trego dams.

As Xcel Energy begins to evaluate the array of study requests and determine their study proposal and next steps, the department will continue to provide guidance and recommendations. The licensee should continue to work with the department to collect resource information and develop study plans and protocols. If new information becomes available through the relicensing process, we reserve the rights to require additional studies to gather appropriate information.

To save time and costs, the department recommends that studies be combined, and that the licensee meet with the stakeholders who have requested studies to explore their options and still achieve desired data collection. We also recommend exploring the use of citizen monitoring groups and organizations.

Please be aware that Scientific Collectors Permits may be required to complete various surveys. Please work with the department to obtain appropriate permits and approvals prior to the collection of data.

Please note that the department cannot guarantee the accuracy of the information related to FERC project monitoring that is stored in the department's Surface Water Integrated Monitoring System (SWIMS), its repository lakes pages, and other associated department websites. Please contact the statewide FERC coordinator for the most current and accurate information on FERC projects.

The department will provide additional outreach to the tribes, as appropriate.

Please direct all inquiries to the Project Manager, Cheryl Laatsch, Statewide FERC Coordinator.

If you have any questions or comments regarding our recommendations, please contact me at 920-387-7869, or Cheryl.Laatsch@wisconsin.gov. We look forward to working with you.

Regards,

Cheryl Laatsch
Statewide FERC Coordinator
Wisconsin Department of Natural Resources

Comments on Pre-Application Document (PAD)
Relicensing of Hayward (P-2417) and Trego (P-2711) Projects

General:

Throughout the PAD, Xcel references data that is greater than 10 years old (for example, 3.2.1.1 references NSPW data from 1991). Additionally, some of the department websites that were referenced do not provide publishing or revision dates for the collected data and summaries (for example, 3.2.1.6 bathymetry data is actually from a 1964 map, 4.1.7 WDNR 2020a is data from 2010), and the department cannot verify if this data is still applicable to present day conditions at the Projects.

Please verify that the PAD reflects current project conditions.

3.2.1.1 Hayward Dam

A mixture of sand and bentonite material was placed over the apron in locations where holes have historically been seen. The downstream apron is a concrete slab located over rock-filled timber cribbing with thicknesses varying from 1 to 3 feet. The voids in the timber cribbing beneath the apron are grouted.

- Provide details on how the repairs have held up.
- Provide details on if there are ongoing monitoring of the voids and apron deficiencies.
- Provide details on the last time these voids and apron deficiencies were inspected.

3.2.2 Hayward Project Boundary

The current and proposed Project boundaries are depicted in Figure 3.2.2-1 on the following page and in the existing Exhibit G included as Appendix 3.2.2-1. The Licensee is proposing to increase the acreage within the Project boundary an additional 2.8 acres. The increase includes a portion of the reservoir currently occupied by the Project, but not currently included in the Project boundary (Mead & Hunt, 2020).

- It is difficult to clearly understand the proposed project boundary on Figure 3.2.2-1. Please provide an updated map or additional side-by-side boundary comparisons.
- Provide details if flowage easements are in place for the new project boundary area.

3.3.2 Trego Project Boundary

The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary. This results in an overall decrease of acreage within the Project boundary of 29.1 (submerged) acres.

- Please clarify why LiDAR data was not applied to the Hayward project. The department requests consistent approaches between the projects.

3.4.1.1 Current Operation (Hayward)

Under normal operating conditions, the Licensee is required to maintain the reservoir at a target elevation of 1,187.4 feet but can fluctuate around the target elevation such that the reservoir is maintained between 1,187.0 feet (minimum) and 1,187.5 feet (maximum).

- Provide details on why the target elevation of the reservoir is 1,187.4 feet, when the maximum reservoir elevation is 1,187.5 feet. This target elevations only leaves a margin of 0.1 feet.
- Provide details on why the specific reservoir elevation license requirements for Hayward are different than Trego's reservoir target elevations fluctuations (the Licensee maintains the Project reservoir at a target elevation of 1034.9 feet, with fluctuations limited to +/- 0.3 feet around the target elevation).

The plant is manually operated with controls installed for automatic shutdown in case of operational emergencies. Whenever a plant shutdown occurs or high or low headwater levels are detected, staff at the Licensee's Wissota Hydroelectric Project control center are automatically notified.

- Define the terms "high" and "low" for headwater levels.

Tailwater is monitored manually via a staff gage downstream of the powerhouse.

- Provide details on the location of the staff gage and the frequency of monitoring and calibration.

Flows in excess of the 8 cfs minimum flow are primarily passed through the powerhouse. Flows in excess of the Project's hydraulic capacity are passed through the overflow spillway.

- Clarify how this is meeting run-of-river operations. This does not appear to be equal inflow/outflow, as excess flows will go downstream.
- Clarify why excess flows are not passed through the overflow spillway.

3.4.2.1 Current Operation

The Project currently operates in a run-of-river mode where discharge measured immediately downstream of the Project tailrace approximates the sum of inflows to the Project reservoir

- Provide more information on how sum of inflow is calculated.
- Provide details on water usage for the spillway and powerhouse and the amount of water flowing into these areas versus flowing out of these areas.

Headwater and tailwater elevations are continuously monitored electronically and manually confirmed with staff gages mounted on the Project headworks and tailwater.

- Provide the locations of where elevations are being electronically and manually collected.

4.1 General Description of the Project Area (18 CFR § 5.6(d)(3)(xiii))

There are two FERC-licensed hydroelectric projects and three state-regulated dams on the Namekagon River; all are listed from upstream to downstream in ***Table 4.1-1*** *and are shown in* ***Figure 4.1-1****. The FERC-regulated*

dams include the Hayward and Trego Projects. The state-regulated facilities do not generate power and are regulated by the State of Wisconsin.

- Provide details on how these state-regulated facilities impact or effect the Hayward and Trego projects.
    - Department database shows that Phipps and Pac-Wa-Wong are owned by the U.S. Department of Interior. The most recent files we have are from 1995 for Phipps Dam.

    - Namekagon is State regulated and located 27 miles upstream of Hayward Project. This is a run of river dam with 17-ft fixed crest weir and two 4-ft stoplog bays. The dam was designed to pass the Q1000-yr event with 2.4 feet of freeboard before overtopping.

4.2.3.1 Hayward Project, 4.2.3.2 Trego Project

The combination of NSPW shoreline ownership, minimization of reservoir fluctuation, existing native riparian vegetation buffers, local shoreland regulations, and Upper St. Croix and Namekagon River Management Plan provide adequate protection from wide-spread shoreline erosion and over development in the vicinity of the Hayward Project.

- Provide a map and table of Xcel ownership, public lands, and private ownership within the Hayward and Trego FERC boundaries.

4.3.2 Streamflow, Gage Data, and Flow Statistics

- Provide a map showing all gauge locations for the Hayward and Trego projects.

Monthly flow duration curves for the Trego Project were developed based on discharge information collected by the Licensee. While there is a USGS gage in the vicinity of the Trego Project, it does not record daily flow data needed to develop flow duration curves and the USGS gage at Leonards is not located close enough to provide statistically accurate flow information

- Provide greater detail on these two gauging stations and why these gauges cannot provide relevant flow data.

4.3.2.2 Trego Project

There is a drainage area of 488 square miles at the Trego Project. Based on the data for the analyzed period, the average annual calendar year flow at Trego Project was 540 cfs, the maximum annual average calendar year flow was 579 cfs in 2019, and the minimum annual average calendar year flow was 469 cfs in 2015.

- Provide the relevancy and significance of the years 2015 and 2019.
- The department requests flow data from the past 20 years for the Hayward and Trego projects. This includes duration curves, low flows, high flows, spring run-off, dry years, wet years, etc.

4.3.4 Instream flow

- Discuss and evaluate current instream flow data for the Hayward and Trego projects.

4.3.7.1 River Water Quality Standards

- The upper confidence bound for Hayward Lake residence time is 6 days, therefore, Hayward Lake is considered an impounded flowing water.
- The upper confidence bound for Trego Lake residence time is 11 days, therefore, Trego Lake is considered an impounded flowing water.
- Verify if state standards are being met at the Hayward and Trego project.
- Trego Lake is considered an impaired water and is 303(d) listed for the Recreation designated use, due to high chlorophyll-a concentrations, and will addressed as part of the St. Croix Nutrient TMDL expiring in 2025.
- Trego Project should be subject to the Warm-Large temperature criteria (see table below from Chapter NR 102.2 – Water Quality Standards for Wisconsin Surface Waters)
- Hayward Projec =t should be subject to Coldwater temperature criteria (see table below from Chapter NR 102.2 – Water Quality Standards for Wisconsin Surface Waters)

Table 2
Ambient Temperatures and Water Quality Criteria for Temperature for Non–Specific Waters
(All values are expressed as degrees Fahrenheit)

	Cold[4]			Warm — Large[5]			Warm — Small[6]			LFF[7]		
Month	Ta[1]	SL[2]	A[3]	Ta	SL	A	Ta	SL	A	Ta	SL	A
JAN	35	47	68	33	49	76	33	49	76	37	54	78
FEB	36	47	68	33	50	76	34	50	76	39	54	79
MAR	39	51	69	36	52	76	38	52	77	43	57	80
APR	47	57	70	46	55	79	48	55	79	50	63	81
MAY	56	63	72	60	65	82	58	65	82	59	70	84
JUN	62	67	72	71	75	85	66	76	84	64	77	85
JUL	64	67	73	75	80	86	69	81	85	69	81	86
AUG	63	65	73	74	79	86	67	81	84	68	79	86
SEP	57	60	72	65	72	84	60	73	82	63	73	85
OCT	49	53	70	52	61	80	50	61	80	55	63	83
NOV	41	48	69	39	50	77	40	49	77	46	54	80
DEC	37	47	69	33	49	76	35	49	76	40	54	79

1 Ta = ambient temperature
2 SL = sub–lethal criteria
3 A = acute criteria
4 Cold = waters with a fish and aquatic life use designation of "cold water community"
5 Warm – Large = waters with a fish and aquatic life use designation of "warm water sport fish community" or "warm water forage fish community" and unidirectional 7Q10 flows ≥ 200 cfs (129 mgd)
6 Warm – Small = waters with a fish and aquatic life use designation of "warm sport fish community" or "warm water forage fish community "and uni–directional 7Q10 flows < 200 cfs (129 mgd)
7 LFF = waters with a fish and aquatic life use designation of "limited forage fish community"

4.4.1.1 Fish Stocking Data

- Describe the purpose of fish stocking at these projects, including information on frequency, methods, and timelines of stocking events.

4.4.1.2 Mussels

- Data provided by the department included the year of observation, but this is not included in table 4.4.1.2-1

4.4.3.1 Hayward Project

The WDNR further acknowledged that Hayward Lake did not provide good walleye habitat, and even in the absence of fish entrainment, the original goal of 3 walleye per/acre would not be possible to achieve. The WDNR also concluded there was no compelling resource-based reason to plan for drawdowns

- This information should be updated since the FERC 2012 statement.
- Provide current status of walleye and walleye habitat at the Hayward Project.

4.5.1 Botanical Species

- Boreal Forest was not a forest type in the NW Sands Ecological Landscape historically.

4.5.2. Wildlife

- Acknowledge which species have NHC-listed status.
- Identify species that are state or federally listed under 4.7 Rare, Threatened and Endangered Species.
- There is an inconsistency of the 4.5 list of species and the list in 4.7 (for example, the Northern Long-Eared Bat is listed in 4.5.2, however, 4.7.2.3 states that the species is not found within the vicinity of the projects).
- Marten and white tailed jackrabbit do not occur in the vicinity of these project boundaries.

4.5.3 Invasive Species

- Please update the references and reference lists for consistency.
- *Selected Regulated AIS* in WI may have been updated since 2016, and this flyer should only serve as a reference.

4.8.1.6 Hayward Project Informal Shoreline Fishing Area

The unimproved shoreline areas downstream of the spillway and powerhouse, which are owned by the Licensee, are often used as informal fishing areas

- Xcel should work with local municipality to maintain and enhance recreational opportunities, especially in areas that are known to have active use.

4.8.2.3 Town of Trego Park Landing

- Photo 4.8.2.3-1 shows presence of active erosion at the boat landing and will need repair.

Study Requests

Relicensing of Hayward (P-2417) and Trego (P-2711) Projects

(Study requests to be applied to both Hayward and Trego Projects, unless otherwise noted)

ASSESSMENT OF CURRENT DAM OPERATIONS

• Goals and Objectives: Determine if the Project is meeting the requirements of minimum flows and run-of-river operations; including documenting how downstream river flows are managed appropriately to limit water level fluctuations.

• Relevant DNR Management Goals: Review the current operations relative to maintaining consistent reservoir elevations and downstream flows that mimic background hydrology, as achieved by run-of-river operations.

• Existing Information: For the Hayward Project, a minimum flow of 8 cfs or inflow, whichever is less, is released at all times into the bypass reach, as stated in the current license. The Trego Project does not have minimum flow requirements.

• Operation nexus to resource and how informs license: Ensure Project operates within limits of hydrologic modification through run-of-river, and not causing divergence in flows that harm the downstream aquatic ecosystem.

• Methodology: Desktop review of existing inflow and outflow data, including an evaluation report of run-of-river and operations requirements.

• Level of Effort and Cost: Staff time is expected to be 20-40 hours at $125 per hour equaling $2,500-$5,000 for data analysis and report.

ASSESSMENT OF MINIMUM FLOW, DRAWDOWNS, AND RESOURCE IMPACTS DOWNSTREAM OF THE TAILWATER

• Goals and Objectives: Provide an assessment of the average range of flows, including minimums and maximums and their relevance, associated with run-of-river operations and facility capacity. Determine if the project minimum flow of 8 cfs at the Hayward Project and target reservoir elevations of the Trego Project are providing sufficient flows and environment for aquatic resources.

• Relevant DNR Management Goals: Evaluate the current minimum flow and ensure that the minimum flow does not have an adverse impact on the aquatic resources within the Project boundary and downstream of the Project. Ensure that the aquatic environment is maintained in a healthy state, which includes protection of rare and listed species. Consideration for impacts to wildlife that will be hibernating would be adversely affected by drawdowns. Sediment loading impacts from frequent drawdowns and loss of recreational opportunities, due to limited access, are affected by drawdowns. If a drawdown or refill is performed too quickly, turbid water can flow down river, depending on the water flow rate. Sediment can also settle out at the base of the dam, creating water quality and habitat issues.

• Existing Information:

> **Hayward**: For the Hayward Project, a minimum flow of 8 cfs or inflow, whichever is less, is released at all times into the bypass reach, as stated in the current license.

Trego: The Trego Project does not have minimum flow requirements and does not have a bypassed reach.

The department has concerns for otters, furbearers, and other wildlife if water levels are not managed similar to current operations. Turtles, frogs, and other herps would be negatively affected if water levels are drawndown after October 1st.

• Operation nexus to resource and how informs license: Ensure Project is meeting the intent of run-of-river, and not causing divergence in flows that harm the downstream aquatic ecosystem.

• Methodology: In-stream flow study, which includes a description of current habitat conditions within the bypass channel under current operation and flows to determine if the current minimum flows are impacting available habitat, fish, and macroinvertebrate communities. Assess various flow regimes to determine what is appropriate to minimize and avoid adverse impact on the cold-water resource.

• Level of Effort and Cost: Staff time is expected to be 20-40 hours of field work at $125 per hour, plus costs for equipment.

ASSESSMENT OF STREAM FLOWS, CHANNEL DIMENSIONS, AND LINEAR GRADIENT

• Goals & Objective: Determine impacts the Project has on the existing stream flows, channel dimensions and linear gradient of Namekagon River downstream of the Project.

• Relevant DNR Management Goals: The proposed study would investigate the impacts the Project would have on the existing stream flows, channel dimensions, and linear gradient of the Namekagon River. The impacts that the Project may cause on the existing stream flows, channel dimensions and linear gradient may alter resources and recreational and developmental management plans for the future.

• Existing Information: Data is limited relating to flow, channel dimensions, and linear gradient impacts within the Project boundary.

• Operation nexus to resource and how informs license: The relicensing of Hayward and Trego has the potential to have short term and long-term impacts on the aquatic community downstream of the impoundment. These impacts include, but are not limited to, dewatering and limiting available aquatic habitat in the downstream river channel depending on stream discharge and dam operation. These impacts can vary by season as well as daily. Proper management of the resource will help ensure that adequate flows are available to aquatic life at the proper time and thermal regime.

• Methodology: Conduct a flow study to determine stream morphology downstream of the Project at various flows, including width, depth, wetted perimeter and substrate composition. The study should identify any wetlands that are flooded. This should include available aquatic habitat under current operation through flood flow conditions. Quantitative Habitat Assessment Methodology should be used to document habitat conditions. Refer to existing management efforts (recreational, resource, habitat) to investigate the impacts the proposed Project would have.

• Level of Effort and Costs: 40 hours of fieldwork and 40 hours of report writing at $125 per hour, plus equipment costs.

ASSESSMENT OF WATER QUALITY

• Goals & Objectives: The department is requesting at least one year of water quality data collection. Depending on the first year of data, a second year of water quality studies may be requested. Assess and monitor the following water quality parameters:

Total Phosphorus	Sulfate, Total Mercury	Total Suspended Solids
Chlorophyll-a	Methyl Mercury	Sediment Accumulation
Dissolved Oxygen (DO)	Dissolved Phosphorus	Alkalinity
Temperature	Nitrate (plus nitrite)	Secchi Depth
Conductivity	Ammonia	Color
pH	Chloride	Iron, Manganese, and/or Sulfide
Total Nitrogen	Bacteria	Cyanobacteria

• Relevant DNR Management Goals:

Total Phosphorus: One of the primary causes of eutrophication and most widespread pollutant in waterbodies statewide and nationally. Impoundments are unlikely to raise the concentration of phosphorus in the downstream river but play a role in the transformation, such as the ratio of dissolved phosphorus to total phosphorus. Dam operation might influence internal phosphorus loading to the impoundment by affecting the mixing regime as water levels change.

Chlorophyll-a: A measurement of the amount of algae in a waterbody, one of the primary manifestations of eutrophication. As impoundments increase surface area, slow and warm water are likely to produce more chlorophyll-a, per unit phosphorus/nitrogen, than the upstream or downstream river. Impoundments may produce chlorophyll-a in the lake environment that is then passed to the downstream river.

Dissolved Oxygen: Dissolved oxygen is critical for the health and survival of aquatic organisms. Deep impoundments may stratify and become oxygen depleted in deep water. Impoundments may then cause a decrease in dissolved oxygen in the downstream river, especially if there is bottom withdrawal of a eutrophic impoundment, or an impoundment that stratifies. Additionally, eutrophic impoundments may transform nutrients into organic matter (mainly algae) that then flows into the river, decomposes and reduces oxygen.

Temperature: Temperature regime of a waterbody structures community composition of fish, invertebrates, plants, etc. Temperature also effects rates of chemical reactions, ecosystem productivity and the ability for gasses to dissolve in water. Impoundments can increase water temperatures by slowing water velocity and increasing surface area to absorb solar radiation. Additionally, deep impoundments may cause deep water temperatures to decrease if there is stratification. Dam operations can influence downstream temperature by changing/mixing withdrawal location, top versus bottom draw (among others).

Conductivity: High concentrations of dissolved ions, measured as conductivity, can impair the osmoregulation of organisms with gills and other semipermeable membranes. Sources of elevated conductivity are likely from nonpoint and certain point source discharges. However, conductivity is important for classifying the impoundment and stream and is therefore needed as background information.

pH: pH can control the biologic availability, solubility and speciation of chemicals in water. Although wild rice does well in slightly acidic waters (pH 5.9 – 6.2), even moderately acidic water may irritate the gills of aquatic fish and insects or reduce the hatching success of fish eggs. Eutrophication increases swings in pH during the algal growth and die-off phases. Highly eutrophic impoundments may release high or low pH to the river downstream. In addition, fluctuating water levels can acidify the impoundment by exposing the waterbody bed to air and then flushing sulfate into the water when lake levels rise again or when it rains. Dam operation probably has very little opportunity to mitigate dramatic pH swings at short timescales, but operations that cause sufficient changes in water levels may affect pH at a seasonal or interannual time scale.

Total Nitrogen: An oversupply of nitrogen is one of the primary causes of eutrophication. A lack of nitrogen limits wild rice development. Impoundments are unlikely to raise the concentration of nitrogen in the downstream river. Although some planktonic algae can fix atmospheric nitrogen, this amount is likely overwhelmed by the amount of nitrogen coming in from the watershed via tributary streams. Impoundments do play a role in the transformation, such as the ratio of dissolved inorganic nitrogen to organic nitrogen.

Sulfate, Total Mercury, Methyl Mercury: Dam operations can influence the sulfur and ultimately the mercury cycle. In short, long-term drawdowns can eventually lead to increased sulfate runoff when it rains. This acidifies the water and can then enhance methyl mercury concentrations in water and methyl mercury in fish. Sulfate can also be converted to toxic sulfide which affects the mitochondria of plants. When sulfate is high, sulfides are also usually high and therefore toxic to wild rice and other plants. This process has been demonstrated in formation of new reservoirs and in the regulation of existing reservoirs. Impoundments can cause this process to happen. Water levels will need to be managed to prevent increased total mercury and high sulfate levels.

Dissolved Phosphorus: An oversupply of phosphorus is one of the primary causes of eutrophication and most widespread pollutant in waterbodies, statewide and nationally. Low phosphorus levels limit wild rice seedling success and development. Impoundments are unlikely to raise the concentration of phosphorus in the downstream river, but play a role in the transformation, such as the ratio of dissolved phosphorus to total phosphorus. Dam operation might influence internal phosphorus loading to the impoundment by affecting the mixing regime as water levels change.

Nitrate (plus nitrite): One of the bioavailable forms of nitrogen, a primary cause of eutrophication. Impoundments are unlikely to raise the concentration of nitrate in the downstream river. Although some planktonic algae can fix atmospheric nitrogen, this amount is likely overwhelmed by the amount of nitrate coming in from the watershed via tributary streams.

Ammonia: One of the bioavailable forms of nitrogen, a primary cause of eutrophication. Impoundments are unlikely to raise the concentration of ammonia in the downstream river.

Chloride: Chloride, at elevated levels is toxic to fish, invertebrates and amphibians. At lower levels, it can negatively affect diversity, productivity, and increase the density of water. Chloride is increasing statewide and nationally in waterbodies that have even small percentages of their watershed in urbanized land use. The impoundment is unlikely to transform or change chloride levels from the incoming tributaries (assuming long-term stable water levels). The major exception being if the shore is heavily developed and there are major applications of road salt or point sources with high chlorides.

Bacteria: Bacterial indicators, such as E. coli, are used to detect the presence of fecal contamination in waterbodies to protect recreational uses. Impoundments are unlikely to increase E. coli in downstream

rivers, unless there is heavy recreation (campgrounds, beaches, non-sewered sanitation) on the impoundment.

Total Suspended Solids (TSS): High concentrations of TSS can inhibit visibility for predators, damage gill structure of fishes, and lead to high rates of sedimentation in streams and alter benthic habitat. Impoundments are likely to lower TSS concentrations in the downstream river. In extreme cases where sediment build-up behind a dam structure is high, there may be some chance of increased concentrations of TSS. Dam operation is unlikely to influence TSS unless there is a catastrophic event, drawdown or using ash cinders as a sealant.

Sediment Accumulation Behind Dam: Dams trap sediments upstream. Ecological concerns include increasing turbidity upstream and smothering spawning beds in the reservoir and upstream. Sediment build up can also threaten the longevity of the dam itself.

Alkalinity: Alkalinity itself is not regulated, but it is important for determining sensitivity to acidification and the biological communities that can live there. Alkalinity does not have criteria or thresholds; it is used to help understand lake characteristics. Alkalinity can be measured in concert with conductivity and pH with a single water sample.

Secchi Depth: Secchi depth measures water clarity and is a general indicator of lake health. The impoundment could affect Secchi depth through its effects on eutrophication and suspended sediments. Dam operations can influence internal nutrient loading and chlorophyll *a* (see above), and thus, also water clarity.

Color: Color refers to how much colored organic matter is in the water, staining it brown. Water color is important for understanding the ecology of the lake. Highly stained waters reduce water clarity and in turn, can affect algal and plant growth and even fish growth. The impoundment is unlikely to affect color, but color will be important for understanding the ecology of the impoundment. Color does not have criteria or thresholds; it is used to help understand lake characteristics.

Iron, Manganese, and/or Sulfide: These are reducing substances that can have high concentrations in the hypolimnion of reservoirs under anoxic conditions. They use oxygen through their own chemical transformations and can further increase oxygen demand. In addition, iron binds phosphorus under oxic conditions, but releases phosphorus under anoxic conditions. Therefore, reservoirs with high iron could be prone to internal phosphorus loading if they go anoxic in the hypolimnion. May be necessary to manage impoundments that stratify and become anoxic. May be necessary to manage impoundments that stratify and become anoxic. Dam operations can impact stratification and mixing, and thus, the concentration of these substances and internal nutrient loading. The department does not have criteria or thresholds for these substances; they would be used to help understand cycling of nutrients, mercury, etc., and oxygen dynamics within a lake

Cyanobacteria cell counts and cyanotoxins: Harmful Algal Blooms are of concern for human health, recreation, and fish and aquatic life. High concentrations of chlorophyll *a* are often correlated with high concentrations of cyanobacteria and cyanotoxins, but not in all cases. These indicators need to be measured independently for evaluation. As impoundments increase surface area, slow and warm water they likely to produce more chl *a* per unit phosphorus/nitrogen, than the upstream or downstream river. This could also include more cyanobacteria and cyanotoxins as well. Recent studies of dams across wide geographic areas show that cyanobacterial blooms are more prevalent when dams are drawn down. Temperatures increase along with water residence times and nutrient concentrations, all of which favor

cyanobacteria. Dam operations can influence the likelihood of cyanobacterial blooms. The department recommends following EPA's recommended cyanobacteria thresholds. The department's standard operating procedures and assessment methodology should be followed for monitoring, reporting and review. Highly recommended in reservoirs/impoundments that are known to suffer from harmful algal blooms. In addition to routine monitoring, samples may be taken in response to reports of algal blooms/sickness. Not necessary where chlorophyll concentrations are low and there are no reports of algal blooms.

• Existing Information:

Hayward: Water quality monitoring is not required in the current license. Water clarity data was collected at the Hayward Project 2010-2017. Hayward Lake is a designated Area of Special Natural Resources Interest (ASNRI) as an Outstanding and Exceptional Area, a Priority Navigable Waterway (PNW) Musky Area, and a PNW Walleye Area. The Namekagon River that flows through the Hayward Project is an ASNRI Wild and Scenic River, ASNRI Trout Stream, and a PNW Musky Area.

Trego: Water quality monitoring is not required in the current license. Water quality parameters were collected at the Trego Project 2010-2014 and 2016-2020. Satellite water clarity was collected at the Trego Project in 2015. Trego Lake is an ASNRI Outstanding and Exceptional Area and ASNRI Wild Rice Area. The Namekagon River that flows through the Trego Project is a PNW Musky Area.

• Operation nexus to resource and how informs license: Ensure compliance of state water quality standards and how operations are meeting those standards. The operation of the dam affects the water quality of the impoundment and downstream resources. The overall goal of the request is to further understand the current water quality conditions of the reservoir and river resources which will help inform management decisions in the future. Limited water quality data presented in the PAD is not representative of current or future water quality conditions.

• Methodology: The department classifies Hayward Lake as an impounded flowing water, where a water residence time is less than 14 days. According to current department information, the upper confidence limit for water residence time for Hayward Lake is 6 days. This means that river monitoring protocols should be applied instead of lake protocols upstream of the impounded area and downstream of the dam. Lake protocols should be applied within the deep hole of the impounded area.

The department classifies Trego Lake as an impounded flowing water, where a water residence time is less than 14 days. According to current department information, the upper confidence limit for water residence time for Trego Lake is 11 days. This means that river monitoring protocols should be applied instead of lake protocols upstream of the impounded area and downstream of the dam. Lake protocols should be applied within the deep hole of the impounded area.

River monitoring methods (including continuous monitoring) should be performed in at least three locations within the project area (or best appropriate location), including one location downstream of the dam, one location within the impounded area (within the deep area of the impoundment, typically near the dam), and one location upstream of the impounded area.

Data should be collected or analyzed using the DNR WISCALM Guidance, surface water grab sampling protocols, and the Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, 2020). A list of standard operating procedures can be found in the appendix of the most current department Wisconsin Consolidated Assessment and Listing Methodology (WisCALM,

https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html), in addition to protocols listed in the table below:

One (1) sample location upstream of the impounded area and one (1) sample location downstream of the dam			
Parameter	**Method**	**Frequency – At least one year of studies requested**	**DNR Protocols**
Total phosphorus	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Chlorophyll *a*	Grab samples	Monthly, July 15 – September 15 **3 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, 2020)
Dissolved Oxygen	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
Temperature	Field measurement	Continuous, year-round	Use instruction manual from manufacturer
Conductivity	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
pH	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
Dissolved Phosphorus	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Total Nitrogen	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Sulfate, Total Mercury	Grab samples	Possibly 1x in spring	Nutrient Grab Sample Protocol
Methyl Mercury	Fish Tissue Samples	Possibly 1x in spring	Contact DNR Fisheries Biologist
TSS	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Nitrate (plus nitrite)	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Ammonia	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Chloride	Grab samples	Monthly, May – Oct **6 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Bacteria	Grab samples	Monthly, May – Oct **6 total**	Citizens Monitoring Bacteria: A training manual for monitoring E. coli http://dnr.wi.gov/lakes/forms/ecoli_may162005.pdf
Nutrient Grab Sample Protocol:https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=114118765 **Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, Revised 2020):** **https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf**			

One (1) sample location within the impounded area (deep hole			
Parameter	**Method**	**Frequency – At least one year of studies requested**	**DNR Protocols**
Total Phosphorus (TP)	Field fixed, persulfate digestion	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Chlorophyll *a*	Water filtered in facility's lab or mail to SLH	3x July 15 - Sep 15 **3 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Dissolved Oxygen	Field, Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Temperature	Field, Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Conductivity & pH (optional)	Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Conductivity, pH, Alkalinity	Field collected, then sent to lab	1x during July 15 - Sep 15 **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Dissolved Phosphorus	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Clarity (Secchi)	Field	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Secchi Disk Procedures)
Color	Field collected, then sent to lab	1x during July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Total Nitrogen	Field fixed (sulfuric acid)	1x during July 15 - Sep 15 **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Sulfate, Total Mercury	Field collected, then sent to lab	Possibly 1x in spring	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Methyl Mercury	Fish tissue. See appendix for explanation.	Possibly 1x in spring	Contact DNR Fisheries Biologist
Nitrate (plus nitrite)	Field fixed (sulfuric acid)	1x during July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)

Ammonia	Field collected, then sent to lab	Probably 1x July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Chloride	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Iron, Manganese, and/or Sulfide	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Total suspended solids (TSS)	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Cyanobacteria/ cyanotoxins	Contact DNR Water Quality Biologist		
Bacteria	Field collected, then sent to lab	Dependent on system & tied to public beaches – Contact Water Quality Biologist	Citizens Monitoring Bacteria: A training manual for monitoring E. coli http://dnr.wi.gov/lakes/forms/ecoli_may162005.pdf

Wisconsin Citizen Lake Monitoring Training Manual (Secchi Disk Procedures, Revised 2020):
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/SecchiMan.pdf

Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, Revised 2020):
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf

For the analytes without state standards, they should be analyzed by mean and median values and reported in a table by date and time annually.

Sediment accumulation should be assessed and mapped behind the dam. This includes estimated depth and volume of sediment held within the impoundment.

Sampling Locations: Apply river monitoring methods in the river in the impounded area, downstream of the dam, and upstream of the impounded area.

- **In the Impounded Area:** One or more stations within the main impounded area. At least one station should be located in the deep area of the impoundment, which would typically be near the dam. However, it must be located outside of the hazard zone demarcated by buoys. For large impoundments an additional station or two may be required in the middle and upper reaches of the impounded area, along the thalweg, to characterize water quality throughout the impoundment. For those with a more complex system of tributary arms or large bays, additional monitoring stations may be recommended to characterize those areas.

- **Downstream of the dam:** One station. In cases where some of a river's flow is diverted through the dam and another portion of the flow is not, the station should be located below the mixing zone (see the DNR's "Guidance for Mixing Zones, Zones of Initial Dilution, and Rapid Mixing"). It should also be placed in an area that is safe to access (some areas may be too swift-flowing) and if possible where vandalism of equipment is less likely.
    - In certain cases, a second station immediately below the dam may be required if low DO is expected to be an issue due to bottom draw releases and/or low DO in the impounded area.

- **Upstream of the impounded area:** Monitoring inflows can provide a point of comparison with waters in the impoundment and downstream and help identify pollution sources. One river station upstream of the impounded area may be required if:
    - There is not another station upstream of the facility's impounded area that is being monitored by another facility upstream (in areas with several consecutive dams).
    - There is a water quality problem identified downstream or in the impounded area which needs additional upstream data to determine the cause of the issue.

• Level of Effort and Costs: Six field days plus with two people $125 per hour plus costs for equipment. Estimated 40 hours for report writing and chemical analysis. Additional field work may be required to monitor/maintain continuous monitoring sensors.

ASSESSMENT OF SEDIMENATION AT TREGO DAM

• Goals & Objectives: Assess sedimentation upstream of Trego Dam near where the boundary is proposed to be removed.

• Relevant DNR Management Goals: Dams trap sediments upstream. Ecological concerns include increasing turbidity upstream and smothering spawning beds in the reservoir and upstream. Sediment build up can also threaten the longevity of the dam itself.

• Existing Information: During the JAM presentation, the local Trego Lake association shared concerns with sedimentation at the Trego dam, as well as where the proposed FERC boundary is being removed. The lake association also has concerns of flooding in this portion of the project boundary.

• Operation nexus to resource and how informs license: Ensure compliance of state water quality standards and how operations are meeting those standards. The operation of the dam affects the water quality of the impoundment and downstream resources. The overall goal of the request is to further understand the current water quality and sedimentation conditions of the reservoir and river resources which will help inform management decisions in the future.

• Methodology: Sediment accumulation should be assessed and measured downstream of HWY 53 through the project area that is being proposed for removal. Assessments of sediment deposits and sediment depth measurements can be collected along multiple transects, including the bay areas north and west of Leisch Road.

• Level of Effort and Costs: 40 hours of desktop review, and data summary at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF WILDLIFE AND WILDLIFE HABITAT

• Goals & Objectives: Document wildlife presence and diversity, habitat types, and general wildlife and vegetation abundance within the Project area. The goal of this study is to evaluate the distribution and composition of vegetation, wildlife, and wildlife habitats, including wetlands, and the effects operations of those

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, including listed species. This information will be beneficial to understanding the current environment, and potential needs for resource management associated with the Project.

• Existing Information: Limited or no wildlife surveys or data have been collected within the Project boundary. Additionally, the PAD does not include any field assessment or surveys of wildlife habitat or use.

Trego: The department does not own land so we do not have any wildlife or fishery area management plans for this area of land. The only survey conducted in this area was the bear snare survey (which showed an abundance of bears).

The department has concerns for otters, furbearers, and other wildlife if water levels are not managed similar to current operations. Turtles, frogs, and other herps would be negatively affected if water levels are drawn down after October 1st.

Hayward: From a game species standpoint, wildlife impacts are presumed to be low. The game "species" that would see the largest direct impact would be waterfowl and furbearers. The Waterfowl Management Plan was approved by the department and Wisconsin Natural Resources Board as of January 2020 and lays out the goals for Wisconsin's waterfowl.

Water dwelling or using furbearers could also be impacted in water conditions changes from its current state. Like the waterfowl plan, the department Beaver Management Plan can be used for reference.

There is bald eagle territory on Lake Hayward, with two nests by the Lumberjack Bowl and a newer nest just north of Hwy 77.

Waterfowl Management Plan (2020): https://p.widencdn.net/uffph8/WisconsinWaterfowlPlan

Beaver Management Plan (2015): https://p.widencdn.net/axlcfq/WM0610

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on habitat and wildlife use of affected habitats. Proper management of the resource will help to minimize any adverse impacts associated with the removal, restoration, and relicensing activities.

• Methodology: Using a qualified biologist or ecologist knowledgeable in local vegetation, identify, classify, and delineate on a map major vegetation cover types within project area. Existing aerial photography, on the ground surveys, or a combination of the two to identify and map the cover types may be used. The biologist/ecologist will record all wildlife present.

During the summer and fall (migration), ground-truth any remote-sensing mapping efforts, record all wildlife observed (directly or indirectly) and document any terrestrial invasive species detected during survey efforts. Describe each cover type by species composition, successional stage, and aerial extent (acreage) within the survey area, including invasive species. As an example, the methodology expressed in the following reference could be used: https://www.fs.fed.us/research/publications/gtr/gtr_wo89/gtr_wo89.pdf

• Level of Effort and Costs: 80 hours of desktop review, field work, and data summary at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF FISHERIES AT TREGO PROJECT

• Goals & Objectives: Define the diversity and abundance of the fish community within the Trego Project.

• Relevant DNR Management Goal: Understand the existing environment. The department manages public water for recreational use, such as fishing, protection and management of species, and the overall health of the fishery of the state.

• Existing Information: The PAD states that department data was provided for upstream of Trego Lake, downstream of Trego Lake, and within Trego Lake for 2003-2019. Trego Lake is an ASNRI Outstanding and Exceptional Area and ASNRI Wild Rice Area. The Namekagon River that flows through the Trego Project is a PNW Musky Area.

The department has concerns on Lake Sturgeon entrainment at the Trego Dam. Lake Sturgeon are currently stocked by the department in the Namekagon River (above Trego Lake) and within Trego Lake in hopes of re-establishing this population, however, with entrainment, larger adult sturgeon can leave the lake but cannot return.

• Operation nexus to resource and how informs license: Having current fish survey information will help department staff make informed management decisions regarding the fishery.

• Methodology:

Seasonal catch per unit effort (CPUE) surveys in the spring, summer, and fall to quantify fish population relative abundance and summary report to document the species available to recreational fishers and general fish community composition.

Early Spring Fyke Netting: Three to five fyke nets (front frame 4'x6'), set the week of ice out.

Early Spring Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 45-55 degrees

Late Spring Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 60 – 70 degrees.

Summer Fyke netting (June-early August): Three to five fyke nets (front frame 4'x6'), set when water temps are approaching 70 degrees.

Fall Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 55-65 degrees

• Level of Effort and Costs: Estimated $125 per hour, plus equipment costs.

Early Spring Fyke Netting: Nets would be checked for 3 - 5 days, approximately 2 - 4 hours a day to set, check, move and workup the fish.

Early Spring Electroshocking: Approximately 1-2 nights of electrofishing (depending on 2 or 4 boats), approximately 6 hours per boat/night, 8 2-mile stations.

Late Spring Electroshocking: Approximately 2-4 nights of electrofishing (depending on 1 or 2 boats), approximately 4 hours per night

Summer Fyke Netting: Approximately 2 to 4 hours a day to set, check, move and workup the fish. The nets would be deployed for 3 to 4 net nights , usually set on a Monday, checked daily and removed Thursday or Friday of that same week.

Fall Electroshocking: Approximately 2-4 nights of electrofishing (depending on 1 or 2 boats), approximately 4 hours per night, 4 stations

ASSESSMENT OF FISH ENTRAINMENT AND FISH MOVEMENT

• Goals & Objectives: The department has concerns on Lake Sturgeon entrainment at Trego dam. Assess fish entrainment at the Trego Project and Hayward Project and better understand fish movement from above to below the dams. The department has concerns with Lake Sturgeion entra

• Relevant DNR Management Goals: Understand the existing environment. The department manages public water for recreational use, such as fishing, protection and management of species, and the overall health of the fishery of the state.

• Existing Information:

Trego: The department has documented at least seven lake sturgeon that have entrained the dam (from Trego Lake to Namekagon River below) and survived to be recaptured below Trego Dam. There are likely many more sturgeon and other fish species that are entraining below Trego Dam and surviving. The department suspects that muskellunge are also doing this but haven't been able to document that through our fish surveys.

This dam is a major block to fish passage and migration for the Namekagon River, the most notable species that is impacted are lake sturgeon. Lake Sturgeon are currently stocked by the department in the Namekagon River (above Trego Lake) and Trego Lake in hopes of re-establishing this population. However, with entrainment, larger adult sturgeon can leave the lake but cannot return.

Trego Project has 1.5" spacing for both trash racks (one for each turbine), with a 1.2 feet/second intake velocity at maximum flow.

Hayward: Department fisheries biologists are interested in the fishery below the Hayward dam, and some of the most popular fish species are species coming from Hayward Lake upstream.

Hayward Project has 1.5" trash rack spacing with a 1.5 feet/second intake velocity at full gate.

• Operation nexus to resource and how informs license: Having current fish movement information (e.g. when fish are passing the dam, how many fish are passing the dam) and survival information will help department staff make informed management decisions regarding the fishery.

• Methodology: Model a tagging study after existing research to look at entrainment of sturgeon, muskie, and walleye. This research could use radio tagging or hydroacoustic telemetry.

• Level of Effort and Costs: Fieldwork and data reporting at $125 per hour, plus equipment costs

MACROINVERTEBRATE SURVEY

• Goals & Objectives: Assess the water quality using macroinvertebrate bio-indicators downstream of the impoundment.

• Relevant DNR Management Goals: The department is charged with managing the water quality of the waters of the state and meeting designated criteria under the Clean Water Act.

• Existing Information: Macroinvertebrate data is not available for the Hayward and Trego Projects.

• Operation nexus to resource and how informs license: Macroinvertebrates are likely impacted by segmentation of the river, and impoundments can impact communities due to changing thermal and/or flow regimes. These bio-indicators are used to assess the health of the resource.

• Methodology: Collect a wadable macroinvertebrate sample, if possible, downstream of the flowage using the department's Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2017). If the stream is not wadeable, a large river macroinvertebrate sample should be collected. Data should be analyzed using the current department WISCALM Guidance. Wisconsin DNR Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2017) and Large River Macroinvertebrate Sampling (2015), as appropriate. Data should be analyzed using the current department WISCALM Guidance. Macroinvertebrates should be collected upstream of the reservoir in the riverine reach, in the bypass channel and downstream of the powerhouse in the fully mixed zone.

Large River Macroinvertebrate Sampling (2015)
https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=120273145

Wadable Streams Macroinvertebrate Sampling (2017)
http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=150708168

• Level of Effort and Costs: One day of field work with an estimated 20 hours of field and data analysis at $125 per hour equals $2,500. Lab analysis at state certified lab estimated to cost $1,000. Mobilization, travel, and equipment is estimated at $2,000.

AQUATIC AND TERRESTRIAL INVASIVE SPECIES SURVEY

• Goals & Objectives: Evaluate the presence/absence of invasive species listed in NR40, including habitat preferences, within the Project area.

• Relevant DNR Management Goal: Minimize the transport and establishment of existing invasive species and establish management practices to reduce new invasive species. Compliance with NR40.

• Existing Information: Chinese mystery snail, curly-leaf pondweed, Eurasian water milfoil, and hybrid Eurasian/northern water milfoil have been observed at the Hayward Project. Zebra mussel eDNA, qPCR analysis was conducted in 2019; results were negative. Chinese mystery snails, curly-leaf pondweed, Eurasian water milfoil, and Japanese mystery snails have been observed at the Trego Project. Early Detection Monitoring was conducted at the Trego Project in 2017. Purple loosestrife is monitored annually and is observed at Hayward Project. Purple loosestrife is not monitored in the current license for Trego Project.

• Operation nexus to resource and how informs license: The Project may influence invasive species that have the potential to directly or indirectly cause economic or environmental harm or harm to human health, including harm to native species, biodiversity, natural scenic beauty and natural ecosystem structure, function or sustainability; harm to the long−term genetic integrity of native species; harm to recreational, commercial, industrial and other uses of natural resources in the state; and harm to the safety or wellbeing of humans, including vulnerable or sensitive individuals. – per NR40.

• Methodology: Use department Early Detection Early Response Protocols. Additional methodology may be needed for terrestrial species, and other methodologies such as point-intercept may be appropriate if combing this study with other studies.

• Level of Effort and Costs: 40 hours of field work and reporting at $125 per hour equals $5,000. Mobilization, equipment, and supplies are estimated at $10,000.

AQUATIC PLANT SURVEY

• Goals & Objectives: The goal of the aquatic plant study is to provide baseline data on the condition of the aquatic plant community in the Project.

• Relevant DNR Management Goals: The proposed aquatic plant study will provide baseline aquatic plant information to determine if management practices would be needed to enhance the existing aquatic plant community, and overall health of the Project reservoir as a bio indicator. Water levels can influence aquatic vegetation.

• Existing Information: In-water plant community data is limited within the Project boundary.

• Operation nexus to resource and how informs license: The study results will provide baseline aquatic plant data. The data informs the Department of the effects on the surface water resource and would be used to formulate management options. Plant density and diversity of aquatic and native species are important for establishing varies management plans and protecting the resource.

• Methodology: The information collected from this study includes an assessment of the density and diversity of macrophytes, which includes frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization. The aquatic invasive species study should be conducted according to the department's Recommended Baseline Monitoring of Aquatic Plants in Wisconsin.

• Level of Effort and Costs: 40 hours of fieldwork and 40 hours of reporting at $125 per hour, plus equipment costs.

MUSSEL STUDY

• Goals & Objectives: Determine the effects of barriers to mussel distribution and diversity within the Project area and Namekagon River. Determine freshwater mussel density and diversity, including characterizing mussel habitat within the Project area. The study would provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Project area.

• Relevant DNR Management Goals: This information will help the resource agencies determine if any best management practices are needed to protect listed species, as well as any management measures to protect or enhancement the existing freshwater mussel population.

• Existing Information: No federally or state threatened/endangered or special concern mussel species are known to occur in the impounded sections of the reservoirs, however listed species may occur downstream from the dams or further upstream from the impounded reaches of the reservoirs.

• Operation nexus to resource and how informs license: The operations of the Project could influence the freshwater mussel species located within the Project boundary. The results of the survey will provide essential information to determine if any protection measures, restoration, or enhancements would be necessary as a management requirement associated with the relicensing of the dam.

• Methodology: A qualitative and quantitative survey for freshwater mussels should be conducted within the Project area and downstream of the dam structure, on the Namekagon River. Some methods that can be used are the department's Guidelines for Sampling Freshwater Mussels in Wadable Streams and the department's Quantitative Habitat Assessment Methodology. Methodology should be discussed with the department for quantitative surveys. A Mussel Survey Plan should be submitted to the department for review at least 2 weeks (1 month preferred) prior to implementation.

Mussel sampling should be conducted when water temperatures exceed 50°F to minimize thermal stress to the resource. This period will allow mussels disturbed during sampling to re-establish themselves into the substrate.

Qualitative timed searches should first be conducted to assess habitat suitability and presence of freshwater mussels. Sites will be located below each barrier within the study area, plus one site upstream of the Project area. Starting locations should be representative of available habitat within the sampling reach. As a minimum, timed searches will be 4 per/hrs or a total search distance of 200 m in riverine sections of the project area and up to 8 per/hrs within reservoirs.

Based on results of qualitative surveys, quantitative surveys may be required. Quantitative sampling using quadrat samples will be used to determine population density, community composition, age and total length distributions, living/dead and sex ratios. One quantitative site will be located on the Project area where mussel habitat is determined suitable and where past sampling has occurred. The sampling unit will consist of a 30m transect with 10 equally spaced 1/4m2 quadrats every three meters along the unit. Each transect extends perpendicular from shore. Up to 300 1/4 m2 quadrats are sampled, collecting all living bivalves and empty shells. Mussels are brought to the surface in a 3 mm mesh-sized bag where they are identified to species, aged, and shell measurements recorded. All live mussels are then returned along the same transect they were collected.

• Level of Effort and Cost: An estimate of 80 hours of field work and 40 hours to analyze data and draft a report at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF RARE AND ENDANGERED SPECIES

• Goals & Objectives: Rare plants and animals have been found within, adjacent to, and in habitats similar to the study area. It would be recommended to complete plant and animal surveys for these species to determine if they occur within the study area and to further our understanding of their populations within this area. This will also inform the licensee as to where these plant and animal locations are.

• Relevant DNR Management Goals: The department has responsibility to manage plants and animals, including listed species. This information will be beneficial to understanding the current environment, and potential needs for resource management associated with the Project. The licensee is also required to follow state Endangered Species laws.

• Existing Information: An Endangered Resources Review has been performed for current Hayward and Trego Project boundaries, but will need to be updated with proposed project boundary changes that are presented within the PAD.

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on vegetation and animals-- in particular, wood turtles and their habitat. Proper management of the resource will help to minimize any adverse impacts associated with the removal, restoration, and relicensing activities.

• Methodology: Using a qualified botanist knowledgeable in area vegetation and specific species, identify, classify, and delineate on a map rare, threatened, or endangered plant species within the Project area. Using a qualified biologist or ecologist, conduct presence/absence surveys for specific rare, threatened, or endangered animal species.

• Level of Effort and Cost: 40 hours of desktop review and 40 hours of fieldwork, plus equipment costs.

WOOD TURTLE SURVEYS

• Goals & Objectives: Wood turtles are listed as Threatened in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys, population modelling and natural nest site surveys are three examples of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The main goal of this study request is to determine whether any wood turtle nest sites occur within the Project boundary at either Hayward or Trego.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the wood turtle. This study will be beneficial to understanding the current environment and potential needs for resource management associated within both Project boundaries. Two of the main threats to wood turtles across their range are: 1. Adult mortality due to vehicle collisions 2. Predation of eggs and hatchlings at nest sites, resulting in poor recruitment in many river systems. Wood turtles are particularly susceptible to nest predation due to their tendency to nest colonially and nest in the same location every year, providing a pattern that is recognizable by nest predators, such as raccoon and fox. In an effort to improve recruitment, the department has employed several strategies to protect existing nest sites and create protected artificial nest sites. If any

natural nest sites are found within the Project boundaries at Hayward or Trego, the department will work with the licensee to protect these nest sites from predation as well as from negative human-related impacts.

• Existing Information: Wood turtles are known to be present near this Project boundary, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of these Projects has the potential to have short term and long-term impacts on wood turtles and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to wood turtles are related to seasonal water level fluctuations during vulnerable life history stages, both upstream and downstream. If nest sites are present downstream of the dam, increasing downstream water levels during the period following egg laying in June until hatchling emergence in August/September could cause nest failure if nests become submerged for extended periods of time. Depending on timing, winter drawdowns could have impacts on wood turtles upstream of the dam if the water level is lowered to a point where overwintering turtles are exposed to the elements due to low water levels where they are hibernating.

• Methodology: Using a qualified biologist or ecologist, wood turtle nesting site surveys are requested, following the protocol listed below.

Wood turtle nesting site surveys: Beginning in early to mid-June, and extending until approximately the first week in July, wood turtle nesting activity can be surveyed by conducting daily searches for adult wood turtles and/or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring/summer and is within approximately 200 feet of the river's edge. Note that this can include gravel parking areas, roads or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to a lack of suitable conditions for turtle nesting.

• Level of Effort and Costs: 40-60 hours at $125 per hour, plus equipment costs.

1. Wood turtle nesting site surveys: Assess nest site suitability within the project boundary, focusing on free-flowing river stretches. Desktop review followed by ground truthing.
2. Wood turtle nesting site surveys, Spring/Summer: Daily surveys of suitable nesting sites (if any are found) for four weeks (Assume 1 hour per survey).

BLANDING'S TURTLE SURVEYS AT HAYWARD PROJECT

• Goals & Objectives: Blanding's turtles are a Special Concern species in Wisconsin. In an effort to better understand the abundance and distribution of this species, we are requesting that Blanding's turtle surveys are conducted within the Hayward and Trego project boundaries. The overall goal of this survey request is to determine whether any Blanding's turtle nest sites occur within the Project boundaries.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the Blanding's turtle. This study will be beneficial to understanding the current environment and potential needs for resource management associated within the Project boundary. Two of the main threats to Blanding's turtles across their range are: 1. Adult mortality due to vehicle collisions 2. Predation of eggs and hatchlings at nest sites, resulting in poor recruitment in many systems. If any natural nest sites are found within the current or proposed Project boundary, the department will work with the licensee to protect these nest sites from predation as well as from negative human-related impacts.

• Existing Information: Blanding's turtles are known to be present near these Project boundaries, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of these Projects has the potential to have short term and long-term impacts on Blanding's turtles and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to Blanding's turtles are related to seasonal water level fluctuations during vulnerable life history stages. If nest sites are present downstream of the dam, increasing downstream water levels during the period following egg laying in June until hatchling emergence in August/September could cause nest failure if nests become submerged for extended periods of time. Depending on timing, winter drawdowns could have impacts on Blanding's turtles upstream of the dam if the water level is lowered to a point where overwintering turtles are exposed to the elements due to low water levels where they are hibernating.

• Methodology: Using a qualified biologist or ecologist, Blanding's turtle nesting site surveys are requested, following the protocol listed below.

1. Blanding's turtle nesting site surveys: Beginning in early to mid-June, and extending until approximately the first week in July, Blanding's turtle nesting activity can be surveyed by conducting daily searches for adult Blanding's turtles and/or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring/summer and is within approximately 200 feet of the water's edge. Note that this can include gravel parking areas, roads or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to a lack of suitable conditions for turtle nesting.

• Level of Effort and Costs: 40-60 hours at $125 per hour, plus equipment costs.

1. Blanding's turtle nesting site surveys: Assess nest site suitability within the project boundary. Desktop review followed by ground truthing.
2. Blanding's turtle nesting site surveys, Spring/Summer: Daily surveys of suitable nesting sites (if any are found) for four weeks (Assume 1 hour per survey).

MINK FROG SURVEYS AT HAYWARD PROJECT

• Goals & Objectives: Mink Frogs are listed as a species of Special Concern in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys are an example of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The overall goal of this survey request is to further our knowledge of the distribution of Mink Frogs within the watershed more broadly. The main objectives of this study request are to determine if Mink Frogs are present within the Project boundary of the dam.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the Mink Frog. This survey study will be beneficial to understanding the current environment and potential needs for resource management associated within the Project boundary.

• Existing Information: Mink Frogs are known to be present within this Project boundary, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on Mink Frogs and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to Mink Frogs are related to seasonal water level fluctuations during vulnerable life history stages, both upstream and downstream.

• Methodology: Using a qualified biologist or ecologist, conduct calling (presence/absence) surveys for Mink Frogs.

1. Calling or presence/absence surveys for Mink Frogs: Follow the Mink Frog Survey Protocols where suitable habitat is present: https://wiatri.net/inventory/frogtoadsurvey/Volunteer/Mink/MinkFrogSurveyProtocols.pdf.

• Level of Effort and Costs: 20 hours at $125 per hour, plus equipment costs.

1. Presence/absence surveys for Mink Frogs, June 6 – July 15, 2021: Two surveys per week for four weeks (assume 2 hours per survey). These surveys should focus on free-flowing river stretches where adjacent bog habitat is present.

ASSESSMENT OF RIVERINE AND RESERVOIR HABITAT

• Goals & Objectives: Define, measure, and assess the stream habitat conditions upstream and downstream of the hydropower facilities at current and proposed elevations. Define, measure, and assess the reservoir habitat, including upstream and downstream of the reservoir at current and proposed elevations. Determine if degradation is occurring and if resources are affected.

• Relevant DNR Management Goals: Obtaining recent habitat assessment information is critical for future management actions and establishing baseline data. Water level fluctuations due to drawdowns may affect aquatic habitat; impacts of drawdowns on the resource should be assessed. Obtaining information on how/if new water levels will cause shoreline erosion as a new ordinary high water mark is established

• Existing Information: The PAD states that "the Lake Hayward shoreline was surveyed for archaeological evidence in 1998 and 2003. The surveys concluded the reservoir shoreline was very stable and well vegetated with little or no erosion." The PAD states that "the Trego Lake shoreline was surveyed for archaeological evidence in 1998 and 2003. The surveys concluded the reservoir shoreline was very stable and well vegetated with little or no erosion." The PAD stats that "riparian habitat is heavily developed on Hayward Lake and moderately developed on Trego Lake."

• Operation nexus to resource and how informs license: Having updated habitat assessment information is critical for evaluating the effects of the project on the reservoir and downstream ecosystem. It will provide baseline data to current conditions and assist with management recommendations of any current or future needs. The data can be used to help guide water resource management associated with the Project.

• Methodology: The riverine habitat within the project area downstream from the dam should be evaluated with the department Quantitative Habitat Assessment methodology in the wadable stretches of the Project at the time of each fish survey, as well as in the wadeable stretches of the Namekagon River at various flows or estimates. For the reservoir, department shoreland habitat protocol should be used. Newly impounded areas and any wetlands that could be affected by the new water level should be mapped. Please work with the department do determine which protocol should be used for different locations.

• Level of Effort and Costs: 80 hours of field work and 40 hours of data analysis and reporting at $125 per hour, plus equipment costs.

ASSESSMENT OF RECREATION

• Goals & Objectives: Evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing, with consideration for the different seasonal uses.

• Relevant DNR Management Goals: The Department supports a wide array of recreational use. We support the need for recreational use surveys that consider a broad array of users. A quantitative recreational use survey completed within the Project boundary will evaluate potential changes associated with any modifications to water levels and operations. Information needs to be gathered in order to understand the current use, and potential future uses.

• Existing Information:

Hayward Project: Hayward Lake is an ASNRI Outstanding and Exceptional Stream designation. Below the dam is a PNW Musky water. The ASNRI designation also points to the Wild and Scenic River status for the Namekagon River, that is protected by federal law. Hayward Lake has a boat ramp 0.3 miles upstream from the dam, just east of the Highway 27 crossing. Hayward Lake also has a recreational fishing pier approximately ½ mile upstream from the dam.

Trego: Trego Lake, on the Namekagon River has designated ASRNI status as an Outstanding and Exceptional area. It also has Wild Rice present and retains the designation for that reason as well. Tribal consultation will be necessary to determine any changes to this waterbody and how it might impact wild rice.

Just downstream from the Trego dam is a canoe landing popular with non-motorized watercraft that use the riverway. This area being national scenic riverway, this reach is managed for paddlers and camping where several primitive water-only access campsites are available. Trego Lake has two boat ramps for motorized boats, and a canoe/kayak launch on the east side of Trego. This area is extremely popular with non-motorized boats and tubes, with a large rental business on the east side of Trego.

• Operation nexus to resource and how informs license: Hydro operations, management of impoundments, water level changes, and sufficient public access can have a significant impact on recreational value. Adequate information is necessary to determine what impacts may be occurring from the hydro operations, and what recreational opportunities may be enhanced.

• Methodology: Desktop assessment, including review of the State of Wisconsin 2019 to 2023 Statewide Comprehensive Outdoor Recreation Plan (SCORP), released in March 2019, public surveys, and existing recreational sites. This includes assessment of current uses, level of use, evaluation for additional recreational features.

• Level of Effort and Cost: 40 hours of desktop review and fieldwork at $125 per hour, plus equipment costs.

ASSESSMENT OF PROPOSED PROJECT BOUNDARY

• Goals & Objectives: Quantitative assessment of acres of wildlife habitat and surface water that would be modified with a proposed change in Project boundary. This includes impacts to public access and recreational activities.

• Relevant DNR Management Goals: Protection of natural resources and providing public recreational opportunities are part of the Department's mission.

• Existing Information: The PAD states for the Hayward Project that "the Licensee is proposing to increase the acreage within the Project boundary an additional 2.8 acres. The increase includes a portion of the reservoir currently occupied by the Project, but not currently included in the Project boundary." The PAD states for the Trego Project that "The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary. This results in an overall decrease of acreage within the Project boundary of 29.1 (submerged) acres."

• Operation nexus to resource and how informs license: The riparian areas are critical in protecting water quality and fish and wildlife habitat in the Namekagon system. Recreation and public access, along with natural resource protection are all part of the Public Trust Doctrine in Wisconsin.

• Methodology: Desktop evaluation of wetland and riparian habitat. Identify changes in acreage in wetland and habitat, as well as changes in acreage and use in reactional features. Additionally, identify if any of the areas proposed to be exclude from the Project boundary provide habitat for listed species.

• Level of Effort and Cost: 40 hours of desktop review at $125 per hour.

Hayward and Trego Hydroelectric Projects

Site Visit

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

May 27, 2021

FERC Docket Nos. 2417-065 and 2711-024

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Proof of Publication - Notification of Scheduled Site Visit**
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

On November 20, 2020, Northern States Power Company – Wisconsin (NSPW), d/b/a Xcel Energy, filed with the Federal Energy Regulatory Commission (FERC or Commission) a Notice of Intent (NOI), Pre-Application Document (PAD), and Request to Use the Traditional Licensing Process (TLP) for the relicensing of the Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711). The Commission, by letter dated January 21, 2021, granted NSPW's request to use the TLP for both Projects.

In accordance with the first stage of consultation requirements of the TLP, NSPW held a Joint Agency Meeting on March 11, 2021. Due to COVID-19 health related concerns, the meeting was held via conference call. No site visit to either Project was conducted at that time in order to abide by Centers for Disease Control and Corporate guidelines to avoid public gatherings and discretionary travel.

NSPW has scheduled a site visit to the Hayward and Trego Projects, in conjunction with a site visit to the White River Hydroelectric Project (FERC Project No. 2444), on Thursday, June 17, 2021. The site visit will begin at 9:00 a.m. at the White River Project located at 46720 State Hwy 112, Ashland, WI 54806. The group will then proceed to the Hayward Project for a site visit, followed by lunch on your own, and finish the day with a site visit to the Trego Project.

NSPW requests those interested in participating in the June 17, 2021 Site Visit RSVP by Monday, June 14, 2021 to Mr. Matt Miller at (715) 737-1353 or matthew.j.miller@xcelenergy.com.

The Site Visit agenda includes the following:

- Welcome and Introductions at the White River Project
- Tour of the White River Project Facilities
- Tour of the Hayward Project Facilities

- Lunch on your own in the Hayward area
- Tour of the Trego Project Facilities

NSPW will publish a notice in the Sawyer County Record and Spooner Advocate, newspapers of general circulation in Sawyer and Washburn Counties, respectively, announcing the June 17, 2021 site visit. Copies of both public notices, and the corresponding Affidavits of Publication, will be submitted to the Commission once they are received.

NSPW is distributing this correspondence to the stakeholder list provided in the NOI/PAD (updated based on return mail or by request) via US Mail.

Thank you for your time and consideration in this matter. Should you have any questions, please contact Matthew Miller at (715) 737-1353 or matthew.j.miller@xcelenergy.com.

Respectfully Submitted,

James M Zyduck Digitally signed by James M Zyduck
Date: 2021.05.27 17:25:53 -05'00'

James M. Zyduck
Director, Hydro Plants

Enclosure: Certificate of Service
Stakeholder List

cc: Stakeholder List
Shawn Puzen – Mead & Hunt, Inc. (via email)
Project Files

Certificate of Service

I hereby certify that I, on behalf of Xcel Energy, have this day served (via first class mail) the foregoing documents upon each person designated on the attached Master Address Distribution List.

Dated this 27th day of May 2021.

Darrin Johnson

Darrin Johnson
MEAD & HUNT, Inc.

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

Hayward and Trego Hydroelectric Project Licensing Stakeholder List
FERC Project Nos. 2417 and 2711

Indian Tribes

Edith Leoso, THPO
Bad River Band of the Lake Superior
Tribe of the Chippewa
P.O. Box 39
Odanah, WI 54861-0039

Mike Wiggins, Chairman
Bad River Band of the Lake Superior Tribe of
the Chippewa
P.O. Box 39
Odanah, WI 54861

Brian Newland, Chairman
Bay Mills Indian Community of Michigan
12140 W Lakeshore Drive
Brimley, MI 49715-9319

Kevin R. Dupuis, Sr., Chairman
Fond Du Lac Band of Lake Superior Chippewa
1720 Big Lake Road
Cloquet, MN 55720

Jill Hoppe, THPO
Fond Du Lac Band of Lake Superior Chippewa
1720 Big Lake Road
Cloquet, MN 55720

Ned Daniels Jr., Chairman
Forest County Potawatomi Community of WI
3051 Sand Lake Road
Crandon, WI 54520-9801

Michael LaRonge, THPO
Forest County Potawatomi Community of WI
5320 Wensaut Lane, P.O. Box 340
Crandon, WI 54520

Andrew Werk Jr., President
Fort Belknap Indian Community
RR 1, Box 66
Harlem, MT 59526

Michael J Blackwolf, THPO
Fort Belknap Indian Community
656 Agency Main Street
Harlem, MT 59526

Robert Deschampe, Chair
Grand Portage Band of Chippewa Indians
P.O. Box 428
Grand Portage, MN 55605

Mary Ann Gagnon, THPO
Grand Portage Band of Chippewa Indians
P.O Box 428
Grand Portage, MN 55605

Marlin WhiteEagle, President
Ho Chunk Nation of WI
PO Box 667
Black River Falls, WI 54615-0667

William Quackenbush, THPO
Ho Chunk Nation of WI
P.O. Box 667
Black River Falls, WI 54615-0667

Alden Connor, THPO
Keweenaw Bay Indian Community of Michigan
16429 Bear Town Road
Baraga, MI 49908

Warren C Swartz, Sr., President
Keweenaw Bay Indian Community of Michigan
107 Bear Town Road
Baraga, MI 49908

Louis Taylor, Sr., Chairman
Lac Courte Oreilles Band of Chippewa Indians
13394 W Trepania Road, Bldg. NO1
Hayward, WI 53843-2186

Indian Tribes (continued)

Brian Bisonette, THPO
Lac Courte Oreilles Band of Chippewa Indians
13394 W Trepania Road, Bldg. NO1
Hayward, WI 54843

John Johnson
Lac Du Flambeau Band of Lake Superior
Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538-0067

Melinda Young, THPO
Lac Du Flambeau Band of Lake Superior
Chippewa Indians
P.O. Box 67
Lac Du Flambeau, WI 54538

Daisy McGeshick, THPO
Lac Vieux Desert Band of Lake Superior
Chippewa Indians
P.O. Box 249
Watersmeet, MI 49969

James Williams, Jr., Chairman
Lac Vieux Desert Band of Lake Superior
Chippewa Indians
P.O. Box 249
Watersmeet, MI 49969

Amy Burnette, THPO
Leech Lake Band of Ojibwe
190 Sailstar Drive NE
Cass Lake, MN 56633

Faron Jackson, Sr., Chairman
Leech Lake Band of Ojibwe
190 Sailstar Dr NE
Cass Lake, MN 56633

Joan Delabreau, Chairman
Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135

David Grignon, THPO
Menominee Indian Tribe of Wisconsin
W3426 Cty. VV W, P.O. Box 910
Keshena, WI 54135-0910

Diane Hunter, THPO
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Douglas G. Lankford, Chief
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Melanie Benjamin, Chief Executive
Mille Lacs Band of Ojibwe
43408 Oodena Drive
Onamia, MN 56359

Natalie Weyaus, THPO
Mille Lacs Band of Ojibwe
43408 Oodena Drive
Onamia, MN 56359

Gary Frazer, Executive Director
Minnesota Chippewa Tribe
P.O. Box 217
Cass Lake, MN 56633

Stacie Cutbank, THPO
Oneida Tribe of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Tehassi Hill, Chairperson
Oneida Tribe of Wisconsin
P.O. Box 365
Oneida, WI 54155-0365

Chad Able, Treaty Natural Resource
Red Cliff Band of Lake Superior
Chippewa Indians
88385 Pike Road, Hwy. 13
Bayfield, WI 54814

Marvin Defoe, THPO
Red Cliff Band of Lake Superior
Chippewa Indians
88385 Pike Road, Hwy. 13
Bayfield, WI 54814

Rick Peterson, Chairman
Red Cliff Band of Lake Superior Chippewa
Indians
88385 Pike Road, Hwy. 13
Bayfield, WI 54814

Chris McGeshick, Chairman
Sokaogon Chippewa Community
Mole Lake Band
3051 Sand Lake Road
Crandon, WI 54520-9801

Indian Tribes (continued)
Adam Van Zile, THPO
Sokaogon Chippewa Community
Mole Lake Band
3051 Sand Lake Road
Crandon, WI 54520-9801

Lewis Taylor, President
St. Croix Band of Lake Superior Chippewa
24663 Angeline Avenue
Webster, WI 54893-9246

Wanda McFaggen, THPO
St. Croix Band of Lake Superior Chippewa
24663 Angeline Avenue
Webster, WI 54893

Shannon Holsey, President
Stockbridge Munsee Tribe of Mohican Indians
N8476 Mo He Con Nuck Road
Bowler, WI 54416

Sherry White, THPO
Stockbridge Munsee Tribe of Mohican Indians
P.O. Box 70
Bowler, WI 54416-0070

Nathan Allison, THPO
Stockbridge Munsee Community
Tribal Preservation Extension Office
86 Spring Street, Williamstown, MA 01267

Jamie Arsenault, THPO
White Earth Band of the Minnesota Chippewa Tribe
P.O. Box 418
White Earth, MN 56591

Michael Fairbanks, Chairman
White Earth Band of the Minnesota Chippewa Tribe
P.O. Box 418
White Earth, MN 56591

Federal
Kimberly Bose, Secretary
FERC Office of General Counsel
888 First Street NE
Washington, DC 20426

Tammie Poitra, Regional Director
U.S. Bureau of Indian Affairs
Midwest Regional Office
5600 American Boulevard W, Suite 500
Bloomington, MN 55437-1458

Nannette Bischoff, FERC Coordinator
St. Paul District
U.S. Department of the Army
Corps of Engineers
180 5th Street E, Suite 700
St. Paul, MN 55101-1638

Mary Manydeeds, Environmental Specialist
U.S. Department of the Interior
Bureau of Indian Affairs
Norman Pointe II Building
5600 American Boulevard W, Suite 500
Bloomington, MN 55437-1458

Michael C. Connor
U.S. Department of the Interior
Comm. U.S. Bureau Reclamation
1849 C Street NW
Washington, DC 20240-0001

Nick Utrup, Fisheries Biologist
U.S. Department of the Interior
Fish & Wildlife Service
4101 American Boulevard E
Bloomington, MN 55425-1665

Glen Grothman, U.S. Representative
U.S. Representative from Wisconsin District 6
Washington, DC 20515

Field Supervisor
U.S. Department of the Interior
Fish & Wildlife Service
Green Bay Field Office
2661 Scott Tower Drive
New Franken, WI 54229-9565

Christine Gabriel, Regional Environmental Coordinator
U.S. Department of the Interior
National Park Service
601 Riverfront Drive
Omaha, NE 68102-4226

Julie Galonska, St. Croix National Scenic Riverway
U.S. Department of the Interior
National Park Service
401 N Hamilton Street
St. Croix Falls, WI 54024

Angie Tornes, Midwest Hydropower Coordinator
U.S. Department of the Interior
National Park Service
626 E Wisconsin Avenue, Suite 100
Milwaukee, WI 53202

Federal (continued)
Lisa Yager, St. Croix National Scenic Riverway
U.S. Department of the Interior
National Park Service
401 N Hamilton Street
St. Croix Falls, WI 54024

Jen Tyler
Mail Code: E-19J
U.S. Environmental Protection Agency
NEPA Implementation Section, Region V
77 W Jackson Boulevard, AR-18J
Chicago, IL 60604-3507

Tom Tiffany, U.S. Representative
U.S. Representative from Wisconsin District 7
1714 Longworth House Office Building
Washington, DC 20515

State
Public Service Commission of Wisconsin
P.O. Box 7894
Madison, WI 53707-7854

Wisconsin Cooperative Fishery Research Unit
U.W. Stevens Point
Stevens Point, WI 54481

Kathleen Angel, Wisconsin Coastal
Management Program
Wisconsin Department of Administration
101 E Wilson Street, 10th Floor
Madison, WI 53703

Connie Antonuk, WDNR
107 Sutcliff Avenue
Rhinelander, WI 54501

Macaulay Haller, WDNR
101 S Webster Street
Madison, WI 53707

Cheryl Laatsch, FERC Coordinator
Wisconsin Department of Natural Resources
502 E Mill Street
Beaver Dam, WI 53916

Jeffrey Schierer, Watershed Management
Wisconsin Department of Natural Resources
875 S Fourth Ave
Park Falls, WI 54552

Wisconsin Office of the Governor
P.O. Box 7863
Madison, WI 53702-0001

Tyler Howe, Preservation Office
Wisconsin State Historical Society
816 State Street
Madison, WI 53706

Local
Dale Peters, City Manager
City of Eau Claire
203 S Farwell Street, P.O. Box 5148
Eau Claire, WI 54702-5148

Lisa Poppe Clerk/Treasurer
City of Hayward
P.O. Box 99
Hayward, WI 54843

City Manager
City of La Crosse
601 Main Street W
Lacrosse, WI 54601

Marathon County
500 Forest Street
Wausau, WI 54403-5554

Ronald Pete, Town Chairman
Town of Superior
4917 South State Road 35
Superior, WI 54880

Thomas Hoff, County Administrator
Sawyer County
10610 Main Street, Suite 23
Hayward, WI 54843

Town Chairman
Town of Hayward
15460W State Rd 77E
Hayward, WI 54843

Wes Huffer, Town Chairman
Town of Trego
N8521 Hwy 53
Trego, WI 54888

William Allard, Town Supervisor
Town of Trego
W5690 Trego River Street
Trego, WI 54888

Brian Vosberg, Town Supervisor
Town of Trego
N7523 Lakeside Road
Trego Wi 54888

Local (continued)
Barb Hinkfuss, Town Clerk
Town of Trego
W6097 River Road
Trego, WI 54888

Lolita Olson, County Clerk
Washburn County
10 4th Avenue, P.O. Box 639
Shell Lake, WI 54871

Other
James Fossum
River Alliance of Wisconsin
199 Janet Marie Lane
Winona, MN 55987

Thomas Frost, Board Member
Trego Lake District
N7558 Wood Drive
Trego, WI 54888

Charlie Petersen, Chairman
Trego Lake District
5504 12th Avenue S
Minneapolis, MN 55417

Northwest Regional Planning Commission
1400 S River Street
Spooner, WI 54801-8692

Mike Arrowood, Chairman
Walleye for Tomorrow
2240 Auburn Street
Fond du Lac, WI 54935

Joan Harn
3223 6000 Aniston Road
Bethesda, MD 20817

Angie Tornes
3223 S Indiana Avenue
Milwaukee, WI 53207

Utility
Scott Crotty, Xcel Energy
Sr. Operations Manager
1414 W Hamilton, P.O. Box 8
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Matt Miller, Xcel Energy
Hydro License Compliance Consultant
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Eau Claire, WI 54702-0008

James Zyduck, Xcel Energy
Director, Hydro Plants
1414 W Hamilton, P.O. Box 8
Eau Claire, WI 54702-0008

Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Monday, June 7, 2021 10:40 AM
To: Antonuk, Connie J - DNR
Cc: Laatsch, Cheryl - DNR; Yach, James A - DNR; Shawn Puzen; Darrin Johnson
Subject: RE: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Thanks Connie. We will add you the attendance list.

From: Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>
Sent: Monday, June 7, 2021 9:09 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Yach, James A - DNR <JamesA.Yach@wisconsin.gov>
Subject: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Hi Matt:

I wanted to confirm my attendance for the on-site visits of the White River, Hayward and Trego dam facilities scheduled for Thursday, June 17. I see from your letter that we are to be at the White River Dam at 0900 on Thursday, June 17 to begin the tour. From the White River, the tour will move to the Hayward dam and then Trego dam. I am looking forward to seeing these facilities and getting back out into the field. I hope the weather is nice. Thank you. Connie in Rhinelander

Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Monday, June 7, 2021 10:58 AM
To: Yach, James A - DNR; Antonuk, Connie J - DNR
Cc: Laatsch, Cheryl - DNR; Shawn Puzen; Darrin Johnson
Subject: RE: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Thanks James. We will list you as tentative.

From: Yach, James A - DNR <JamesA.Yach@wisconsin.gov>
Sent: Monday, June 7, 2021 10:53 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>; Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: RE: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Hi Matt,

I'm hopeful of being able to join at the Trego location. I'm not convinced my schedule will allow as I will be in Grantsburg earlier, but I will try to squeeze it into my schedule.

James.

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Monday, June 7, 2021 10:40 AM
To: Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Yach, James A - DNR <JamesA.Yach@wisconsin.gov>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: RE: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Thanks Connie. We will add you the attendance list.

From: Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>
Sent: Monday, June 7, 2021 9:09 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Yach, James A - DNR <JamesA.Yach@wisconsin.gov>
Subject: Thur, June 17, Xcel Hayward and Trego Site Visit Invite

Hi Matt:

I wanted to confirm my attendance for the on-site visits of the White River, Hayward and Trego dam facilities scheduled for Thursday, June 17. I see from your letter that we are to be at the White River Dam at 0900 on Thursday, June 17 to begin the tour. From the White River, the tour will move to the Hayward dam and then Trego dam. I am looking forward to seeing these facilities and getting back out into the field. I hope the weather is nice. Thank you. Connie in Rhinelander

Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Friday, June 11, 2021 1:29 PM
To: Wolter, Max H - DNR
Cc: Darrin Johnson; Shawn Puzen; Laatsch, Cheryl - DNR
Subject: RE: Response Requested for Site Visits: White River, Hayward, and Trego Hydros

Hello Max,

Feel free to call my cell phone 715-225-8841. It might be helpful if I have your number as well as I can call you when we leave White River.

Matthew Miller
Xcel Energy
Hydro License Compliance Consultant
1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702
P: 715.737-1353 **F**: 715.737.1077
E: matthew.j.miller@xcelenergy.com

XCELENERGY.COM

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Friday, June 11, 2021 10:33 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: FW: Response Requested for Site Visits: White River, Hayward, and Trego Hydros

See below. Can you provide a cell phone or info on how Max can plan to meet up with the group?

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>
Sent: Friday, June 11, 2021 10:13 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>

Cc: Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Subject: RE: Response Requested for Site Visits: White River, Hayward, and Trego Hydros

I will attend for Fisheries for the Hayward and Trego sites. I will probably just meet up with the group in Hayward. If you are able to get an approx. time and meet up location for that leg it would be helpful. Thank you!

Max H. Wolter
Fisheries Biologist
Hayward Service Center
Bureau of Fisheries Management
Wisconsin Department of Natural Resources
(☎) phone: (715) 634-7429
(☎) fax: (715) 634-9232
(✉) e-mail: Max.wolter@wisconsin.gov

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Thursday, June 10, 2021 3:29 PM
To: Rowe, Stacy A - DNR <Stacy.Rowe@wisconsin.gov>; Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>; Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Walker, Nathan K - DNR <nathan.walker@wisconsin.gov>; Spiegel, Joshua O - DNR <Joshua.Spiegel@wisconsin.gov>; Van Egeren, Scott J - DNR <Scott.VanEgeren@wisconsin.gov>; Beringer, Patrick S - DNR <Patrick.Beringer@wisconsin.gov>; Kenyon, Marc W Jr - DNR <Marc.KenyonJr@wisconsin.gov>; Kleist, Jon J - DNR <Jon.Kleist@wisconsin.gov>; Magana, Ryan J - DNR <Ryan.Magana@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>; Holsclaw, Jacob A - DNR <Jacob.Holsclaw@wisconsin.gov>; Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>; Christel, Nancy M - DNR <Nancy.Christel@wisconsin.gov>; Toshner, Pamela J - DNR <Pamela.Toshner@wisconsin.gov>; Toshner, Scott T - DNR <Scott.Toshner@wisconsin.gov>; Michels, Dan R - DNR <Dan.Michels@wisconsin.gov>; Cunningham, Joseph L - DNR <Joseph.Cunningham@wisconsin.gov>; Piszczek, Paul P - DNR <Paul.Piszczek@wisconsin.gov>; Aartila, Tom P - DNR <Tom.Aartila@wisconsin.gov>; Druffner, Jacob D - DNR <jacob.druffner@wisconsin.gov>; Brady, Ryan S - DNR <Ryan.Brady@wisconsin.gov>; Folstad, Jason P - DNR <Jason.Folstad@wisconsin.gov>; Lawson, Zachary J - DNR <Zachary.Lawson@wisconsin.gov>; Mesalk, Tyler J - DNR <tyler.mesalk@wisconsin.gov>
Cc: Yach, James A - DNR <JamesA.Yach@wisconsin.gov>; Antonuk, Connie J - DNR <Connie.Antonuk@wisconsin.gov>
Subject: Response Requested for Site Visits: White River, Hayward, and Trego Hydros

Hi everyone: Please forward to additional staff as appropriate.

Xcel has scheduled site visits for the Trego and Hayward hydro dams. If you want to attend, please check with your supervisor and be sure to follow COVID requirements for site visits, and let me and Connie know so we can provide information to Xcel. RESPOND ASAP

Date: June 17th

The site visit will begin at 9:00 a.m. at the White River Project located at 46720 State Hwy 112, Ashland, WI 54806.

The Site Visit agenda includes the following:
- Welcome and Introductions at the White River Project
- Tour of the White River Project Facilities
- Tour of the Hayward Project Facilities
- Lunch on your own in the Hayward area
- Tour of the Trego Project Facilities

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov


dnr.wi.gov


Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Sunday, June 13, 2021 10:11 PM
To: Somermeyer
Cc: Shawn Puzen; Darrin Johnson
Subject: RE: Trego dam tour RSVP

Hi Bob,

We will add you as an attendee and contact you at the number below regarding the meeting time. The White River and Hayward tours precede the Trego site visit.

From: Somermeyer <mozzib53@protonmail.com>
Sent: Saturday, June 12, 2021 5:22 PM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: Trego dam tour RSVP

My name is Bob Somermeyer and I live on Ross Rd in Trego. I would like to attend the Trego dam tour on Friday the 17th.
Regards,
Bob
608-438-7240

Sent from ProtonMail for iOS

Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Monday, June 14, 2021 8:33 AM
To: Charles Petersen
Cc: Shawn Puzen; Darrin Johnson
Subject: RE: Trego Dam Site Visit

Thanks Charlie. Feel free to call my cell phone (715-225-8841) on Thursday to confirm the meeting time as it is entirely dependent on the White River and Hayward visits that precede it.

Matthew Miller
Xcel Energy
Hydro License Compliance Consultant
1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702
P: 715.737-1353 **F**: 715.737.1077
E: matthew.j.miller@xcelenergy.com

XCELENERGY.COM

-----Original Message-----
From: Charles Petersen <cjpetersen@msn.com>
Sent: Monday, June 14, 2021 8:25 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: Trego Dam Site Visit

EXTERNAL - STOP & THINK before opening links and attachments.

Mr. Miller,

I will be attending the Trego Dam Site Visit. I will be at the dam at 1:00 p.m. and await the arrival of the group. Because of other commitments, I will not be able to attend other tours.

Thank you for allowing me to learn about the Trego Dam. I look forward to meeting you on Thursday. If you have any questions or comments, please do not hesitate to contact me.

Charlie Petersen
Trego Lake District

Charlie Petersen
cjpetersen@msn.com
612-803-8765

White River, Hayward, Trego Site Visit Participants

June 17, 2021

Name	Organization	White River	Hayward	Trego
Zach Lawson	WDNR	X		
Connie Antonuk	WDNR	X	X	X
Scott Crotty	Xcel	X	X	X
Matt Miller	Xcel	X	X	X
Shawn Puzen	Mead & Hunt	X	X	X
Jessica Strand	Bad River Tribe	X		
Nathan Kilger	Bad River Tribe	X		
Tim Hudak	Xcel	X		
Abi Fergus	Bad River Tribe	X		
John McCue	City of Hayward		X	
Max Walter	WDNR		X	X
Lee	WDNR		X	X
Julie Galonska	NPS		X	X
Lisa Yaeger	NPS		X	X
Jonathon Moore	NPS		X	X
Charlie Peters	Trego Lake District			X
Bob Somermeyer	Trego Lake District			X
Ryan Tjader	Xcel			X

Darrin Johnson

From: Shawn Puzen
Sent: Monday, June 21, 2021 3:27 PM
To: jonathan_moore@nps.gov
Cc: Darrin Johnson; Miller, Matthew J; Crotty, Scott A
Subject: Trego Documents
Attachments: Programmatic Agreement.PDF

Hi Jonathan,

It was nice to meet you last week.

Per your request, we have added you to the address list for Hayward and Trego.

In addition, attached is a copy of the Programmatic Agreement we talked about.

Lastly, the FERC contact for relicensing is Laura Washington. 202- 502-6072 laura.washington@ferc.gov.

Please do not hesitate to contact Matt, Scott or me if you have any additional questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL ENERGY REGULATORY COMMISSION,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE STATE OF WISCONSIN, STATE HISTORIC PRESERVATION OFFICER,
AND
THE STATE OF MICHIGAN, STATE HISTORIC PRESERVATION OFFICER,
FOR MANAGING HISTORIC PROPERTIES
THAT MAY BE AFFECTED BY NEW AND AMENDED LICENSES ISSUING
FOR THE CONTINUED OPERATION OF
EXISTING HYDROELECTRIC PROJECTS IN
THE STATE OF WISCONSIN
AND ADJACENT PORTIONS OF
THE STATE OF MICHIGAN

WHEREAS, the Federal Energy Regulatory Commission (hereinafter, "Commission") proposes to issue new and amended licenses, pursuant to Part I of the Federal Power Act, 16 U.S.C. Sections 791(a) through 825(r), for the continued operation of existing hydroelectric projects (hereinafter, "Projects") in the State of Wisconsin and in adjacent portions of the State of Michigan's Upper Peninsula; and,

WHEREAS, the Commission has determined that issuing new and amended licenses for Projects may affect properties included in, or eligible for inclusion in, the National Register of Historic Places (hereinafter, "Historic Properties"); and,

WHEREAS, the Commission has consulted with the Advisory Council on Historic Preservation (hereinafter, "Council"), the State of Wisconsin, State Historic Preservation Officer (hereinafter, "Wisconsin SHPO"), and the State of Michigan, State Historic Preservation Officer (hereinafter, "Michigan SHPO"), pursuant to Section 106, National Historic Preservation Act, as amended (16 U.S.C. Section 470f; hereinafter, "the Act") and the Council's regulations implementing this Section, 36 C.F.R. Part 800, concerning such Projects and their potential effects; and,

WHEREAS, the Commission, the Council, the Wisconsin SHPO, and the Michigan SHPO are the executing parties to this Programmatic Agreement (hereinafter, "Parties"); and,

WHEREAS, for the purposes of this Programmatic Agreement, the Michigan SHPO agrees to coordinate its responsibilities for review and comment through the Wisconsin SHPO, and the Wisconsin SHPO agrees to coordinate and cooperate on all decisions regarding cultural resources in the State of Michigan with the Michigan SHPO; and,

WHEREAS, the contents of the documents appended to this Programmatic Agreement are herewith incorporated entirely by reference and held to be integral to it; and,

WHEREAS, this Programmatic Agreement does not supersede Programmatic Agreements executed prior to the date of its execution;

NOW, THEREFORE, the Commission, the Council, the Wisconsin and Michigan SHPOs agree that Projects will be administered according to the following stipulations, thus satisfying the Commission's responsibilities under the Act for the individual Projects to which they apply.

S t i p u l a t i o n s

The Commission will ensure that the following measures are carried out by applicants for new or amended licenses (hereinafter, "Licensees") for Projects located entirely in the State of Wisconsin or in the States of Wisconsin and Michigan.

Licensees whose applications are tendered the Commission after the date this Programmatic Agreement is executed will comply with all parts of this Programmatic Agreement.

Licensees whose applications, as of the date this Programmatic Agreement is executed, are already tendered, may omit Part I, herein.

I. PRE-LICENSING PROCEDURE

The following steps will be completed by Licensees before tendering the Commission an application, in consultation with the Wisconsin SHPO, and in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (published in the Federal Register, Vol. 48, No. 190, pages 44716 through 44742; hereinafter, "Secretary's Standards"). [1] Moreover, these steps will be completed by or under the direct supervision of a person or persons whose qualifications at least meet the Secretary's Standards, as applicable to the relevant preservation discipline.

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[1] See Appendix One of this Programmatic Agreement.

A. Identification of Historic Buildings, Structures, and Objects: Licensees will identify historic buildings, structures, and objects associated historically, structurally, spatially, or functionally with their Projects and within their Projects' Areas of Potential Effects [2] (hereinafter, "APE"). Upon completing this identification, Licensees will submit two copies of the resulting reports, prepared in accordance with the guidelines, Architecture/History Survey Report Specifications For Compliance-Driven Surveys, [3] to the Wisconsin SHPO pursuant to 36 C.F.R. Part 800, at Section 800.4.

B. Identification of Archaeological Properties: Licensees will survey Project shoreline areas within their APEs, except that no Licensee will be required by the stipulations of this Programmatic Agreement to survey shoreline areas within another Licensee's Project boundary, to identify archaeological sites currently subject to erosion, in accordance with the Wisconsin Archaeological Survey Guidelines For Conservation Archaeology in Wisconsin; [4] prepare reports based on the results of surveys; and submit these reports, in duplicate copies, along with all appropriate documentation to the Wisconsin SHPO for review and comment. All supporting photographic documentation will be submitted as original prints.

C. Evaluation of Identified Properties: Licensees will apply the Criteria of Evaluation, 36 C.F.R. Part 60, at Section 60.4, and, as appropriate, the principles set forth in

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[2] For purposes of this Programmatic Agreement, the APE for Projects for which a new or amended license issues, as APE is defined in 36 C.F.R. Part 800, at § 800.2(c), includes all the following: (a) lands enclosed by the project boundary as delineated in the existing License, (b) attached or associated buildings and structures extending beyond the project boundary, which contribute to the National Register for Historic Places eligibility of the hydroelectric generating facility, (c) lands or properties outside the project boundary, where the project may cause changes in the character or use of Historic Properties, if any Historic Properties exist.

[3] See Appendix Two of this Programmatic Agreement.

[4] See Appendix Three of this Programmatic Agreement.

Hydroelectric Development in the United States, 1880-1940, [5] to every historic building, structure, object, and archaeological property identified in fulfillment of this Part of this Programmatic Agreement, in accordance with 36 C.F.R. Part 800, at Section 800.4.

1. For each individual property to which the Criteria of Evaluation is applied the Licensee will report its results in written form. For each individual property that the Licensee finds to be eligible for listing on the National Register of Historic Places, the Licensee will report these results on a National Park Service Form 10-900; (hereinafter, "Form").

2. Licensees will complete the Forms according to National Register Bulletin Nos. 15 and 16, and the Wisconsin Supplementary Manual, [6] and submit to the Wisconsin SHPO an original and two copies of each Form completed, with other supporting materials. Other supporting materials will include the following.

a. For archaeological properties, Licensees will include a professionally-written report detailing the results of the Phase 1 Survey, stipulated at Part I.B, herein, describing any analysis and interpretation of the data undertaken subsequent to the Phase 1 Survey.

b. Licensees will include all supporting photographic documentation, as original prints, for each of the three copies submitted to the Wisconsin SHPO, submitted as physically separate documents.

c. Licensees will include a cover letter summarizing the Licensee's determination of eligibility for each of the properties documented on the Forms.

3. Licensees may avoid this requirement for eroding archaeological properties by consulting with the Wisconsin SHPO and employing means acceptable to the Wisconsin SHPO for stabilizing such properties and preserving them in place.

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[5] This reference is to a 1991 nationwide historic context on the development of hydroelectric power generation by Dr. Duncan Hay, for the Edison Electric Institute. See Appendix Four of this Programmatic Agreement for the relevant portions of this document.

[6] See Appendix Five of this Programmatic Agreement.

4. Licensees may seek additional assistance in the evaluation of archaeological properties from National Register Bulletin Nos. 12, 36, and 38.

5. If the Wisconsin SHPO deems the documentation to be incomplete, the Wisconsin SHPO may return it to the Licensee to be revised. If the Wisconsin SHPO deems the documentation complete, the Wisconsin SHPO will apply the Criteria for Evaluation, 36 C.F.R. Part 60, at Section 60.4, in accordance with 36 C.F.R. Part 800, at Section 800.4; sign the completed Form formalizing the determination of eligibility; retain the original Form; and return two signed copies to the Licensee.

6. The Licensee will file a copy of the completed Form bearing the Wisconsin SHPO's signature with the Commission, for information, with all supporting materials.

II. POST LICENSING PROCEDURE

In fulfilling the requirements of this Part of this Programmatic Agreement, Licensees, in consultation with the Wisconsin SHPO, will address all issues regarding Historic Properties that were not resolved prior to a license's issue, and will ensure that Historic Properties are considered in the continued operation and maintenance of hydroelectric facilities during the term of their licenses in accordance with the following stipulations. To further this purpose, Licensees will develop Historic Resources Management Plans (hereinafter, "HRMP").

A. Interim Procedures: Until a Licensee's HRMP has been approved, the Licensee will comply with 36 C.F.R. Part 800, at Sections 800.4 through 800.6, with respect to any proposed ground-disturbing activities.

B. Historic Resources Management Plan: Each Licensee, within one year of a license issuing, will develop an HRMP that addresses each of the following subjects, or that provides documentation sufficient to justify any omissions, based on the irrelevance of the omitted subject. The Licensee will file one copy of the HRMP with the Commission and one with the Wisconsin SHPO for review. If the Wisconsin SHPO agrees with the HRMP, the Licensee will implement it.

1. Shoreline Monitoring: The HRMP will include a procedure for monitoring the Project shoreline on a periodic basis and reporting the results of monitoring by submitting an archaeological report in two copies to the Wisconsin SHPO. If archaeological properties are identified during monitoring, the

Licensee will implement Part I.C, herein.

2. Unsurveyed Lands Within the Project Boundary: At Projects where no prior archaeological survey has been conducted, including lands normally inundated by the Project reservoir and property owned by someone other than the Licensee (hereinafter, "Private Property"), the HRMP will include the following procedures:

a. For unsurveyed lands that are not normally inundated by the project reservoir, the Licensee will include one of the following procedures in the HRMP.

(1) The Licensee may include a procedure for ensuring that an archaeological survey is conducted in the planning stage of any significant ground-disturbing activity (including, but not limited to, land management, timber management, recreational development, and lease or sale) proposed to be carried out by the Licensee on these lands that may disturb Historic Properties.

(2) Alternatively, the Licensee may include a procedure for completing archaeological surveys for these lands within ten years of the date the license issues.

b. For unsurveyed lands that are normally inundated by the project reservoir, the HRMP will include a procedure for developing appropriate methods and techniques to identify Historic Properties which become accessible during periods of Project reservoir drawdown or dewatering, and a tentative schedule for conducting the surveys. Fulfilling this requirement will not cause, occasion, or prolong a period of drawdown or dewatering.

c. The Licensee, in the HRMP, will include the following procedure for taking into account effects to archaeological properties on Private Property to which the Licensee may be unable to gain access to conduct archaeological research.

(1) The Licensee, if unable to gain access to Private Property to conduct archaeological research, will notify the Wisconsin SHPO of the inability to gain access, identifying the property owners by name and address.

(2) The Licensee will provide the Wisconsin SHPO with a copy of all relevant correspondence demonstrating the Licensee's reasonable attempts to gain access for the purpose of conducting archaeological research.

(3) The Licensee will furnish the Wisconsin SHPO with a copy of the appropriate USGS topographic map showing the exact location of the Private Property.

(4) The Licensee, in the event shoreline monitoring, conducted pursuant to Part II.A.1, herein, discloses a change in an archaeological site located on Private Property to which the Licensee has been unable to gain access for conducting archaeological research, or if the Licensee learns that the ownership or control of such Private Property is transferred, will make further attempts to gain access and inform the Wisconsin SHPO of these further attempts and of their results.

3. Archaeological Properties on Non-Managed Lands Within the Project Boundary: Previously-recorded archaeological properties on lands for which no ground-disturbing activities are contemplated (hereinafter, "Non-managed Lands") will be listed as such in the HRMP.

C. In-Place Preservation At Shorelines: In general, Licensees will give priority to preserving Historic Properties in place through shoreline stabilization, in developing HRMPs, and may use shoreline stabilization for other purposes.

1. Shoreline Stabilization: Where stabilization efforts may disturb Historic Properties, the Licensee will describe or specify the type of stabilization proposed, such as placement of rip-rap or revegetation, the provisions for archaeological data recovery, if any are warranted, and a budget and a schedule for implementing the plan. If the Wisconsin SHPO does not respond within forty-five days of receiving the submission, or responds with no objections to the Licensee's plan, the Licensee will implement the plan.

2. Data Recovery Plans: Where preservation in place is deemed not to be feasible and data recovery is found to be necessary, Licensees will develop all plans for recovering archaeological data in consultation with the Wisconsin SHPO, ensure that such plans are consistent with the Secretary's Standards and generally consistent with, Treatment of Archaeological Properties (Advisory Council on Historic Preservation, 1980). Archaeological data recovery plans will, at a minimum, include the following information.

a. The Licensee will identify the property, properties, or portions of properties where data recovery is to be carried out, as well as any property, properties, or portions of properties that will be destroyed or already have been affected without the benefit of data recovery.

b. The Licensee will specify the research questions that are to be addressed through data recovery and explain their relevance and importance.

c. The Licensee will specify the means to recover, analyze, manage, and disseminate data to the professional archaeological community and the general public, and, explain the relevance of these means to the research questions; involve the interested public in the data recovery project; and, as appropriate, keep Indian tribes informed of the data recovery project and afford them the opportunity to participate.

d. The Licensee will include a schedule for implementing the data recovery plan.

e. The Licensee will include a plan for the disposition of recovered materials and records, according to Part IV.D. herein.

f. The Licensee will propose a schedule for submitting progress reports to the Wisconsin SHPO, where such reports are appropriate.

3. Implementing a Data Recovery Plan: The Licensee will submit the data recovery plan to the Wisconsin SHPO and, if the Wisconsin SHPO does not object within 30 days, implement the data recovery plan at the earliest opportunity.

4. Final Reports of Data Recovery: After a data recovery plan has been implemented, the Licensee will submit two copies of a final report detailing the results of the data recovery efforts to the Wisconsin SHPO for review and approval.

D. In-Place Preservation of Historic Hydroelectric Generating Facilities and Other Structures: Licensees will operate and maintain National Register eligible hydroelectric generating facilities (hereinafter, "Facilities") according to 36 C.F.R. Part 67, Guidelines for Rehabilitating Historic Buildings (revised 1990), and applicable National Park Service Preservation Briefs.

1. During the term of a license, the Licensee will take every reasonable precaution to preserve Facilities as Historic Properties; guarantee their integrity of design, materials, workmanship, location, setting, feeling, and association, to the extent that each of these qualities is relevant to National Register eligibility; and ensure public safety. To further these purposes, Licensees will adhere closely

to the following guidelines.

2. Specifically, Licensees will avoid destroying, demolishing, or otherwise altering their Facilities, any distinguishing qualities or characters of their Facilities, or any stylistic features or examples of skilled craftsmanship which may characterize their Facilities. Licensees will similarly avoid such effects upon their Facilities' environments within the Projects' boundaries. Licensees will avoid damage to their Facilities resulting from cleaning surfaces, and will repair rather than replace deteriorated features of their Facilities.

3. The Licensee proposing to alter its Facilities or its Facilities' environment contrary to the clear aim and intent of this Programmatic Agreement to preserve intact such Facilities and their environments, may do so only upon notice of any such proposal given to the Wisconsin SHPO and the Secretary of the Commission.

a. The Licensee will afford the Wisconsin SHPO and the Commission forty-five days, commencing on the date on which they all receive the notice of such proposal, to review the notice of such proposal, during which time the Licensee will take no actions that would foreclose the Wisconsin SHPO's and the Commission's full opportunity to object.

b. The Licensee will attach to the notice of such proposal such plans and specifications for such proposals as the Wisconsin SHPO and the Commission may require, and will respond with such further or clarified plans and specifications as the Wisconsin SHPO or the Commission may request. Required plans and specifications will include a description of the proposed undertaking, including relevant photographs and other needed documentation; a description of alternatives and mitigation measures, both considered and proposed; and a project plan and schedule.

c. If, after this forty-five days, there is no objection, the Licensee may implement the plans and specifications. Any party desiring to object within forty-five days will do so according to Part V.B, herein.

4. In cases of emergency, Licensees will respond in a manner ensuring public safety, and will notify the Wisconsin SHPO as soon as circumstances permit, but not more than seven days following the emergency, to explain any major modifications to Historic Properties required to cope with the emergency.

5. Licensees will not be required to seek the

Wisconsin SHPO's comments for completing routine repair and replacement in kind at their Facilities. Such routine repair and replacement in kind includes concrete repair work, maintenance and overhaul of existing generating and hydraulic equipment (except for equipment identified in the Form as a contributing element to its Facilities' National Register eligibility), maintenance of existing buildings and structures, dike repair and maintenance, maintenance and improvement of electrical systems, replacement of substation and transmission components, compliance with Commission mandated safety improvements not requiring structural modifications, development and maintenance of exterior public recreation components not requiring structure modifications, and placement and maintenance of public safety devices and signs.

6. Facilities that, at the time of licensing, are not National Register eligible, but become eligible, will become subject to the stipulations of this Programmatic Agreement as of the time they become eligible.

E. Public Interpretation: In their HRMPs, Licensees will propose, in detail, ways to interpret Historic Properties for the benefit of the public.

III. COMPLIANCE MONITORING, REPORTS, AND PUBLIC INVOLVEMENT

The purpose of this Part is to ensure compliance with the stipulations of this Programmatic Agreement through reporting.

A. Compliance Monitoring: The Commission and the Wisconsin SHPO have the right to monitor activities carried out pursuant to this Programmatic Agreement, and the Council will review such activities if requested. Licensees will cooperate with the Commission and the SHPO in carrying out this responsibility.

B. Annual Reports: Licensees, on January 31 of every year, will submit annual reports to the Wisconsin SHPO and the Commission outlining all activities associated with implementing the HRMP and this Programmatic Agreement, and undertaken in the preceding year and planned during the ensuing year.

C. Archaeological Report Dissemination: Licensees will submit all archaeological reports prepared according to the terms of this Programmatic Agreement to the Commission and the Wisconsin SHPO within six months of completing the report. Upon receiving written request, the Licensee may furnish copies of reports to other interested parties. The Licensee will ensure that precise locational data is withheld if it appears that its release might jeopardize Historic Properties (See National

Register Bulletin No. 29).

D. Public Involvement: Licensees will consult with the Wisconsin SHPO and the Commission to determine whether interested persons, as defined at 36 C.F.R. Part 800, at Section 800.1(c)(2), should be informed of effects to Historic Properties.

IV. TREATMENT OF HUMAN REMAINS AND GRAVE-ASSOCIATED ARTIFACTS; CURATION OF ARCHAEOLOGICAL COLLECTIONS, NOTES, MAPS, AND OTHER DOCUMENTATION; AND COMPLIANCE WITH THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT

Licensees will ensure that the following stipulations are implemented.

A. Tribal Reservations and Lands of the United States: Licensees will ensure that all human remains and other cultural items [7] encountered on lands embraced within the exterior boundaries of Indian reservations or in dependent Indian communities (hereinafter, "Tribal Lands), or lands controlled or owned by the United States (hereinafter, "U.S. Lands") are treated in accordance with the Native American Graves Protection and Repatriation Act (hereinafter, "NAGPRA"), 25 U.S.C. Section 3001, et seq.

1. NAGPRA creates rights for certain parties that go beyond the right merely to be consulted, set forth in the Act, that are pertinent to the inadvertent discovery, intentional removal, ownership, and repatriation of human remains and other cultural items recovered from Tribal and U.S. Lands. Thus archaeological data recovery and similar mitigative actions developed pursuant to the Act must also meet NAGPRA requirements when they occur on Tribal or U.S. Lands.

2. Licensees using Tribal or U.S. Lands for purposes

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[7] NAGPRA defines "cultural items" as (a) human remains, (b) funerary objects "reasonably believed" to have been associated with human remains or, "by a preponderance of the evidence," a specific burial site, (c) sacred religious objects, and (d) cultural patrimony, defined as material remains of "historical, traditional, or cultural importance to the Native American group or culture itself ...." "Unassociated" funerary objects were, according to the Senate Select Committee report accompanying NAGPRA, specifically excluded from its protections.

requiring the issue of a license, will, within one (1) year of such a license issuing, prior to and apart from the discovery of any human remains or other cultural items, identify the following items in consultation with the Wisconsin SHPO.

a. the specific Native American organizations with a proprietary interest in any human remains and other cultural items that may be encountered and recovered,

b. the kinds of artifacts that will be considered to be cultural items as defined in NAGPRA, including associated and unassociated funerary objects, sacred objects, or objects of cultural patrimony,

c. the kinds of analysis and curation to which the material will be subjected, along with a schedule for any disposition of the material, and

d. a specific course of action to be taken if human remains and other cultural items are encountered unexpectedly during project operation or project development, including recreational development.

3. Before excavating or removing discovered human remains or other cultural items from U.S. Lands, the Licensee will make every reasonable effort to protect the property and consult with the appropriate Native American groups. The Licensee will secure the consent of the appropriate Native American groups before removing any human remains or other cultural items from Tribal Lands.

B. Consistency With NAGPRA's Purpose: Licensees will ensure that any action taken is consistent with NAGPRA's purpose of protecting Native American's interred human remains and other cultural items.

C. Other Than Tribal and U.S. Lands: Licensees will ensure that all human remains and grave-associated artifacts encountered on lands that are neither Tribal nor U.S. Lands are treated according to Section 157.70, Wisconsin Statutes, with consideration given to the Council's policy on the treatment of human remains.

D. Curation of Archaeological Collections, Notes, Maps, and Other Documentation: Licensees will ensure that, except as otherwise required above, all artifacts, notes, records, reports, maps, and any other type of documentation that are, respectively, recovered, written, made, drawn, or otherwise generated according to this Programmatic Agreement, are curated in the State of

Wisconsin, unless the Michigan SHPO specifically requests that items pertaining to Michigan be delivered to the Michigan SHPO for curation, in a facility that meets the requirements of 36 C.F.R. Part 79, insofar as this purpose can be achieved consistent with the rights of Private Property owners.

V. DISPUTE RESOLUTION

A. Foundational Considerations: The Commission alone is statutorily mandated to ensure compliance with the National Historic Preservation Act and the Federal Power Act, notwithstanding this or any other Programmatic Agreement.

1. In all matters arising under this Programmatic Agreement, the Commission reserves to itself the sole right and authority to determine, consistent with the Council's regulations, the means of taking into account the effects of undertakings on Historic Properties, and, consistent with its own regulations, the best adapted use of a waterway.

2. Neither this Programmatic Agreement, nor any part of it will be interpreted to give any other party this right or authority.

3. While a Licensee may implement measures and adopt findings, where a consensus with the SHPO for such measures or findings is found to exist, a Licensee's right to seek the Commission's resolution of any matter disputed between it and any other Party to this Programmatic Agreement will not be abridged.

B. Procedures: If the SHPO, a Licensee, Licensees or the Council objects to any action or any failure to act on the part of any Party to this Programmatic Agreement, any Licensee, or Licensees within 45 days of such action or failure to act, the objecting Party, Licensee, or Licensees will file written objections with the Commission.

1. The Commission will consult with the Parties any interested parties, Licensee, or Licensees to resolve the objection.

2. The Commission may initiate sua sponte such consultation to resolve any of its objections to actions or to failure to act on the part of any Party, Licensee, or Licensees.

C. Council Comments: If the Commission determines that the matter cannot be resolved by consultation, the Commission will request the Council's further comments pursuant to 36 C.F.R. Part 800, at Section 800.6(b).

1. Any Council comment provided in response to such a request will be taken into account by the Commission in accordance with 36 C.F.R. Part 800, at Section 800.6(c)(2), with reference to the subject of dispute.

2. After consultation and review of written responses the Commission will issue a decision on the matter.

D. Status of Actions Not In Dispute: The Commission's responsibility to carry out all actions under this Programmatic Agreement that are not the subject of dispute will remain unchanged.

VI. EXECUTING, AMENDING, AND TERMINATING THIS PROGRAMMATIC AGREEMENT

This Programmatic Agreement will continue in full force and effect in its present form until it is amended or terminated.

A. Execution: Execution and implementation of this Programmatic Agreement evidences conclusively that the Commission has satisfied its Section 106 responsibilities for all individual Projects in the State of Wisconsin or the States of Wisconsin and Michigan issued new or amended licenses after the date whereon this Programmatic Agreement is executed.

B. Amending This Programmatic Agreement

1. The Commission, the Wisconsin SHPO, the Michigan SHPO, the Council, or any interested party may request an amendment to this Programmatic Agreement, whereupon the Parties will consult in accordance with 36 C.F.R. Part 800, at Section 800.13.

2. This Programmatic Agreement will be amended only upon the agreement of the Commission, the Wisconsin SHPO, the Michigan SHPO, and the Council.

3. Historic Properties affected by a new license issuing to Wisconsin Power & Light for its continued operation of the Shawano Project, Project No. 710, in Shawano and Menominee Counties, are protected under a Programmatic Agreement for that project. Some of those Historic Properties are on lands belonging to the Menominee Indian Tribe of Wisconsin. If the Programmatic Agreement for the Shawano Project is terminated or amended with the result that the Shawano Project is administered under this Programmatic Agreement, the Parties will consult together and with the Menominee, both directly and through counsel, to amend this Programmatic Agreement sufficient to

afford their interests in Historic Properties located on their lands protection equal or superior to that stipulated in the Programmatic Agreement for the Shawano Project alone.

C. Terminating This Programmatic Agreement: The Commission, the Wisconsin SHPO, the Michigan SHPO, or the Council may terminate this Programmatic Agreement by giving notice to the Parties at least thirty days before the desired termination date, provided that the Parties will have consulted in good faith before notice is given to avoid termination by amendment or by other actions.

FEDERAL ENERGY REGULATORY COMMISSION

By _____ Date 12/1/93
Fred E. Springer, Director
Office of Hydropower Licensing

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By _____ Date 12/30/93
Robert D. Bush, Ph.D., Executive Director

STATE HISTORICAL SOCIETY OF WISCONSIN

By _____ Date _____
Jeff Dean, State Historic Preservation Officer

MICHIGAN DEPARTMENT OF STATE, BUREAU OF HISTORY

By _____ Date _____
Dr. Kathryn Eckert, State Historic Preservation Officer

Darrin Johnson

From: Moore, Jonathan D <Jonathan_Moore@nps.gov>
Sent: Wednesday, June 23, 2021 12:39 PM
To: Shawn Puzen
Cc: Darrin Johnson; Miller, Matthew J; Crotty, Scott A
Subject: Re: [EXTERNAL] Trego Documents

Shawn,

Thank you to Xcel Energy and Mead & Hunt for hosting the site visits of the Hayward and Trego facilities on the 17th. It was helpful to see both facilities and to meet all of you. Thank you also for forwarding the statewide programmatic agreement (1993).

Would it also be possible for you to send the following documents:

- Trego PA (1992)
- Historic Resources Management Plan, Hayward
- Cultural Resources Management Plan, Trego

I looked through the appendices at the hydrorelicensing.com site. If they are there and I missed them, I apologize.

Thank you again for your assistance.

Regards,

Jonathan Moore
Cultural Resources Program Manager
St. Croix National Scenic Riverway
National Park Service
401 North Hamilton Street
St. Croix Falls, WI 54024
715-491-6839

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Monday, June 21, 2021 3:27 PM
To: Moore, Jonathan D <Jonathan_Moore@nps.gov>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: [EXTERNAL] Trego Documents

Hi Jonathan,

It was nice to meet you last week.

Per your request, we have added you to the address list for Hayward and Trego.

In addition, attached is a copy of the Programmatic Agreement we talked about.

Lastly, the FERC contact for relicensing is Laura Washington. 202- 502-6072 laura.washington@ferc.gov.

Please do not hesitate to contact Matt, Scott or me if you have any additional questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Darrin Johnson

To: Moore, Jonathan D; Shawn Puzen
Cc: Miller, Matthew J; Crotty, Scott A
Subject: RE: [EXTERNAL] Trego Documents
Attachments: 19921127 Trego programmattic agreement.pdf; 19950523 Trego CRMP sumitted to FERC.pdf; 19970110 hayward hrmp.pdf; 20071220 order approving Trego CRMP.pdf; 19970404 FERC approval of Hayward CRMP.pdf

Hi Jonathan,

Attached are the Trego PA, Trego CRMP, and Hayward HRMP per your request. I have also included the FERC orders approving the CRMP & HRMP. Please let us know if you have any further questions.

From: Moore, Jonathan D <Jonathan_Moore@nps.gov>
Sent: Wednesday, June 23, 2021 12:39 PM
To: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: Re: [EXTERNAL] Trego Documents

Shawn,

Thank you to Xcel Energy and Mead & Hunt for hosting the site visits of the Hayward and Trego facilities on the 17th. It was helpful to see both facilities and to meet all of you. Thank you also for forwarding the statewide programmatic agreement (1993).

Would it also be possible for you to send the following documents:

- Trego PA (1992)
- Historic Resources Management Plan, Hayward
- Cultural Resources Management Plan, Trego

I looked through the appendices at the hydrorelicensing.com site. If they are there and I missed them, I apologize.

Thank you again for your assistance.

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Cultural Resources Program Manager
St. Croix National Scenic Riverway
National Park Service
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FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

June 24, 2021

FERC Docket Nos. 2417-065 and 2711-024

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Proof of Publication of Notice of Scheduled Site Visit**
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

Dear Secretary Bose:

Northern States Power Company – Wisconsin (licensee), d/b/a Xcel Energy, published a notice in newspapers of general circulation in Sawyer County and Washburn County, Wisconsin announcing the June 17, 2021 site visits to the Hayward (FERC Project No. 2417) and Trego (FERC Project No. 2711) hydroelectric projects. The notice was published in the Sawyer County Record on June 2, 2021 and the Spooner Advocate on June 3, 2021. A copy of each public notice and Affidavit of Publication is enclosed.

Thank you for your time and consideration in this matter. If you have any questions, please contact Matthew Miller at (715) 737-1353 or matthew.j.miller@xcelenergy.com.

Sincerely,

James M Zyduck

Digitally signed by James M Zyduck
Date: 2021.06.28 13:50:47 -05'00'

James M. Zyduck
Director, Hydro Plants

Enclosures: Public Notices and Affidavits of Publication

cc: Shawn Puzen – Mead & Hunt, Inc. (via e-mail)
Project Files

OFF THE SHELF: NEWS OF THE SHERMAN & RUTH WEISS COMMUNITY LIBRARY

BY **KATHY HANSON**
For the Record

Message from Molly Lank-Jones, Director, Sherman & Ruth Weiss Community Library

The Library Board of Trustees is the backbone of any public library. The Trustee Essentials Handbook states that active, enthusiastic trustees govern library operations and promote library development to protect and advance the interests of the broader community. (Wisconsin Department of Public Instruction, Public Library Development Team. Trustee Essentials..., 2016)

At the Sherman & Ruth Weiss Community Library, April marked the end of terms for former Board President Matt Ostrander and former Vice President Delores Peterson. They have been exemplary in advancing the interests of our community and visitors, and in managing me! I hope they remember they only need to take one year off before they can serve on the board again.

May marks the beginning of a new term for Karen Duffy, who has taken on the role of president; Linda Hand, who serves as the City Council representative; and city resident Dave Eckstrom. The remaining roster includes Ann Schleeter, vice president; Bruce Paulsen, secretary and county representative; Kathy McCoy, treasurer; Ray Moeller, former long-time board president; and Katie Pritchett, school representative. Several of these trustees served on the library board several years ago. The library staff and I welcome them back and are happy to welcome the new trustees.

Meet the staff: Janet Rowney

Janet Rowney is one of the faces in the library who works the front desk, but she can also be found working on interlibrary loan books, shelving and shopping (searching for titles requested by library patrons and other libraries), helping patrons on the computer, assisting them in finding their items in the stacks, and working curbside with the COVID guidelines.


Rowney

Like many in the Hayward area, she is from Chicago but spent summers in the Hayward area.

Her education is as diverse as any you can imagine: math/science major, theatre major, teaching degree from UW-Superior, student of drama performance with Shakespeare & Company. She has also worked as a server, bartender and hostess.

Perhaps most interesting of all is Janet's passion for working as a deckhand on a tall ship — the S/V Denis Sullivan. She has sailed all five Great Lakes, as far east as Quebec City and as far west as Duluth.

But back to the library. Here is what she told us.

"When I first took the job at the library, I was really naïve with my preconceptions of what the job would entail. The processing of books is much more complicated than it appears from the patron's perspective. And you also need to become familiar with the patrons. Plus, there is helping with computer use and printing and faxing and finding materials and research and . . .

Every day I am grateful for the staff. Molly and Ann are supportive bosses and I value each and every staff member and volunteer. My favorite part of the job is the continual challenges. Every day is a fresh experience."

To which we say, "All hands on deck, Janet!"

Maggy's Book Review

"On the House" by John Boehner

I read so much I keep a book diary. Helps me remember what I've read and to make recommendations if anybody asks. I'm going on my fifth diary in the last 10 years or so. They make for a nice gift suggestion to the kids at Christmas, too. Rectangular. Easy to wrap.

So, for the book I'm going to review this time for the library newsletter I'm going straight to my latest book diary and will give it to you straight about John Boehner's "On the House: A Washington Memoir."

Why I read it: It was hyped and promoted a lot; I had hoped for some juicy D.C. dish; I'd always wondered where former Speaker of the House John Boehner disappeared to. I pre-ordered it and counted the days 'til Amazon dropped it off on my front porch.

My review: In a word, disappointing. Too much of the content was boring and permeated with 7th grader cliches. It was surprising, however, to learn that Boehner's big birth family (11 kids!) were life-long Democrats, though he never explains why he alone made the switch to the Grand Old Party.

Unfortunately, too much of what Boehner gives us is minutiae about his life: his inspirational high school football coach. His Catholic education. His ongoing addiction to Camels. His devotion to red wine. He's even posed on the cover with a cigarette burning in an ashtray and holding a stemmed fishbowl of Cabernet.

He provides some insights into politics and D.C. insiders from his still staunchly Republican point of view, though in the end the GOP turned him out to pasture at age 60. And even with all the tumult going on in his nearly unrecognizable party, he says he voted for Donald Trump in 2020.

That was long after he'd been dumped for the numbers genius, Paul Ryan, who's long gone now, too. Boehner laughingly recounts how Ryan had to have the speaker's office nearly fumigated before moving into it. Too many Camels got smoked in that office for the new speaker, a health nut.

Boehner's lack of spite in a book that could have been over the top with it makes me wonder whether he's leaving an opening for himself, though he claims to be enjoying himself mightily on the golf course these days.

Outdoor Storytime begins June 1 at Weiss Library

The Sherman & Ruth Weiss Community Library is bringing Outdoor Storytime to the library starting June 1, presented on the Children's Patio by Northwest Connection Family Resources.

Sessions will begin at 10:15 a.m. and will run through Aug. 24. Children of all ages are welcome to participate in the interactive, educational activity.

Library officials remind users that inside the building the library's current COVID-19 policy remains in effect. Library patrons and staff must wear a mask and use a hand sanitizer on entering. Children age 3 and older are included in the policy, and the toys and games are temporarily in storage. If people do not have a mask, the library will provide one near the entry at the "sanitation station."

Those who prefer not to mask are free to join Storytime by entering through the Children's Patio gate. During storytime, groups/pods will socially distance around the storyteller, who will be in the center of the patio. Parents and children are free to enter the library to browse either before or after storytime, but masks are required.

1,000 Books program

Participation in Storytime also makes it easier for children to complete 1,000 Books Before Kindergarten, a library challenge to read 1,000 books before the child enters kindergarten. Storytime provides excellent bonding time for children and their caregivers.

Families are invited to join the 1,000 Books challenge at the library. By reading just one book a night, families can reach the 1,000-book goal in three years and provide children with essential early literacy skills.

When children join, they receive a 1,000 Books Before Kindergarten book bag and incentives for every 100 books that are read to the child. When the child completes the program they will receive a book of their choice donated to the program by Arclin of Hayward.

The 1,000 Books program is available to all families with children between the ages of birth and 5 years. Registration is open. For more information, call the library at (715) 634-2161, or visit www.weisscommunitylibrary.com.

Weiss Library resumes 5-day schedule

Effective this week, the Sherman & Ruth Weiss Community Library will be open Monday through Friday for indoor service, but will continue to observe its current COVID-19 policy requiring library patrons and staff to wear a mask and use a hand sanitizer as they enter.

Library hours also have been adjusted to provide more consistent service: Monday, Wednesday, Thursday and Friday from 10 a.m. to 5 p.m., and Tuesday from noon to 7 p.m. The library will continue to offer curbside pickup service on-demand during its open hours.

Library pandemic policies will remain in place at least until the library board meets June 8. People who do not have a mask are provided them near the entry at the "sanitation station."

Pickup will be available during regular hours of operation for those who prefer not to mask or who enjoy the convenience of curbside service. Users must call the library to make an appointment. Curbside pickup now will now be located at the side door facing Highway 77.

Those arriving for pickup should either call the library at (715) 634-2161 from their car or ring the doorbell at the side door. Patrons will be asked to show a library card or I.D. to confirm the order.

The library meeting room will remain unavailable until later in the summer. The Used Book Room will be open Monday through Friday during regular library hours, with purchases made on the honor system (no change will be available).

For more information, visit www.weisscommunitylibrary.com or call the library at (715) 634-2161.

PUBLIC NOTICE

Site Visit for the Relicensing of the Hayward Hydroelectric Project (FERC Project No. 2417) Trego Hydroelectric Project (FERC Project No. 2711)

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, (hereinafter NSPW), hereby notifies resource agencies, Indian tribes and stakeholders, including interested members of the public, that it has scheduled a site visit to the Hayward (FERC Project No. 2417) and Trego (FERC Project No. 2711) Hydroelectric Projects (Projects) as part of the Federal Energy Regulatory Commission's (FERC or Commission) relicensing process. The Hayward and Trego Projects are located on the Namekagon River in the City of Hayward in Sawyer County, Wisconsin and Town of Trego in Washburn County, Wisconsin, respectively.

On Nov. 30, 2020, NSPW filed with the Commission a Pre-Application Document, Notice of Intent, and Request to Use the Traditional Licensing Process (TLP) for the relicensing of both Projects. The Commission, by letter dated Jan. 21, 2021, granted NSPW's request to use the TLP for both Projects.

In accordance with the first stage of consultation requirements under the TLP, NSPW held a Joint Agency Meeting on March 11, 2021. Due to COVID-19 health-related concerns, the meeting was held via conference call. No site visit to either Project was conducted at that time in order to abide by Centers for Disease Control and Corporate guidelines to avoid public gatherings and discretionary travel.

NSPW has scheduled a site visit to the Hayward and Trego Projects, in conjunction with a site visit to the White River Hydroelectric Project (FERC Project No. 2444), on Thursday, June 17, 2021. The site visit will begin at 9 a.m. at the White River Project located at 46720 State Hwy 112, Ashland, WI 54806. The group will then proceed to the Hayward Project for a site visit, followed by lunch on your own, and will finish the day with a site visit to the Trego Project.

An accurate number of attendees is necessary to allow NSPW to coordinate the site visit based on the most recent Wisconsin COVID-19 mandate(s) and Corporate guidelines. In addition, based upon the number of attendees, participants may need to be separated into groups, if required by the mandate(s) and guidelines.

All interested parties, including members of the public, who plan to attend the site visit on Thursday, June 17, are asked to RSVP no later than Monday, June 14, to Matt Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Xcel Energy®

CANOE MUSEUM

JULIE HUSTVET

Sleek, well-crafted form merged with function in the canoes displayed at the Wisconsin Canoe Heritage Museum's celebration of Wisconsin Canoe Heritage Day on Saturday, May 29. The day's activities included the annual Canoe & Wooden Boat Show, live music, silent auction, and the reopening of the museum.

Spooner library: Open, ready to forward in best way it can

BY SPOONER MEMORIAL LIBRARY

As COVID-19 cases continue to drop, and with updated Centers for Disease Control recommendations, the library board, director, and team are beginning their "exit strategy" from COVID practices to move forward.

At their May 26th board meeting, the board discussed at length the Director's recommendations for moving forward.

These stated, "In March 2020, we sought out advice from Washburn County Public Health, Center for Disease Control (CDC), Department of Instruction, and specific library related entities on how to best navigate the COVID-19 pandemic. This has not changed over a year later and continues to guide us in our reopening plan.

"We are aware of CDC's statement allowing vaccinated individuals to gather unmasked. We will not be asking patrons if they are or are not vaccinated, thus we will continue to require 100% mask compliance at this time.

"However, we have a plan in place to start moving towards normalcy. One plan is to adjust our mask requirement when St. Francis de Sales school is out as students use the library almost daily. Beginning June 7, the library will adjust the mask requirement to the following: Monday-Wednesday will require 100% mask compliance in ages 5+ and Thursday-Saturday will not require 100% mask compliance.

"This change allows library patrons who are unable to be vaccinated an opportunity to still safely use the library at the beginning of the week. Once Washburn County reaches a 70% vaccinated rate, the library will no longer require 100% mask compliance as the County has approached herd immunity rates. We may make this change prior to the 70% mark if deemed appropriate by public health.

"The library will continue to host programs outside if possible or with limited seating inside. We will be opening more computer stations. More seating has already opened up. We appreciate your patience and respect as we navigate COVID-19 together."

The board voted unanimously to approve this update to the pandemic policy and will evaluate it once more at the June 22nd board meeting.

Masks will be required by everyone age 5+ on Monday-Wednesday. If a patron cannot or refuses to wear a mask those days, we will provide curbside service while the patron waits outside. (Curbside service is available Monday-Saturday.)

We will continue to have masks and hand sanitizer in our entrance as it is still the recommendation of CDC for people without their vaccinations to wear masks, but masks are not required at the end of the week. Staff will continue to wear masks (to lead by example). All six adult computer stations are open, and two spaced computer stations are open in the children's wing.

We have a mixture of spaced tables and community tables in our sitting areas on both the adult and children's sides. Children's toys will be taken out of storage and set back up on the children's wing with the understanding that we will not be able to clean them all between uses.

Returned items and items in delivery from other libraries will no longer be quarantined after a follow-up study confirming the extremely rare chance of COVID spread amongst library materials.

In the same way that we went into the pandemic with careful thought and consideration for the community, we will continue to do so with our exit strategy. No matter where our patrons stand on issues, such as masks and safety concerns, we hear you. We know we cannot make everyone happy, but we can definitely listen to the voices of the community and to science as we have been.

It is time to move forward in the best way we can. So, yes we are open!

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Xcel Energy®

ROP AFFIDAVIT

June 04, 2021

Customized Newspaper Advertising
319 E 5th Street
Des Moines, IA 50309
515-244-2145 ext 152; Fax: 1-866-440-6028
Email: media@cnaads.com

Advertiser: Xcel Energy Brand:

Order #: 21061MX0

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Hayward Sawyer County Record
15464 County Rd. B
Hayward, Wisconsin 54843

V: 715-939-9036 F: 1-715-635-2186 Email: mcarlson@spooneradvocate.com

WI/Hayward Sawyer County Record (Hayward, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Wed 06/02/21	2.00 X 10.00	**Caption:** Xcel Energy **Special Instructions:** Deadline - Mon prior by noon	

Media Dept 6.4.2021

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Email: media@cnaads.com

Advertiser: Xcel Energy Brand:

Order #: 21061MX0

ATTN: Michelle Carlson WI/Spooner Advocate
WI/Spooner Advocate
251 East Maple St.
Spooner, Wisconsin 54801-0338

V: 715-939-9036 F: 1-715-635-2186 Email: mcarlson@spooneradvocate.com

WI/Spooner Advocate (Spooner, WI)

Run Date	*Ad Size*	*Caption / Position / Special Instructions*	*Section and Page information*
Thu 06/03/21	2.00 X 10.00	**Caption:** Xcel Energy **Special Instructions:** Deadline - week prior	

Media Dept 6.4.2021

ATTACHMENT B

STAGE 2 CONSULTATION

Study Summary

Darrin Johnson

From: Darrin Johnson
Sent: Monday, August 2, 2021 5:06 PM
To: Julie_Galonska@nps.gov; joan.harn@verizon.net; Tornes, Angela; lisa_yager@nps.gov; Thomas Frost; connie.antonuk@wisconsin.gov; Laatsch, Cheryl - DNR; tyler.howe@wisconsinhistory.org; Nick Utrup, USDOI-FWS; Susan Rosebrough (susan_rosebrough@nps.gov); David Thomson (dave_thomson@NPS.gov); cjpetersen@msn.com
Cc: Miller, Matthew J; Crotty, Scott A; Shawn Puzen
Subject: Proposed Study Summary for Hayward and Trego Hydroelectric Project relicensing
Attachments: 20210802 Hayward and Trego Study Sum sent to agencies for comment.pdf

Good Afternoon,

Please find enclosed a copy of the Proposed Study Summary for the Hayward (P-2417) and Trego (P-2711) Hydroelectric Projects. Please provide any comments you may have within 30 days. Any comments received will be addressed prior to submittal to FERC. NSPW will be also developing individual detailed study plans for each of the studies to be conducted. The study plans will also be sent out for review and comment once they have been developed. If you have any questions, feel free to contact me.

DARRIN JOHNSON
FERC COMPLIANCE AND LICENSING, WATER
Mead & Hunt
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Summary of Study Comments and Responses

Hayward Project
FERC Project No. 2417

Namekagon River
Sawyer County, Wisconsin

Trego Project
FERC Project No. 2711

Namekagon River
Washburn County, Wisconsin

Report prepared for

Eau Claire, Wisconsin

Report prepared by

Mead & Hunt

www.meadhunt.com

August 2021

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C. Assessment of Minimum Flow and Resource Impacts Downstream of the Tailwater – WDNR 2

D. Assessment of Riverine and Reservoir Habitat – WDNR 3

E. Assessment of Stream Flows, Channel Dimensions, and Linear Gradient – WDNR 3

F. Cultural/Historical Resources Study – NSPW 4

G. Trego Fishery Study – WDNR 5

H. Fish Entrainment and Fish Movement Study – WDNR 5

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J. Macroinvertebrate Study – WDNR 8

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L. Mussel Study – WDNR 9

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P. Sedimentation, Hydraulics and Channel Change Study at Trego Dam – NPS, TLD, WDNR 18

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Appendices

1 Study Request Letters

1. Study Requests Received From[1]:

- National Park Service (NPS)
- Trego Lake District (TLD)
- Wisconsin Department of Natural Resources (WDNR)

2. Summary of Study Comments and Action Items

A. Aquatic Plant Survey – WDNR

WDNR Comment(s):

The In-water plant community data is limited within the Project boundary. The goal of the study is to provide baseline information on the condition of the aquatic plant community in the Project(s).

Methodology – The information collected from this study includes an assessment of the density and diversity of macrophytes, which includes frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization. The aquatic invasive species study should be conducted according to the department's Recommended Baseline Monitoring of Aquatic Plants in Wisconsin.

NSPW Response:

NSPW will complete a point-intercept survey according to the WDNR's Recommended Baseline Monitoring of Aquatic Plants in Wisconsin methodology as part of the Aquatic and Terrestrial Invasive Species (ATIS) Study described in **Section I** below. NSPW will rely on the WDNR to provide the point intercept grid.

B. Assessment of Current Dam Operations – WDNR

WDNR Comment(s):

Determine if the Project is meeting the requirements of minimum flows and run-of-river operations; including documenting how downstream river flows are managed appropriately to limit water level fluctuations. Conduct a desktop review of inflow and outflow data, including an evaluation report of run-of-river operations and requirements.

NSPW Response:

The Licensee will complete a desktop review of existing flow data and provide an evaluation report in the DLA. It should be noted that routine drawdowns are not a regular occurrence at either Project. In a review of the Licensee's records, only two drawdowns were noted at Trego Flowage. The first was an 11-foot drawdown in 1978 to repair concrete on the dam. The second was conducted in 1988 when a 3-foot fall drawdown of the Trego Flowage was conducted at the request of the Trego Lake District to perform lake management activities. The only drawdown on record at Hayward, under the current license, occurred in 2004 on behalf of the City

[1] Actual Study Request Letters are enclosed in Appendix 1.

of Hayward to help facilitate repairs to their water main. A discussion of the frequency and procedures for any future planned drawdowns will be provided in the DLA.

C. Assessment of Minimum Flow and Resource Impacts Downstream of the Tailwater – WDNR

WDNR Comment(s):

Provide an assessment of the average range of flows, including minimums and maximums and their relevance, associated with run-of-river operations and facility capacity. Evaluate the minimum flow of 8 cfs at the Hayward Project and target reservoir elevations of the Trego Project are providing sufficient flows and environment for aquatic resources.

Methodology – Conduct an in-stream flow study, which includes a description of current habitat conditions within the bypass channel under current operation and flows to determine if the current minimum flows are impacting available habitat, fish, and macroinvertebrate communities. Assess various flow regimes to determine what is appropriate to minimize and avoid adverse impact on the cold-water resource.

NSPW Response:

The Licensee will provide an assessment of the average range of flows, including minimums and maximums and their relevance, associated with run-of-river operations and facility capacity in the DLA.

The Hayward Project has a short (approximately 120 foot long) bypassed reach. In conjunction with the last re-licensing effort, NSPW conducted a shoreline stabilization and habitat improvement project within the bypassed reach. The project involved improving the habitat within the bypassed reach by making improvements to the spillway channel. Improvements included the installation of a rock wing deflector extending about 45-50 feet downstream that diverts river flow to approximately two thirds of the original channel width. Approximately one foot of channel material was also removed. The work increased the velocities in the spillway channel to encourage scouring in the pool area to maintain satisfactory pool depths. The eroding shoreline in the area downstream of the spillway was also stabilized and the canoe portage put-in was re-routed to correct erosion issues along the bank.

Based on a 1992 joint flow-release exercise, NSPW and WDNR agreed that a continuous minimum flow of 8 cfs was sufficient to protect aquatic resources. In their comments, WDNR indicated that the flow “was more than adequate for sustaining aquatic organisms downstream” (NSPW, 1991; FERC, 1995). FERC also determined that the minimum flow of 8 cfs provided adequate aeration to maintain water quality in the bypass reach, including the shallow pool and other downstream areas during the critical low flow, high temperature period (FERC, 1997).

The Hayward and Trego Projects are operated in a run-of-river mode that parallels stream flow, so any water level variance experienced in the Namekagon River downstream (from the bypass reach at Hayward and from the dam at Trego) reflects natural conditions. Therefore, the Licensee is not proposing to conduct an in-stream flow study.

D. Assessment of Riverine and Reservoir Habitat – WDNR

WDNR Comment(s):

Having updated habitat assessment information is critical for evaluating the effects of the project(s) on the reservoir and downstream ecosystem. It will provide baseline data to current conditions and assist with management recommendations of any current or future needs. The data can be used to help guide water resource management associated with the Project(s).

Obtaining recent habitat assessment information is critical for future management actions and establishing baseline data. Water level fluctuations due to drawdowns may affect aquatic habitat. Obtaining information on how/if new water levels will cause shoreline erosion as a new ordinary high-water mark is established.

Methodology – The riverine habitat within the project area downstream from the dam should be evaluated with the department Quantitative Habitat Assessment methodology in wadable stretches of the project (s) at the time of each fish survey. For the reservoir, department shoreland habitat protocol should be used. Newly impounded areas and any wetlands that could be affected by the new water level should be mapped. Please work with the department to determine which protocol should be used for different locations.

NSPW Response:

The Projects are operated as run-of-river facilities with only the minimum allowable fluctuation to respond to changing inflows and outflows. NSPW is not proposing a change from run-of-river operation or reservoir elevations such that a new ordinary highwater mark will be established. Therefore, the requested data is unnecessary to assess the impacts of the operation of the hydroelectric project. In addition, there is existing WDNR fishery survey information from within and downstream of each Project reservoir. NSPW is proposing to conduct a point-intercept vegetation survey and an analysis of vegetation along the reservoir shorelines as part of the ATIS Study as discussed in **Section I**. This information will help to provide an evaluation of aquatic habitat within the Project reservoirs and terrestrial habitat along the Project shorelines. Therefore, the Licensee is not proposing to conduct a specific riverine and reservoir habitat study. Any changes to the acreage, amount of impounded area, or wetlands that could be affected by allowed water level fluctuations are already mitigated through the existing and proposed operational requirements.

E. Assessment of Stream Flows, Channel Dimensions, and Linear Gradient – WDNR

WDNR Comment(s):

The relicensing of Hayward and Trego has the potential to have short term and long-term impacts on the aquatic community downstream of the impoundment. These impacts include, but are not limited to, dewatering and limiting available aquatic habitat in the downstream river channel depending on stream discharge and dam operation. These impacts can vary by season as well as daily. Proper management of the resource will help ensure that adequate flows are available to aquatic life at the proper time and thermal regime.

Goal – Determine impacts the Project has on the existing stream flows, channel dimensions and linear gradient of the Namekagon downstream of the Project(s).

Methodology – Conduct a flow study to determine stream morphology downstream of the Project at various flow, including width, depth, wetted perimeter, and substrate composition. The study should identify any wetlands that are flooded. This should include available aquatic habitat under current operation through flood flow conditions. Quantitative Habitat Assessment Methodology should be used to document habitat conditions. Refer to existing management efforts (recreational, resource, habitat) to investigate the impacts the proposed Project(s) would have.

NSPW Response:
A discussion of habitat conditions within the Hayward bypassed reach is located in **Sections C and D**, above.

The Hayward and Trego Projects are operated in a run-of-river mode that approximates natural stream flow. Any water level variability experienced in the Namekagon River downstream (from the bypass reach at Hayward and from the dam at Trego), reflects natural flow conditions. Therefore, no study of stream flow, channel dimensions, or linear gradient are warranted or proposed.

F. Cultural/Historical Resources Study – NSPW

NSPW Proposed Study:
The Hayward Project was evaluated for the National Register of Historic Places (NRHP) in 1989 and determined ineligible. The Trego Project was evaluated for the NRHP in 1991 and determined eligible. No further NRHP evaluations of either site are planned as part of the relicensing process.

Archaeological shoreline surveys of both projects have been conducted at 10-year intervals per the terms of each Project's Historic Resource Management Plan and at the recommendation of the qualified archaeologist completing the surveys. Surveys were last completed in 2013. NSPW will conduct shoreline surveys within the Area of Potential Effect (APE)[2] of each Project according to the terms of the Programmatic Agreement. NSPW will search for impacts to known archaeological sites and previously unidentified archaeological sites along currently eroding areas. As a result, currently eroding shoreline areas and failing shoreline stabilization measures will be identified and evaluated as part of the study.

The study plans and study reports will be distributed to the SHPO and interested THPOs for comment. Stakeholder comments will be addressed in the final study plan and final study report.

This study will be completed in 2022.

[2] The APE for each Project includes all lands within the current and proposed Project boundaries.

G. Trego Fishery Study – WDNR

WDNR Comment(s):

Define the diversity and abundance of the fish community within the Trego Project.

Data is limited within the Project area downstream of the dam. Fisheries data is available within the White River Flowage as part of the Project reservoir.

Methodology-

Trego Project – Seasonal catch per unit effort (CPUE) surveys in the spring summer and fall to quantify fish populations relative abundance and summary report to document the species available to recreational fishers and general fish community composition.

> ***Early Spring Fyke Netting**: 3-5 nets (front frame of 4' x 6') set the week of ice-out.*
>
> ***Early Spring Electroshocking**: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 45-55 degrees.*
>
> ***Late Spring Electroshocking**: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 60-70 degrees.*
>
> ***Summer Fyke Netting (June-early August**): Three to five fyke nets (front frame 4'x6'), set when water temps are approaching 55-65 degrees.*

NSPW Response:

Fishery survey information provided by WDNR indicates that fish surveys were conducted on the Trego reservoir in 2003 (summer netting, fall shocking), 2004 (spring netting), 2011 (fall shocking), 2016 (fall shocking), and 2019 (spring, summer, and fall shocking). Downstream of the Trego Dam, fish surveys were conducted each year from 2003-2006 (fall shocking), 2007 (summer shocking), 2008-2010 (fall shocking), 2014 (summer shocking), and 2018 (summer shocking). This existing data provides information on the species assemblage within and downstream of the reservoir. Therefore, due to the amount of recent fisheries data and because NSPW is not proposing a change in the operation of the facilities, no additional fisheries surveys are proposed.

H. Fish Entrainment and Fish Movement Study – WDNR

WDNR Comment(s):

The department has concern on Lake Sturgeon entrainment at Trego Dam. Assess fish entrainment at the Trego Project and Hayward Project and better understand fish movement from above to below the dams

Trego: The department has documented at least seven lake sturgeon that have entrained the dam (from Trego Lake to Namekagon River below) and survived to be recaptured below the Trego Dam. There are likely many more sturgeon and other fish species that are entraining

below Trego Dam and surviving. The department suspects that muskellunge are also doing this but haven't been able to document that through our fish surveys.

The dam is a major block to fish passage and migration for the Namekagon River, the most notable species that is impacted are Lake Sturgeon. Lake Sturgeon are currently stocked by the department in the Namekagon River (above Trego Lake) and Trego Lake in hopes of re-establishing this population. However, with entrainment, larger adult sturgeon can leave the lake by cannot return.

Hayward: Department fisheries biologists are interested in the fishery below the Hayward dam, and some of the most popular fish species are species coming from Lake Hayward upstream.

Having current fish movement information (e.g.) when fish are passing the dam, how many fish are passing the dam) and survival information will help department staff make informed management decisions regarding the fishery.

Methodology- Model a tagging study after existing research to look at entrainment of sturgeon, muskie, and walleye. The research could use radio tagging or hydroacoustic telemetry.

NSPW Response:

Any entrainment studies need to focus on entrainment into the powerhouse because entrainment through the gates or over the spillway is not an operational effect that is under the control of NSPW. The WDNR concern appears to be concerned about lack of passage downstream, but also cites the inability to stop Lake Sturgeon from moving downstream out of Trego Lake as an adverse impact. The WDNR statement is muddy and inconclusive by stating increased entrainment through the gates as being an adverse impact by allowing Lake Sturgeon to leave Trego Lake through the spillway gates. To derive a specific potential adverse operational impact out of the inconclusive study request made by the WDNR, the only potential operational effect under the control of NSPW is entrainment through the powerhouse. The reduced passage of Lake Sturgeon out of Trego Lake is not a project purpose. Therefore, NSPW has completed the following analysis with existing data to review the potential adverse effect from entrainment through the powerhouse.

The Trego Project has trash racks with 1.5 inch clear spacing and an intake velocity of 1.2 feet/second at maximum flow. The Hayward Project has trash racks with 1.5 inch clear spacing and an intake velocity of 1.5 feet/second at maximum flow. The Chippewa River Fish Protection Study Report identified sizes of fish that can pass through various sized trashracks and the sustained and burst swim speeds of several different fish species based on fish length (Kleinschmidt, 2016). The study indicated that 1.5-inch spacing, the same trashrack spacing present at Hayward, would exclude yellow perch in excess of seven inches, bluegill and black crappie in excess of ten inches, walleye and lake sturgeon in excess of twelve inches, and muskellunge in excess of sixteen inches with respect to the existing intake velocity at Hayward. The study also concluded that 1.5-inch trashrack spacing, the same trashrack spacing at Trego, would exclude yellow perch in excess of six inches, bluegill and black crappie in excess of eight inches, walleye and lake sturgeon in excess of ten inches, and muskellunge in excess of thirteen

inches with respect to the existing intake velocity at Trego. Excluded fish would not be able to pass through the trashracks and therefore would not be subject to turbine mortality. The study also indicated that fish larger than six inches in length have sustained swim speeds of at least 1.5 feet/second and would be able to swim away from the racks and would only be subject to volitional entry into the turbines (Kleinschmidt, 2016). This would result in only small fish under six inches in length being unable to escape turbine entrainment. The study also indicated that turbine passage survival for target fish species that were able to fit through the trashracks would see high survival rates, generally over 90%[3] (Kleinschmidt, 2016).

Fishery survey information provided by WDNR indicates that fish surveys were conducted on the Hayward Reservoir in 2001 (fall shocking), 2002 (spring netting, fall shocking), 2003 (summer netting, fall shocking), 2004 (fall shocking), 2005 (spring netting, spring shocking), 2006 (fall shocking), 2007 (fall shocking), 2008 (spring netting, summer shocking), 2013 (spring netting), 2014 (spring netting), and 2018 (summer netting). Downstream of the Hayward Dam, fish surveys were conducted in 2003 (spring shocking), 2004 (fall shocking), and via summer shocking in 2005, 2007, 2010, 2012, 2014, 2016, and 2018.

Fishery survey information provided by WDNR indicates that fish surveys were conducted on the Trego reservoir in 2003 (summer netting, fall shocking), 2004 (spring netting), 2011 (fall shocking), 2016 (fall shocking), and 2019 (spring, summer, and fall shocking). Downstream of the Trego Dam, fish surveys were conducted each year from 2003-2006 (fall shocking), 2007 (summer shocking), 2008-2010 (fall shocking), 2014 (summer shocking), and 2018 (summer shocking).

The information above demonstrates that neither entrainment nor mortality is expected to provide a significant adverse impact and therefore specific mitigation measures are unnecessary as part of the future license conditions. Similarly, the available fisheries survey information provides sufficient data regarding the abundance and diversity of fish within and downstream of both projects. Therefore, the Licensee is not proposing to complete a fish entrainment and movement study.

I. Aquatic and Terrestrial Invasive Species (ATIS) Study – WDNR

WDNR Comment(s):

The project may influence invasive species that have the potential to directly or indirectly cause economic or environmental harm or harm to human health, including harm to native species, biodiversity, natural scenic beauty and natural ecosystem structure, function or sustainability; harm to long-term genetic integrity of native species; harm to recreational, commercial, industrial, and other uses of natural resources in the state; and harm to the safety or wellbeing of humans including vulnerable or sensitive individuals. -per NR40.

Methodology – Use WDNR Early Detection Early Response Protocols. Additional methodology may be needed for terrestrial species, and other methodologies such as point-intercept may be appropriate if combining this study with other studies.

[3] Predicted turbine passage survival was determined using trashracks with a 1" spacing.

NSPW Response:

NSPW is proposing to complete an aquatic invasive species survey on the reservoir and tailrace of both Projects, and the bypass channel at the Hayward Project. On the reservoir, a point-intercept survey and a rapid-response survey will be completed in areas up to 15 feet in depth according to protocols previously developed in consultation with the WDNR. Additional information on riverbed/lakebed substrates will be collected at each point-intercept sample point. Under normal protocols, the bed substrate is classified into one of three types; muck, sand, or rock. In order to provide additional information regarding available habitat, bed substrates will be classified into one of the following nine substrate types: clay, silt, sand, gravel, cobble, boulder, bedrock, wood, or organic. In the tailwater and bypass channel areas, a rapid-response plan will be developed and implemented that is safe and corresponds with published WDNR protocols.

NSPW is also proposing to complete terrestrial aquatic invasive species surveys in areas where project operations have the potential to impact or spread terrestrial invasive species. These include project facilities, recreation sites, project tailwater, and project reservoir shorelines. NSPW lands with project facilities or recreation sites and the project tailwater areas will be surveyed for terrestrial invasive species in conjunction with the aquatic rapid response survey. The survey will consist of a meandering survey to identify, locate, and define the perimeter of occurrences of terrestrial plant species listed in NR 40. NSPW will survey the reservoir shoreline for terrestrial invasive species by boat concurrent with the aquatic invasive species survey. In addition to surveying for invasive species, an overall characterization of the terrestrial plant community will be made.

A final report will include mapping of identified colonies of species listed in NR 40 with bathymetric data and estimation of plant abundance and relative density. The study plan and study report will be distributed to interested stakeholders for comment. Stakeholder comments will be addressed in the final study plan and final study report. This study will be completed in 2022.

J. Macroinvertebrate Study – WDNR

WDNR Comment(s):

Assess the water quality using macroinvertebrate bio-indicators downstream of the impoundment.

Collect a wadable macroinvertebrate sample, if possible, downstream of the flowage using the Department's guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2017). If the stream is not wadable, a large river macroinvertebrate sample should be collected. Data should be analyzed using the current department WISCALM Guidance. Macroinvertebrates should be collected upstream of the reservoir in the riverine reach, in the bypass channel, and downstream of the powerhouse in the fully mixed zone.

NSPW Response:

The purpose of the study according to the WDNR is to assess water quality with the use of macroinvertebrates as a bio-indicator. NSPW has agreed to complete water quality monitoring for numerous parameters as described in **Section R**. This will include sampling within the reservoir, upstream of the reservoir in a riverine reach, and in the Namekagon River downstream of the

dams at each Project. The data collected in the water quality monitoring study should provide sufficient information to determine water quality within and immediately downstream of both Projects. No additional macroinvertebrate sampling is proposed.

K. Mink Frog Survey at Hayward Project – WDNR

WDNR Comment(s):

Mink Fogs are listed as a species of Special Concern in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys are an example of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The overall goal of this survey request is to further the knowledge of the distribution of Mink Frogs within the watershed more broadly. The main objective of the study request is to determine if Mink Frogs are present within the Project boundary of the dam.

WDNR indicates in their study request that mink frogs are known to be present within this Project boundary, however, survey data is limited.

Methods:

Calling or presence /absence survey for Mink Frogs: Follow the Mink Frog Survey Protocols where suitable habitat is present: https://witri.net/inventory/frogtoadsurvey/Volunteer/Mink/MinkFrog SurveyProtocols.pdf.

Presence absence surveys for Mink Frogs, June 6-July 15: Two surveys per week for four weeks.

NSPW Response:

WDNR tracks the known locations of threatened, endangered, and special concern species in the NHI database. An Endangered Resources Review (ER Review) encompassing the entire Hayward Project area (ER Log #20-683) was conducted on September 10, 2020. The review did not identify the potential presence of mink frogs within the Project boundary or its associated buffer area. Since the ER Review did not indicate the potential presence of the mink frog, continued operation of the Project is not likely to impact the species. Therefore, no mink frog surveys are proposed.

L. Mussel Study – WDNR

WDNR Comment(s):

The goal of the study is to determine effects of barriers to mussel distribution and diversity within the Project area and the Namekagon River. Determine freshwater mussel density and diversity, including characterizing mussel habitat within each Project area. The study would provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Project area.

The operations of the Project(s) could influence the freshwater mussel species located within the Project boundaries. The results of the survey will provide essential information to determine if

any protection measures, restoration, or enhancements would be necessary as a management requirement associated with the relicensing of the dam(s).

A qualitative and quantitative survey for freshwater mussels should be conducted within the project area and downstream of the dam structure on the Namekagon River. Some methods that can be used are the department's Guidelines for Sampling Freshwater Mussels in Wadable Stream and the department's Quantitative Habitat Assessment Methodology. Methodology should be discussed with the department for quantitative surveys. A Mussel Survey Plan should be submitted to the department for review at least 2 weeks 91 month preferred) prior to implementation.

Qualitative timed searches should first be conducted to assess habitat suitability and presence of freshwater mussels. Sites will be located below each barrier in the study area, plus one site upstream of the Project area. Starting locations should be representative of available habitat within the sampling reach. As a minimum, timed searches will be 4 pers/hrs. or a total search distance of 200 m in riverine sections of the project area and up to 8 pers/hrs. within reservoirs.

Based on qualitative surveys, quantitative surveys may be required. Quantitative sampling using quadrat samples will be used to determine population density, community composition, age, and total length distributions, living/dead, and sex ratios. One quantitative site will be located on the Project area where mussel habitat is determined suitable and where past sampling has occurred. The sampling unit will consist of a transect with 10 equally spaced 1/4m^2 quadrats every three meters along the unit. Each transect runs perpendicular to shore.

NSPW Response:
NSPW will complete a mussel survey at each Project. One riverine reach upstream and one riverine reach downstream of each dam will be surveyed. Each reach will be 1,000 meters in length. Transects will be spaced every 100 meters within the reaches creating a series of 10 transects. A random number selector will be used to select 5 transects within each reach to survey.

Surveys along each transect will be completed in 10-meter-long segments and will extend 0.5 meters on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search entails an initial search of 0.2 minutes per square meter along each 10-meter segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 minute per square meter. During the semi-quantitative survey, divers will visually inspect and probe the substrate as well as turn over rocks to detect small, burrowed mussels.

General stream conditions and morphology within the study area will be recorded including bottom substrate composition using the Wentworth Scale. The surveys will be conducted only when visibility at depth is at least 20 inches.

Live mussels will be identified to species, counted, and sexed by the team malacologist. Dead shell specimens will be scored as fresh dead, weathered dead, or subfossil. Detailed digital

images of the study area and representative mussel species will be recorded. A station location data sheet will also be populated per the Guidelines for Sampling Mussels in Wadable Streams.

If any living or dead federally listed or state listed species are encountered, the Licensee will notify WDNR and USFWS per surveyor collection permit requirements. Any listed mussel species encountered will be individually hand placed to their places of origin. No live mussels will be harmed or taken during the study.

The study plan and report will be distributed to interested stakeholders for comment. Stakeholder comments will be addressed in the final study plan and final study report. The study will be completed in 2022.

M. Project Boundary Study – WDNR

WDNR Comment(s):

The goal of the study is to conduct a quantitative assessment of acres of wildlife habitat and surface water that would be modified with a proposed change in the project boundary. This includes impacts to public access and recreational activities.

Methodology – Desktop evaluation of wetland and riparian habitat. Identify changes in acre in wetland and habitat, as well as changes in acreage and use in recreational features. Additionally, identify if any of the areas proposed to be excluded from the Project boundary provide habitat for listed species.

NSPW Response:

NSPW will provide additional information regarding any lands proposed to be removed from the existing Project boundary in the DLA. This will include changes to the amount of upland, wetland, and reservoir acres, different types of land cover, and potential impact to listed species, recreation sites, and historic/archaeological sites.

N. Rare and Endangered Species Study – WDNR

WDNR Comment(s):

Rare plants and animals have been found within, adjacent to, and in habitats similar to the study area. It would be recommended to complete plant and animal surveys for these species to determine if they occur within the study area and to further our understanding of their populations within this area. This will also inform the licensee as to where these plant and animal locations are.

The relicensing has the potential to have short-term and long-term impacts on vegetation and animals-in particular, wood turtles and their habitat-in particular, wood turtles and their habitat. Proper management of the resource will help to minimize any adverse impacts associated with the removal restoration and relicensing activities.

Methodology – Using a qualified botanist knowledgeable in area vegetation and specific species, identify, classify, and delineate on a map rare, threatened, or endangered plant species within the project area. Using a qualified biologist or ecologist, conduct presence absence surveys for specific rare, threatened, or endangered animal species.

NSPW Response:
Endangered Resource Reviews for the Hayward Project (ER Log #20-683) and Trego Project (ER Log #20-684) were completed on September 10, 2020. The ER Reviews identified potential threatened, endangered, and special concern species within the vicinity of each Project.

In conjunction with development of the DLA, the Licensee will provide an analysis of the vegetation cover types within each Project boundary and potential Project impacts to listed species. If the analysis determines that listed species may be impacted by continuing Project operations, the Licensee will consult with WDNR (for state listed species) and FWS (for federally listed species) to propose mitigation measures. Mitigation measures may include options such as using the USFWS Step-by-Step Guidance to determine whether proposed activities may impact bald eagles, restricting vegetation management activities to occur outside of sensitive periods, or conducting surveys prior to conducting ground disturbing or vegetation clearing activities.

The presence of wild rice has been confirmed on Trego Flowage. Wild rice, while not a special concern, threatened, or endangered species, will be identified during the point-intercept plant survey conducted as part of the ATIS Study discussed in **Section I**. Other than the Wood and Blanding's turtle study discussed in **Section T**, and Mussel Study discussed in **Section L**, no other specific rare species surveys are being proposed by the Licensee.

O. Recreation Study – WDNR

NPS Comment(s):
Evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing with consideration of the different seasonal uses.

Methodology –
An inventory of recreation opportunities and facilities; determining recreation demand using field observations, user surveys, and focus groups; and estimating recreation needs based on the data gathered is consistent with generally accepted practices employed during hydroelectric licensing proceedings. Evaluating outdoor recreation facilities per the Architectural Barriers Act Accessibility Guidelines.

The area of focus for the recreation facilities condition assessment and demand analysis consists of existing targeted formal and informal recreation areas within the existing project boundaries. The Applicant proposes to change the Trego Lake project boundaries therefore it is important to include recreation facilities within the existing project boundaries in the evaluation of recreation needs and the proposed project boundary changes.

Study Sites

The facilities and recreation sites to be inventoried for the recreation study should include targeted developed recreation sites and an informal access site. The inventory should identify current use, current conditions, an any impacts the project might have on these. The study report should identify which Trego Lake recreation facilities would be omitted if the proposed project boundaries were approved.

Trego Lake: Recent permanent closures of two access sites east of U.S. Highway 53, one managed by NPS and the other, Wisconsin Department of Transportation, leaves the Trego Town Park as the only public access site to the headwaters. The only other remaining Trego Lake access is Trego Landing located mid-impoundment, approximately 1.75 miles away. These Trego sites are recommended for study:

- *Trego Town Park Landing*
- *Trego Landing*
- *Xcel's Trego Lake Canoe Access and nearby shoreline (possible angling)*
- *Xcel's tailwater fishing access (north and south)*

These Hayward Lake Sites are recommended for study:

- *Commission approved project recreation facilities including the canoe portage, carry-in access on the impoundment and informal shoreline fishing area.*
- *Hayward Lake Bartz's Bay; undeveloped and informal ice fishing access site off Chippewa Trail.*

Study Methods

This recreation study has four components: (1) Facility inventory and condition assessment, (2) recreational facilities accessibility assessment, (3) a recreation use and demand analysis, and (4) a recreation needs assessment.

Existing Facility Inventory, Condition Assessment

The existing facility inventory and condition assessment portion of this recreation study consists of two steps: (1) Site facility inventory and (2) field reconnaissance/condition assessment. The facility inventory and condition assessment inform the demand analysis and evaluates the condition of each of the facilities at the listed recreation sites. The inventories done in preparation for the 2021 Recreation Reports will form a base upon which to build more information.

Step 1- Site Inventory

The existing facility inventory should include identification and location of parking spaces, picnic units, boat ladings/ramps, bathrooms, and other facility components (e.g., informational signage). Informally created user trails and sites (i.e., sites along shorelines frequented by recreation users but not identified as designated facilities) will also be identified and assessed.

Step 2 - Field Reconnaissance/Condition Assessment

The field reconnaissance should include a physical condition inspection of existing recreation facilities and trails, as identified under Step 1. The reconnaissance should also identify observable use patterns and field verify if recreation amenities are constructed and in a condition that serves user needs. User created sites should be identified for observable use and wear patterns.

The following steps should be taken to complete the facilities inventory:

1. *Complete reconnaissance level field research: conduct fieldwork to create a detailed inventory on the conditions of existing recreation facilities and other user created sites within the study area.*
2. *Assemble the results and create maps of data collected in the field.*

The condition assessment will be qualitative based on a range of repair/replacement/ maintenance needs to acceptable appearance and function to evaluate the condition of recreation facilities. Photos should be taken of facilities, all signs, trailheads, etc., and cataloged based on feature type or location. Other user created sites with observable wear patterns within the project areas should be cataloged for further evaluation within the recreation study.

<u>Facility Accessibility Assessment</u>

The inventory of targeted sites should identify features that do not meet current Americans with Disabilities Act 9ADA) accessibility standards, Architectural Barriers Act (ABA), and Universal Design Principles as well as opportunities for modifications to improve accessibility.

<u>The Recreation Use and Demand Component</u>

The recreation Use and Demand Component of this Recreation Study consists of 6 steps: (1) observational survey; (2) visitor use questionnaire; (3) interviews with user/friend's groups and recreation providers; (4) review of research publications and existing information; (5) assessment of regional uniqueness and significance of the project area' primary recreation opportunities; and (6 regional demand assessment. The steps are described in more detail below.

Step 1 - Observational Survey

Observed recreation use occurring in the project areas based on observational surveys should be used to estimate existing use. Observational surveys should be conducted during seasons of use for each location e.g., winter surveys for ice fishing at Bartz's Bay on Lake Hayward. Timing and sampling frequencies should be based on estimated use levels and the surveys should be conducted at peak times during the day (e.g., peak angler time of day, dawn, and dusk; water skiing, afternoon), on different types of days (weekday, weekend, holiday, or opening of fishing season). The observation data that should be recorded includes vehicle counts, angler counts, counts of each type of watercraft (canoes, kayaks, pontoons, fishing, stand up paddleboards, tubes), and day use/picnic area usage.

Step 2 - Visitor Use Questionnaire

A concise questionnaire focusing on visitor use and experience should be mailed to Trego Lake riparian landowners and fielded at the identified recreation sites when people are most likely to be

present. The survey should be conducted during various days during the survey period including weekdays and weekend as well as holidays. A review of past visitor data should be assessed to determine appropriateness or target survey dates with considerations for current season use patterns and any potential unexpected conditions taken into account. The questionnaire should be crafted to collect information from recreationists about recreation, activity participation, accessibility needs, areas visited, group size, user conflicts, perceived crowding, visitor profile, visual impressions, and satisfaction with or desire for recreational opportunities and facilities including levels and quality of interpretation and posted information in the project areas. The questionnaire should provide an opportunity for visitors to express any potential concerns over the current condition and future possibilities for recreation and recreation facilities in the project areas. Recommended questions for the questionnaire are provided at the end of the study request. The draft questionnaire should be shared with NPS and other interested stakeholders for comment.

Step 3 – Interviews with User Groups and Recreation Providers
Interviews should be conducted with a variety of identified regional and local recreation providers, user groups, and outdoor recreation tourism organizations associated with recreation in the project areas and in the project vicinity. Examples include Trego Lake District and the Chambers of Commerce and tourism organizations of local communities. These entities should be interviewed to gather additional information on current use, user preferences and needs, perceived regional uniqueness, and significance of recreation opportunities within the project areas, existing data, and observations in the project areas for both existing and potential future users.

Step 4 - Review of Research Publications and Existing Information
Recent relevant Wisconsin-based user preference surveys and other outdoor recreation surveys about recreation demand in the project areas should be gathered and reviewed. These include the most recent state and county recreational management plans identified in the PAD including the Wisconsin Statewide Comprehensive Outdoor Recreation Plans (SCORPs). The Applicant should also search for more current surveys that analyze the project and facility areas' outdoor recreation participation rates and growth needs in northern Wisconsin to help address how the project recreation facilities are helping to meet the demand of the greater area. This includes increasing population growth in the Twin Cities, Minnesota, Metropolitan statistical area, a two-hour drive, ecotourism and second home use trends. The newly created state Office of Outdoor Recreation in Wisconsin may provide contemporary information. Demand and user preference studies at various scales, covering Wisconsin, but especially those addressing northern sections of the state, should be reviewed for their applicability to the project areas. Recreation activity and participation trends information should be examined from the existing demand studies and reports.

Step 5 - Assessment of Regional Uniqueness and Significance of the Project Areas' Primary Recreation Opportunities
Regional uniqueness and significance of the project areas' primary recreation opportunities should be evaluated. Site-specific factors that contribute to the uniqueness of the project areas can inform the demand analysis and needs assessment. Where available, information should be gathered for sites including types of designation including water/canoe trail designation, types of

recreation opportunities available, visitation statistics (including information on visitor's origin), and general popularity for regional outdoor recreation areas.

Step 6 - Regional Demand Assessment
The recreation demand analysis should compare demand with the existing supply of recreation opportunities and use patterns. A gap analysis should be performed by comparing relative demand to supply, with consideration for trends and variations in user groups based on research and forecasts of population growth. By comparing this information to a detailed inventory of existing recreation opportunities and using information gathered in the observational surveys, visitor use questionnaires, structured interviews, and focus groups, it will be possible to determine whether there is a need for modifications to the existing facilities and/or for the development of additional facilities and recreation amenities.

Recreation Needs Assessment
A needs assessment is an analysis of all recreation-related study results. Consequently, the methods to complete the needs assessment consist of all the methods used to complete the elements of this Study Description as well as methods described in NPS study Request #3 Hydraulics, Sedimentation, and Channel Change Study (Trego).

Analysis
The information gathered by the recreation study will assess the suitability of facilities in terms of meeting the changing needs of recreation users in the project areas. The analysis will include developing existing and projected visitor-use estimates, along with existing and projected demand (including unmet demand) for recreational opportunities over the 40 to 50-year license term. The facility inventory assessment data collected should be analyzed to identify short and long-term improvement needs over the term of the new license. The recreation demand analysis should provide relevant information about user preferences and needs are related to recreation facilities provided by the project. The draft recreation report should include recommendations for monitoring every 6 years of recreation use, visitor demand evaluation, and facility condition over the life of the license. A courtesy copy of the Draft (should) be shared with NPS and other interested stakeholders for comment.

TLD Comment(s):
The recreation study proposed by NPS will set the stage for future improvements or enhancements of recreation opportunities on Trego Lake. TLD is happy to support and be involved in developing the picture this study creates. In the past, the recreation survey used by Xcel and its agents relied on a questionnaire at the Trego Town Landing. However, the study method was too narrow. The people using the lake most frequently, those living around it, were not methodically surveyed. Studying this crucial issue, as part of Xcel receiving a 40-year license to continue operating the dam, would ensure the entire lake formed by the dam is available for a range of recreational activities.

WDNR Comment(s):
Evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing with consideration of the different seasonal uses.

Methodology – Desktop assessment, including a review of the State of Wisconsin 2019-2023 Statewide Comprehensive Outdoor Recreation Plan (SCORP), released in March 2019, public surveys, and existing recreational sites. This includes assessment of current uses, level of use, evaluation for additional recreational features.

NSPW Response:
NSPW is proposing to complete a recreation survey with four components: (1) facility inventory and condition assessment, (2) recreational facilities accessibility assessment, (3) a recreation use and demand analysis, and (4) a recreation needs assessment.

NSPW will conduct an inventory of recreation sites and facilities in the Hayward and Trego Project vicinity along with an assessment of each site's condition, accessibility, and amount of public recreational use. The surveys will include the following sites:

Hayward Project

- Canoe Portage Take-Out and Carry-In Access
- Canoe Portage Put-in
- Informal Bank Fishing Area
- City of Hayward Boat Landing
- City of Hayward Beach
- Bartz's Bay Informal Ice Fishing Access

Trego Project

- Town of Trego Park
- Town of Trego Boat Landing
- North Tailwater Access (Canoe Portage)
- South Tailwater Access

Visitor use questionnaires will be distributed to recreationists encountered during onsite surveys. In order to gather information from riparian owners, NSPW will provide the visitor use questionnaire to the Lake Hayward Property Owners Association (Hayward Project) and Trego Lake District (Trego Project) for distribution to their members. Questionnaires will also be distributed to the City of Hayward, Hayward Area Chamber of Commerce, and Sawyer County for the Hayward Project and the Town of Trego, Trego Lake District, and Washburn County for the Trego Project. The questionnaire will gather information on current recreational use, user preferences and needs, perceived regional uniqueness, significance of recreation opportunities within the Project areas, existing data, and observations from recreationists.

The Recreation Study Report will include a recreation needs assessment and analysis of data collected during the study. The study plan and study report will be distributed to interested stakeholders for comment. Stakeholder comments will be addressed in the final study plan and final study report. The recreation study will be completed in 2022.

P. Sedimentation, Hydraulics and Channel Change Study at Trego Dam – NPS, TLD, WDNR

NPS Comment(s):

The NPS requests a study to evaluate the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology. The primary goal of this study is determine whether the area proposed for removal from the Trego boundary in the vicinity of the US highway 53 bridge is influenced by project operations and is needed for project purposes such as public recreation, shoreline control, or protection of environmental resources…this proposal will characterize changes in channel planform and shoreline position; update the 1989 WI DNR Study, Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage and bathymetry available from 1966; and build upon this existing data to determine the effects of continued hydropower project operations on sedimentation and flooding in the Namekagon River and Trego lake. Study results will also help inform recommendations related to potential flooding and ongoing management activities (e.g., dredging and vegetation management) that are used to mitigate sediment deposition, the growth of nuisance and invasive aquatic vegetation and related loss of recreation access particularly under changing climate scenarios.

Methodology

The NPS recommends conducting a study to update existing data on the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology in the Namekagon River upstream of Trego Lake. The study consists of four components: (1) analysis of existing aerial imagery; (2) collection of bathymetric data; (3) hydraulic modeling; and (4) synthesis.

Specific tasks and proposed standard methods include the following:

1. *Channel and shoreline change analysis:*
    a. *Evaluate aerial imagery for the period of record, available from the University of Wisconsin map library, to evaluate change in the channel planform and shoreline position through time along the reservoir and upstream from the U.S. Highway 53 bridge. Channel margins and reservoir shoreline should be digitized using geographic information system (GIS) software and applying standard methods (Givear and Bryant, 2003).*
    b. *Quantify information on patterns in sediment deposition, bank/shoreline erosion, delta growth, and changes in aerial extent of aquatic vegetation through time.*
2. *Bathymetric survey and analysis:*
    a. *Acquire a sufficiently detailed channel and lake bathymetry upstream from Trego dam to evaluate changes in bed elevation and support subsequent hydraulic modeling. Bathymetric data should be acquired using single-beam sonar integrated with GNSS positioning system and be integrated with existing Lidar to develop a high-resolution terrain model of the project area.*
    b. *Bathymetric transects should be compared to previous surveys to:*
        i. *Quantify volumes of sediment deposition and erosion that have occurred in the flowage since 1988 (WI, DNR 1989), and*

ii. *Estimate average rate of reservoir sedimentation since 1988 and compare this rate to the rates reported previously by WI DRN for the period from dam construction to 1988.*

3. *Hydraulic modeling and analysis:*
    a. *Using data obtained from the bathymetric survey, apply the US Corps of Engineers HEC-RAS model or similar to develop a one-dimensional hydraulic model extending a sufficient distance upstream from the US Highway 53 bridge to accurately model hydraulics through the project site including backwater effects due to the Trego hydropower project.*
    b. *Evaluate the effect of the project on flood inundation under alternative climate scenarios. Methodologies to evaluate the impact of increasing precipitation and rainfall intensity are evolving and should be selected in consultation with NPS.*
4. *Synthesis – The final study report should address the following licensing issues:*
    a. *Evaluate whether the upstream reach of the Namekagon River proposed for removal from the project boundary is impacted by the project and contributes to problems association with sediment deposition in the reservoir and/or channel; vegetation growth and loss of recreational access; and flood risk to existing infrastructure and public access areas.*
    b. *Recommend updates to management plans and activities for sedimentation and vegetation (e.g., existing license Article 405; Barr Engineering, 1994; and WIDNR GP-NO-2019-66-03813) and identify alternate methods to mitigate the impact of sediment deposition on aquatic plant growth, recreation access, and flooding.*
    c. *Evaluate the need for more detailed hydraulic and sediment transport modeling to quantify effects of sediment deposition on flood risk upstream from Trego dam.*

TLD Comment(s):

An average of 2000 cubic yards of sediment accumulate in Trego Lake each year, as NPS notes in its study request. Sediment creates an enormous issue for Trego Lake users and land owners. The information gathered in the NPS study would be invaluable to identify issues and develop actions to mitigate sediment build-up, control growth of aquatic plants including aquatic invasive species (AIS) resulting from sedimentation buildup and prevent the loss of recreational opportunities for people visiting the lake or living on the lake.

WDNR Comment(s):

Assess sedimentation upstream of Trego Dam near where the boundary is proposed to be removed.

Methodology

Sediment accumulation should be assessed and measured downstream of Hwy 53 through the project are that is being proposed for removal. Assessments of sediment deposits and sediment depth measurements can be collected along multiple transects, including the bay areas, north and west of Leisch Road.

NSPW Response:
An excerpt from the FERC Order Modifying and Approving Drawdown Needs Analysis issued October 31, 1995, stated:

> "*In a study by the COE, it was reported that soil loss from the Trego Flowage watershed was minimal and that sediment carried by the system was primarily generated from natural processes upriver of the project. The study concluded that the Namekagon River is exhibiting normal streambed erosion and was undergoing a natural transition from a meandering system to a braided system. Timber cutting on sloped land near tributary channels, construction activities, and recreational activities were cited as contributing to the sediment load. Presently, the Namekagon River carries very low quantities of sediment compared to other, similar sized Wisconsin river systems…These very low concentrations are consistent with the nature of this well protected river system. The sediment that is carried by the system also appears to be generated from mostly natural processes. The Namekagon River above the flowage is undergoing a natural transition from a meandering to a braided river channel. The COE study found that an average of 6 feet (145,000 cubic yards) of coarse-grained sediment accumulated in the 15-acre inlet area from 1927 through 1988. If deposited at a uniform rate over the 70-year period, approximately 2,000 cubic yards were deposited annually. This infilling rate was reported to be low when compared to other Wisconsin impoundments*."

Sediment deposition at the upper reaches of Trego Flowage is the result of natural processes upstream of the Project and is not attributed to Project operations (i.e., water level fluctuations). A similar process takes place where rivers enter a natural lake. Since the sedimentation is not caused by Project operations, the Licensee is not proposing to conduct a sediment study. The Cultural Resources Study, described in **Section F**, will identify eroding shoreline areas that may influence the amount of sediment within each Project boundary.

The Licensee will also gather information on aquatic and terrestrial vegetation, lakebed substrate, and water depths in conjunction with the ATIS Study described in **Section I**. Information collected will be utilized to develop updated vegetation and bathymetric maps of the reservoir. This information will be utilized to evaluate potential recreational impacts caused by excessive vegetation and/or low water depths as well as develop mitigation measures if needed.

NSPW is not proposing to conduct any hydraulic modeling of portions of the Namekagon River upstream of the maximum operational elevation of 1035.2 feet NGVD as identified in LiDAR mapping. The run-of-river operation does not have a noticeable effect on river hydraulics at elevations above the licensed operational range. Hydraulic effects are driven primarily by the volume of inflow, not the operation of the Project.

Q. Shoreline Survey – NPS, TLD

NPS Comment(s):
The NPS proposes a comprehensive shoreline study that involves a detailed inventory of shoreline erosion, erosion controls, docks, and aquatic vegetation limiting recreational access to

the shoreline within the project boundaries. The objective of this study is to determine the existing shoreline conditions and to provide the basis for making recommendations for protecting and enhancing the project shorelines.

Study Method 1- The NPS recommends conducting a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still). The High-definition Stream Survey (HDSS method (Trutta, 2019) is one method used in recent FERC hydropower licensing proceedings, which enables mapping and a visual record of stream and shoreline characteristics and data from a variety of sensors. The approach has been used to classify streambank condition, ranging from fully functional, functional, slightly impaired, and non-functional (Connell et. al, 2019) It has been used to classify unique manmade or natural features based on type, condition, and location similar to Yetman (2001) and could be used to identify sedimentation features such as in channel bars, vegetated islands, and in channel vegetation. In addition, the approach has also been used with side scan sonar to creation cross sectional bathymetric transects. Such an approach could also be integrated in the NPS requested sediment study.

Evaluate, quantify, photograph, and map shoreline conditions on the Hayward and Trego Project boundary shorelines including:

- *Streambank condition*
- *Bank stabilization types and condition*
- *Docks/piers*
- *Public access locations*
- *Presence/extent/type of aquatic vegetation (especially nuisance and invasive plants, but also highly valued wild rice)*

Objectives include:

1. *Create georeferenced photographic database and map of shoreline conditions.*
2. *Identify areas in need of management attention for shoreline erosion, cultural resource protection, vegetation management, and public access.*
3. *Facilitate evaluation of change over time to ensure protection of visual/scenic/aesthetic, recreation, cultural, and natural resources.*
4. *Facilitate communication between the licensee, NPS, shoreline property owners and local jurisdictions about shoreline protection practices and NPS Wild and Scenic River Act Requirements to review shoreline treatments and to protect and enhance river values.*

Study Method Part 2

In addition, the NPS recommends that the licensee review its records to document changes in shoreline conditions on lands owned by the licensee within the project boundaries that have occurred over the life of the current licenses.

Objectives include:

1. *Compare existing shoreline conditions with past conditions available from the licensee's records.*
2. *Create a list and brief description of shoreline stabilization and other construction projects conducted by the Licensee.*
3. *Identify where consultation with the NPS was conducted for licensee activities.*

TLD Comment(s):

The shoreline survey will identify erosion problem areas and aquatic vegetation on Trego Lake. As we note, sedimentation is a crucial issue, likely driven by erosion and resulting excessive aquatic vegetation. Studies will help us understand as we mitigate these issues.

TLD respectfully requests a more comprehensive look at sediment sources. Specifically, we ask you to extend the shoreline study to cover the Namekagon River between Hayward and Trego. This will help determine if the amount of sediment entering Trego Lake has increased and identify sources of sediment. This coupled with NPS study request #3 will provide a greater overall picture of sediment problems. With this information mitigation actions can be reviewed and developed to improve recreational opportunities for Trego Lake and the Namekagon River.

NSPW Response:

In the Cultural Resources Study described in **Section F**, NSPW will monitor the Project shoreline for erosion. This study will also identify failing shoreline stabilization measures. Erosion sites and failing shoreline stabilization measures will be evaluated to determine if they are caused by project operations. This study will include all shorelines within either the current or proposed project boundaries which are also defined as the APE for each Project. No study of areas outside of the APE will occur because these areas are not influenced by project operations. Neither the Licensee nor FERC have the responsibility or authority to conduct mitigation in areas not affected by the Project operations.

NSPW owns a limited amount of land at each Project. Those lands owned by NSPW are primarily adjacent to the Project dams. The company-owned shorelines will be evaluated along with the rest of the Projects' shorelines when the Cultural Resources Study is conducted. No private docks are currently authorized on NSPW-owned shoreline at either Project. It is NSPW's policy that riparian owners may install docks on project shorelines following WDNR regulations. No permits or authorization from NSPW are required. Therefore, NSPW will not be collecting information regarding docks within the Project boundaries.

The condition of public access sites will be evaluated as part of the Recreation Study described in **Section O**. Information on aquatic vegetation will be collected in conjunction with the ATIS Study described in **Section I**.

The Hayward and Trego Projects are subject to Section 12 of the Federal Power Act regarding the safety of hydropower projects and project works. FERC is the lead federal agency which has oversight regarding dam safety and corresponding construction projects conducted over the term of the license. Since the NPS does not have authority over these projects, the Licensee is not required to consult with NPS regarding construction projects conducted under Part 12. Therefore, the Licensee will not be providing a list of construction projects conducted over the term of the current license and whether or not NPS was consulted on said projects. All construction projects at the Projects are completed in compliance of each Project's applicable Programmatic Agreement and/or Cultural Resources Management Plan.

NSPW believes that the information regarding shoreline erosion and failing shoreline stabilization measures described under the Cultural Resources Study described in **Section F** and the vegetation information to be collected under the ATIS Study described in **Section I**, along with the Recreation Study described in **Section O**, will provide sufficient information regarding the current condition of the shoreline at each Project. Therefore, the Licensee is not proposing a separate shoreline study as proposed by NPS and TLD.

R. Water Quality Study – WDNR

WDNR Comment(s):

The operation of the dam affects the water quality of the impoundment and downstream resources. The overall goal of the request is to further understand the current water quality conditions of the reservoir and river resources which will help inform management decisions in the future. Limited water quality data presented in the PAD is not representative of current or future water quality conditions.

Assess and monitor the following water quality parameters:

Ammonia	*Alkalinity*	*Bacteria*
Chloride	*Chlorophyll-a*	*Color*
Conductivity	*Cyanobacteria*	*Dissolved Oxygen*
Dissolved Phosphorus	*Iron, Manganese, and Sulfide*	*Methyl Mercury*
Nitrate (plus Nitrite)	*pH*	*Secchi Depth*
Sediment Accumulation	*Sulfate*	*Temperature*
Total Mercury	*Total Nitrogen*	*Total Phosphorus*
Total Suspended Solids		

Methodology – The department classifies Hayward Lake as an impounded flowing water, where a water residence time is less than 14 days… The department classifies Trego Lake as an impounded flowing water, where a water residence time is less than 14 days… This means that river monitoring protocols should be applied instead of lake protocols upstream of the impounded area and downstream of the dam. Lake protocols should be applied within the deep hole of the impounded area.

River monitoring methods (including continuous monitoring) should be performed in at least three locations within the project area (or best appropriate location), including one location downstream of the dam, one location within the impounded area (within the deep area of the impoundment, typically near the dam), and one location upstream of the impounded area.

Data should be collected or analyzed using the DNR WISCALM Guidance, surface water grab sampling protocol. And the Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures 2020).

NSPW Response:

NSPW will complete the water quality monitoring for the parameters outlined by WDNR with the exception of methyl mercury. WDNR indicated that dam operations can influence the sulfur and

ultimately the mercury cycle where sulfate runoff can acidify the water and enhance methyl mercury concentrations in water and methyl mercury in fish. Since testing of total mercury levels in water will identify elevated mercury levels, no fish tissue sampling is being proposed by NSPW. The water sampling will be conducted according to WDNR WISCALM Guidance and surface grab sampling protocols. The following parameters will be monitored:

Upstream and Downstream Monitoring Locations (River Sampling Protocol)

- Ammonia, bacteria, chloride, dissolved phosphorus, nitrate (plus nitrite), sulfate-total mercury, total nitrogen, total phosphorus, and total suspended solids will be collected at each of the sampling sites monthly from May to October (6 total).
- Chlorophyll-a will be collected at each of the sites monthly from July through September (3 total).
- DO, temperature, conductivity, and pH will be collected at each of the sites hourly from July through September.

Impoundment (Deep Hole) Monitoring Location (Lake Sampling Protocol)

- Alkalinity, ammonia, bacteria, chloride, dissolved phosphorus, iron, manganese and sulfide, total phosphorus, secchi depth and total suspended solids will be collected at each of the sampling sites in May, July, August, and September (4 total).
- DO and temperature profiles at 1 m intervals will be collected at each sampling site in May, July, September, and October (4 total).
- Chlorophyll-a and cyanobacteria will be collected at each of the sites monthly from July to September (3 total).
- Ammonia, color, nitrate plus nitrite, and total nitrogen will be collected at each of the sites once between July and September (1 total).
- Sulfate and total mercury will be collected once in May (1 total).

The study plan and study report will be distributed to interested stakeholders for comment. Stakeholder comments will be addressed in the final study plan and final study report. Study implementation will be completed in 2022.

S. Wildlife Habitat Study – WDNR

WDNR Comment(s):

Document wildlife presence and diversity, habitat types, and general wildlife and vegetation abundance within the project area. The goal of this study is to evaluate the distribution and composition of vegetation, wildlife, and wildlife habitats, including wetlands, and the effects operations has on those habitats.

The department has concerns for otters, furbearers, and other wildlife if water levels are not managed similar to current operations. Turtles, frogs, and other herps would be negatively affected if water levels are drawn down after October 1st.

Methodology – Using a qualified biologist or ecologist knowledgeable in local vegetation, identify, classify, and delineate on a map major vegetation cover types within project area. Existing aerial

photography, on the ground surveys, or a combination of the two to identify and map the cover types may be used the biologist/ecologist will record all wildlife present. Ground-truth any remote-sensing mapping efforts and record all wildlife species detected (directly or indirectly) during survey efforts. Describe each cover type by species composition, successional state, and aerial extent (acreage) within the survey area, including invasive species. As an example, the methodology expressed the following reference could be used: https//www.fs.fed.us/research/publications/gtr/gtr_wo89/gtr_wo89.pdf.

NSPW Response:
NSPW will determine the dominant cover type of lands within the Hayward and Trego Project boundaries via a combination of remote-sensing and ground truthing in the field. GIS mapping will be used to determine the areal extent of each cover type and an analysis of the differences in cover types between the lands within the existing and proposed boundaries will be completed. This information will be provided in the DLA.

NSPW is not proposing any changes to the operation of the Projects that would impact upland wildlife or upland wildlife habitat. No nexus between the Projects' operations and wildlife management has been established by the WDNR. Therefore, no wildlife observation surveys are being proposed by NSPW. A terrestrial vegetation component was incorporated into the ATIS Study discussed in **Section I**.

T. Wood Turtle and Blanding's Turtle Studies – WDNR

WDNR Comment(s):

Wood Turtles
Wood turtles are listed as threatened in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys, population modeling and natural nest site surveys are three examples of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The overall goal of this survey request is to determine whether any wood turtle nest sites occur within the Project boundary at either Hayward or Trego.

Methodology – Using a qualified biologist or ecologist, wood turtle nesting site surveys are requested following the protocol listed below.

> *Wood Turtle Nesting Site Surveys: Beginning in early to mid-June, and extending until approximately the first week in July, wood Turtle nesting activity can be surveyed by conducting daily searches for adult wood turtles and/or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day late spring/summer and is within approximately 200 feet of the river's edge. Note that this can include gravel parking areas, roads, or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to a lack of suitable conditions.*

Blanding's Turtles

Goals and Objectives

Blanding's turtles are a Special Concern species in Wisconsin. In an effort to better understand the abundance and distribution of this species, we are requesting that Blanding's turtle surveys are conducted within the Hayward and Trego project boundaries. The overall goal of this survey request is to determine whether any Blanding's turtle nest sites occur within the project boundaries.

Methodology

Using a qualified biologist or ecologist, Blanding's turtle nesting site surveys are requested following the protocol listed below.

Blanding's turtle nesting site surveys: Beginning in early to mid-June, and extending until approximately the first week in July, Blanding's turtle nesting activity can be surveyed by conducting daily searches for adult Blanding's turtles and or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring/summer and is within approximately 200 feet of the water's edge. Note that this can include gravel parking areas, roads, or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to lack of suitable conditions for turtle nesting.

NSPW Response:

Wood and Blanding's turtles have been documented to be present within the Project vicinity. NSPW does not believe it is reasonable to conduct daily surveys for nesting turtles over the course of several weeks. Instead, NSPW proposes to conduct a survey to identify and map potential Wood and Blanding's turtle nesting habitat within each Project during the nesting season. The survey will be completed by traveling along the shoreline by boat or on foot (in areas where boating is not feasible) and on foot on Licensee owned lands with Project facilities (e.g., recreation sites, project structures, regularly maintained areas) where Project operations could impact nesting habitat. All areas with suitable nesting habitat will be identified and mapped. If any Wood or Blanding's turtles are identified during the surveys, their locations will be recorded via handheld GPS and a rare animal field report form will be completed and forwarded to WDNR. All specific turtle location information will be considered privileged and will not be publicly released. Once a map showing suitable Wood and Blanding's turtle nesting habitat within the Project is created, the Licensee will consult with WDNR to identify proposed mitigation measures to minimize or eliminate impacts. Information collected during the study and any proposed mitigation measures will be included in the DLA.

The study plan and study report will be distributed to interested stakeholders for comment. Stakeholder comments will be addressed in the final study plan and final study report. The Wood and Blanding's Turtle Nesting Habitat Study will take place in 2022.

TABLE 1: Study Commitments and Timing

Commitment	Explanation	Time of Implementation
Aquatic Plant Study (Completed as part of ATIS Study)	Will be completed as part of Aquatic and Terrestrial Invasive Species (ATIS) Study.	NA
Assessment of Current Dam Operations	Conduct assessment of current dam operations.	2022
	Include information in DLA.	2023
Assessment of Minimum Flow and Resource Impacts Downstream of the Tailwater	Not proposing to complete this study.	NA
Assessment of Riverine and Reservoir Habitat	Will be completed as part of ATIS Study.	NA
Assessment of Stream Flows, Channel Dimensions, and Linear Gradient	Not proposing to complete this study.	NA
Cultural/Historic Resources Study	Finalize study plan.	2021
	Conduct shoreline survey and provide study report to interested stakeholders for comment.	2022
	Finalize study report and include in DLA.	2023
Fisheries Study (Trego)	Not proposing to complete this study.	NA
Fish Entrainment and Fish Movement Study	Not proposing to complete this study.	NA
Invasive Study (Aquatic and Terrestrial)	Finalize study plan.	2021
	Complete study and provide study report to interested stakeholders for comment.	2022
	Finalize study report and include in DLA.	2023
Macroinvertebrate Study	Not proposing to complete this study.	NA
Mink Frog Study	Not proposing to complete this study.	NA
Mussel Study	Finalize study plan.	2021
	Complete study and provide study report for comment to interested stakeholders.	2022
	Finalize study report and include in DLA.	2023

Commitment	Explanation	Time of Implementation
Project Boundary Change Study	Analyze differences of lands in each proposed and existing Project boundary.	2022
	Include information in DLA.	2023
Rare and Endangered Species Study	Evaluate cover types within project to determine potential rare species impacts.	2022
	Include information in DLA.	2023
Recreation Study	Finalize study plan.	2021
	Conduct study and provide study report to interested stakeholders for comment.	2022
	Finalize study report and include in DLA.	2023
Sedimentation Hydraulics, and Channel Change Study at Trego	Components of this study request will be conducted in conjunction with the ATIS Study and Cultural Study. No stand-alone study is proposed.	NA
Shoreline Survey	Components of this study will be conducted in conjunction with the ATIS Study, Cultural Study, and Recreation Study. No stand-alone study is proposed.	NA
Water Quality Study	Finalize study plan.	2021
	Complete water quality monitoring.	2022
	Include information in DLA.	2023
Wildlife Habitat Study	Assess cover type information.	2022
	Include information in DLA.	2023
Wood and Blanding's Turtle Study	Finalize study plan.	2021
	Complete study and send report to interested stakeholders for comment.	2022
	Finalize study report and include in DLA.	2023

3. Literature Cited

Federal Energy Regulatory Commission. 1995. Order Issuing Subsequent License (Minor Project) Northern States Power Company, Project No. 2417-001. Issued September 1, 1995.

Federal Energy Regulatory Commission. 1997. Northern States Power Company Project No. 2417-013, Order Approving Channel Restoration, Stabilization, and Maintenance Plan. Issued February 24, 1997.

Kleinschmidt, 2016. Chippewa River Fish Projection Study. Holcombe Project (FERC No. 1982), Cornell Project (FERC No. 2639), Jim falls Project (FERC No. 2491), Wissota Project (FERC No. 2567), Chippewa Falls Project (FERC No. 2440), Dells Project (FERC No. 2670). November 2016.

Northern State Power Company-Wisconsin. (1991). Application for a Subsequent License for a Minor Water Power Project. Hayward Hydroelectric Project, FERC Project No. 2417. December 1991.

Appendix 1. Study Request Letters

Appendix 1
Comments on PAD and Study Requests

United States Department of the Interior
NATIONAL PARK SERVICE
Interior Regions 3, 4, 5
601 Riverfront Drive
Omaha, NE 68102

April 27, 2021

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC. 20426

Electronic Filing

Re: National Park Service Comments on the Preliminary Application Document and Study Requests for Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711)

Dear Secretary Bose:

The National Park Service (NPS) respectfully submits the following comments on the Preliminary Application Document (PAD) for the Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711). The NPS is also submitting the following study requests: 1)Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego).

The NPS has authority to consult with the Federal Energy Regulatory Commission (FERC) and applicants concerning a project's effects on outdoor recreation resources under the Federal Power Act (18 CFR 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (Pub Law 88-29), and the NPS Organic Act (39 Stat. 535), and the National Wild and Scenic Rivers Act (Section 11(b)). The projects are located on the Namekagon River within the St. Croix National Scenic Riverway, a unit of the National Park System.

The St. Croix National Scenic Riverway (SACN) was established when the enabling legislation, the Wild and Scenic Rivers Act, was signed into law on October 2, 1968. The purpose of the St. Croix National Scenic Riverway is to preserve, protect, and enhance the values of the St. Croix and Namekagon rivers and their immediate environment for the benefit and enjoyment of present and future generations. The values for which the Riverway has been designated as a wild and scenic river are its free-flowing character, exceptional water quality, and the aquatic, riparian, recreational, cultural, geologic, and scenic-aesthetic values present in the rivers.

In addition to the NPS's responsibility to manage the SACN according to national wild and scenic river policies and best management practices, it is the policy of the NPS to represent the national interest regarding recreation to assure that hydroelectric projects subject to the FERC

licensing process incorporate the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. Investigating opportunities to improve the recreation experience is consistent with NPS policy and FERC guidelines to identify potential future recreation needs.

We submit the following comments on the PAD and the three study requests, attached as appendices.

A. NPS COMMENTS ON THE PAD

3.3.2 Trego Project Boundary (Proposed)

The PAD states:

The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary.

This characterization of the impacts of the project is misleading and is not technically correct. Although FERC regulations link impoundment boundaries to the maximum operating elevation, the regulations also recognize the potential need to include other areas for project purposes, such as public recreation, shoreline control, or protection of environmental resources. The effects of the project are related to velocity, gradient (or slope) and hydraulic head. Those effects extend well beyond the maximum operating elevation. The NPS is requesting a study to determine whether the upstream reach is impacted by the project and is needed for project purposes.

4.8 Recreation and Land Use

The Applicant recently provided a 2021 "Draft Recreation Report" for each impoundment as required every six years throughout the 30-year license period. The applicant proposes to use information from these reports for relicensing purposes and proposes not to conduct a recreation study.

The 2020 Wisconsin Outdoor Recreation Economy Report found a 12% increase in outdoor recreation use and spending between 2012-2017 while overall state Gross Domestic Product grew by 7%. However, there is no *current* detailed user information for either impoundment in the Draft Recreation Report(s) that reflects this trend in increased recreation. While we agree that the Draft Recreation Reports adequately provided the *condition* of existing formal recreation facilities, the NPS finds the methodology used to determine *recreation use* in the 2021 reports insufficient for determining baseline information, mitigation and enhancement measures for the new 40-year license application.

We provided these comments regarding the 2021 reports in anticipation of relicensing activities:

> We have concerns that the methodology used to determine recreation use in 2020 may not adequately reflect current user demand since annual recreation counts were based on information collected in 2013–2014 and extrapolated using population trends.
>
> The 2013-2014 daytime recreational use information is an estimate "extrapolated from multiple sources including trail counters, estimates from outfitters, NPS usage numbers, and estimates from overnight facilities." It is not clear how trail counters related to water-based impoundment recreation use; if outfitter estimates referred to impoundment and/or river use; and if NPS usage numbers referred to impoundment and/or river use. In addition, extrapolation for 2020 recreation estimates using population change estimates may not adequately reflect outdoor recreation trends over the period. Outdoor recreation use has increased significantly over the past decade in all regions of the state, likely outpacing population growth estimates for the three local counties for which the average population increase rates was used for extrapolation.

In addition to our prior comments, the report(s) lack important information such as opportunities to modify existing facilities to improve accessibility, dispersed/informal recreational use, and the closure of two access sites that may be within the undefined existing project boundary for Trego Lake. Please note that we use existing place names of "Trego Town Park" for the access site east of Highway 53 and "Trego Landing" for the access site midway on Trego Lake's south side. We recommend including the following recreational components as part of relicensing:

- Recent closure of two paddle craft access points – the popular Wisconsin Department of Transportation site on the south side and the NPS site on the north - located in the upper impoundment area upstream/East of Highway 53 will likely divert recreational use to the Trego Park Landing, Trego Landing, or both. The impact of increased recreational pressure on the remaining two access sites has yet to be determined.
- On Hayward Lake, the popular winter recreation use of ice fishing and impacts of use on informal access were not evaluated in the report. The Hayward Recreation Report describes traffic congestion caused by parking on Chippewa Trail in winter when anglers seek to ice fish on Bartz's Bay. The congestion was identified as problematic and a recommendation was made to consider providing designated parking areas.
- On Hayward Lake, reference to the put-in downstream of the dam was omitted from the PAD and should be included in the study and report.

Lastly, the proposed boundary change excludes Trego Town Park and its landing, the sole remaining access site out of three that provides access to the upper impoundment. It is unclear from the PAD maps if this park and landing are within the existing undefined project boundaries. We note that contemporary references (2021 Trego Recreation Report) and historic documents (described below) reference this site as important for recreational access *to the impoundment* as well as experiencing project impacts of sedimentation and flooding.

Historical reports on sediment deposition in the headwaters of Trego Lake document that these sediments impact access to existing boat launches at Trego Town Park and the resort and campground across the river, both located upstream of Highway 53:

> "Although accessibility would generally be improved it is likely that in certain areas, such as that near immediately above the resort and at the site near the mouth of the bay area opposite the resort, additional sediment would have to be physically removed to achieve desired results" (Trego Flowage Study, Wisconsin Department of Natural Resources, 1989)
>
> "It is doubtful that deposition in the lake is only a recent problem. The photographs seem to indicate that the Delta extends a good way downstream of Rowan's Resort" (U.S. Army Corps of Engineers, Trego Flowage Study, WDNR 1989).

In response to the Applicant's questionnaire, the Town of Trego representative stated that the boat landing is unusable due to aquatic vegetation and that flooding recently impacted the Trego Town Park. Consequently, we include the Trego Park Landing in our Recreation Study and Hydraulics, Sedimentation, and Channel Change Study (Trego) requests to evaluate project related impacts and inform proposed boundary change decisions.

4.10 Historical and Cultural Resources

The NPS St. Croix National Scenic Riverway staff requests to be a formal consulting party with the State Historic Preservation Officer on the Programmatic Agreement addressing Section 106 of the National Historic Preservation Act.

5.1.2.2 Water Resources Trego Project

The PAD attributes flooding concerns raised by the Town of Trego to occasional ice jams in the vicinity of the Highway 53 bridge. This perspective fails to address the effects of continued sedimentation caused by the project on local river hydraulics and flooding. Annual precipitation and heavy rain events are expected to increase in Wisconsin over the life of the new license (NOAA, 2017). The NPS is requesting a study to evaluate the effect of the project on flood inundation under alternative climate scenarios.

NOAA National Centers for Environmental Information, 2017. Accessed 4/11/2021 https://statesummaries.ncics.org/chapter/wi/

5.3 Mitigation Enhancement

The Applicant proposes existing conditions of run-of-river operations, target elevations, minimum flows, and maintaining existing recreational access around their dams as mitigation and enhancement. We disagree with this definition because these measures are baseline standards: 1) run-of-river operation, target elevation, and minimum flows are required in the

State of Wisconsin's Clean Water Act Section 401permit, and 2) the existing Commission Approved Project Recreational Facilities and surrounding area are included in the existing license articles.

The NPS will use study report results to inform development of mitigation and enhancement recommendations for inclusion in the new license articles.

Corrections

Section 4.8.2.1: Correction on ownership of river landing. This site on the south side belongs to WisDOT and will be removed as part of Hwy 53/63 interchange project.

Figure 4.8.2.1-1: NPS River Access (South Side). Correct caption: This belongs to WisDOT.

Section 4.9.2.4: Correct the name of the visitor center to "Namekagon River Visitor Center"

Section 5.4: Include the St. Croix National Scenic Riverway General Management Plan (1998) as a Federal Comprehensive Waterway Plan; this plan was recently filed with FERC.

B. STUDY REQUESTS

The NPS submits as appendices the following study requests: 1) Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego).

C. CONCLUSION

The NPS appreciates the opportunity to provide comments on the PAD and request three studies for Hayward and Trego Hydroelectric Project relicensings. We look forward to working with the licensee, stakeholders, and FERC on this license application. For more information please contact Susan Rosebrough at susan_rosebrough@nps.gov or (206) 220-4121 should you have questions.

Sincerely,

RICHARD CLARK

Digitally signed by RICHARD CLARK
Date: 2021.04.27 15:33:32 -05'00'

Richard A. Clark
Deputy Regional Director

NPS STUDY REQUEST #1: RECREATION STUDY

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS proposes a multi-step focused recreation study; several aspects of these steps have already been completed as evidenced in the 2021 Recreation Report for each of the projects. In addition, the number of sites to be evaluated in this study is a subset of the total number of recreation facilities identified in the PAD and 2021 Recreation Reports.

The information from the comprehensive recreation study is necessary to determine potential future improvements to or new recreation facilities within the existing and proposed project boundaries. The objective of this recreation study is to determine the condition of certain existing recreational facilities, their capacity to address current and future user demand, user preferences, and to provide the basis for making recommendations for improving/enhancing recreation opportunities.

The first step involves a detailed inventory and assessment of targeted recreation facilities within the existing project boundaries to evaluate whether recreation needs are being met. These steps are followed by a demand analysis which contributes to the overall recreation study: comparing demand to the inventory and condition assessment and user preferences allows further evaluation of existing and projected recreation needs within the project areas. This recreation study will be comprised of the following elements for targeted sites:

1) Recreational Facility Inventory and Condition Assessment
2) Recreational Facilities Accessibility Assessment
3) Recreation Use and Demand Assessment
4) Recreation Needs Assessment

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS Organic Act; NPS General Authorities Act; Code of Federal Regulations, Title 36; Americans with Disabilities Act; Architectural Barriers Act; Rehabilitation Act; and NPS Management Policies 2006 (§1.4, 8.1) all address the importance of park units being available to all Americans to enjoy and experience.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System and is included in the St. Croix National Scenic Riverway. The NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and the Namekagon tributary in a natural condition, to protect and enhance the exceptional natural, scenic, and cultural resources of the riverway and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS, 2017).

The presence of the hydropower projects is recognized as the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values must be identified so that protection and enhancement measures can be implemented.

In addition, it is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. It is in the public interest to analyze impacts, provide mitigation to these impacts, and evaluate opportunities for recreation in the future. The FERC guidelines and the Federal Power Act also provide direction to give equal consideration to other non-hydropower resources including recreation. As federal agencies operating in the public interest, both NPS and FERC are charged with making resource management decisions based on sound information about public needs and interests including interests in recreation resources. (18 C.F.R. 4.61).

Criteria 3: Resource Agency Status of Requestor and Relevant Public Interest 18 CFR (§5.9(b)(3))

The National Park Service is a resource agency.

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§5.9(b)(4))

The PAD for each project provides information on developed recreation facilities within the existing project boundary including Commission Approved Project Recreation Facilities owned and maintained by the Applicant as well as facilities owned and managed by others. In addition, the Applicant recently prepared a "2021 Recreation Report" for each project. The PAD and Report include recreation facility condition descriptions; the Report includes estimates on recreation demand and needs based on estimates made in 2013.

The methodology used to determine recreation use in 2020 for the 2021 Reports likely do not adequately reflect current user demand because annual recreation counts were based on information collected in 2013–2014 and extrapolated using population trends.

The 2013-2014 daytime recreational use information is an estimate "extrapolated from multiple sources including trail counters, estimates from outfitters, NPS usage numbers, and estimates from overnight facilities. Extrapolation for 2020 recreation using population change estimates likely do not adequately reflect outdoor recreation trends over the period. Outdoor recreation use has increased significantly over the past decade in all regions of the state, outpacing population growth estimates for the three local counties for which the average population increase rates was used for extrapolation. In addition, recreation use influence by ecotourism – the Twin Cities, Minnesota, are a two-hour drive from Trego Lake - and second home use are not reflected in the average population growth of the three surrounding counties.

> "The Great Northwest Region has an abundance of natural resources such as Lake Superior, the Namekagon and St. Croix rivers, numerous inland lakes, and large forest blocks. Not surprisingly, tourism is a large and growing industry within the region. In addition to Wisconsin residents, visitors from the Twin Cities and surrounding suburban

areas, utilize the region's recreational resources. Seasonal home development, particularly along rivers and lakes, has increased dramatically within the region." (Wisconsin Statewide Outdoor Recreation Plan 2019-2023)

The PAD does not include recreational use impacts of recent or imminent permanent closures of two access sites in the upper Trego impoundment east of U.S. Highway 53, leaving only one, which experiences limited water access due to sedimentation/vegetation, in the upper impoundment. The PAD does not include the informal access to Bartz's Bay, a popular ice fishing area in Lake Hayward.

In addition, while the PAD identifies that Americans with Disabilities Act (ADA) needs are accommodated on the Hayward impoundment it does not identify opportunities for the disabled to access its tailwaters, nor Trego Lake and its tailwaters. These opportunities need to be identified to understand current and future user accessibility needs.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

A clear nexus exists between the project and recreational opportunities on the Hayward and Trego impoundments as the recreational facilities are located adjacent to the Project features and are used by visitors during their visit to the Project. Recreation is an important benefit of hydroelectric projects and FPA regulations require consideration for protection and enhancement of recreational opportunities. FERC's policies include ensuring that the ultimate development of recreation resources at licensed projects is consistent with area recreation needs and with the primary project purpose. To plan for future needs for recreation, data on existing recreation facilities and their needs and demands is necessary to make informed decisions about the development needs required through the term of the new FERC project license.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

An inventory of recreation opportunities and facilities; determining recreation demand using field observations, user surveys, and focus groups; and estimating recreation needs based on the data gathered is consistent with generally accepted practices employed during hydroelectric licensing proceedings. Evaluating outdoor recreation facilities per the Architectural Barriers Act Accessibility Guidelines is a common technique to establish the level of accessibility at outdoor recreation areas and recreation facilities.

The Applicant recently provided in the Recreation Reports (February 2021) for each project condition descriptions of Commission Approved Project Recreation Facilities as well as other facilities within the project boundaries. This study will identify additional information not provided in the Recreation Reports.

a. Study Area

The area of focus for the recreation facilities condition assessment and demand analysis consists of existing targeted formal and informal recreation areas within the existing project boundaries. The Applicant proposes to change the Trego Lake project boundaries therefor it is important to

include recreation facilities within the existing project boundaries in the evaluation of recreation needs and proposed project boundary changes.

b. Study Sites

The facilities and recreation sites to be inventoried for the Recreation Study should include targeted developed recreation sites and an informal access site. The inventory should identify current use, current conditions, and any impacts that the project might have on these. The study report should identify which Trego Lake recreation facilities would be omitted if the proposed project boundaries were approved.

Trego Lake: Recent permanent closures of two access sites east of U.S. Highway 53, one managed by the NPS and the other, Wisconsin Department of Transportation, leaves the Trego Town Park as the only public access site to the headwaters. The only other remaining Trego Lake access is Trego Landing located mid-impoundment, approximately 1.75 miles away. These Trego sites are recommended for study:

- Trego Town Park Landing
- Trego Landing
- Xcel's Trego Lake canoe access and nearby shoreline (possible angling)
- Xcel's tailwater fishing access (north and south)

These Hayward Lake sites are recommended for study:

- Commission approved project recreation facilities including the canoe portage, carry-in access on the impoundment, and informal shoreline fishing area
- Hayward Lake Bartz's Bay: undeveloped and informal ice fishing access site off Chippewa Trail

c. Study Methods

This recreation study has four components: (1) facility inventory and condition assessment, (2) recreational facilities accessibility assessment, (3) a recreation use and demand analysis, and (4) a recreation needs assessment.

1) Facility Inventory, Condition Assessment

The facility inventory and condition assessment portion of this recreation study consists of two steps: (1) site facility inventory and (2) field reconnaissance/condition assessment. The facility inventory and condition assessment inform the demand analysis and evaluates the condition of each of the facilities at the listed recreation sites. The inventories done in preparation for the 2021 Recreation Reports will form a base upon which to build more information.

Step 1 –Site Inventory

The existing facility inventory should include identification and location of parking spaces, picnic units, boat landings/ramps, bathrooms, and other facility components (e.g., informational

signage). Informally created user trails and sites (i.e., sites along shorelines frequented by recreation users but not identified as designated facilities) will also be identified and assessed.

Step 2 – Field Reconnaissance/Condition Assessment

The field reconnaissance should include a physical condition inspection of existing recreation facilities and trails, as identified under Step 1. The reconnaissance should also identify observable use patterns and field verify if recreation amenities are constructed and in a condition that serves user needs. Informal user created sites should be identified for observable use and wear patterns.

The following steps should be taken to complete the facilities inventory:

1. Complete reconnaissance level field research: conduct fieldwork to create a detailed inventory on the conditions of existing recreation facilities and other user created sites within the study area

2. Assemble the results and create maps of data collected in the field.

The condition assessment will be qualitative based on a range of repair/replacement/ maintenance needs to acceptable appearance and function to evaluate the condition of recreation facilities. Photos should be taken of facilities, all signs, trailheads, etc., and cataloged based on feature type or location. Other user created sites with observable wear patterns within the project areas should be cataloged for further evaluation within the recreation study.

2) Facility Accessibility Assessment

The inventory of targeted sites should identify features that do not meet current Americans with Disability Act (ADA) accessibility standards, Architectural Barriers Act (ABA), and Universal Design Principles as well as opportunities for modifications to improve accessibility.

3) Recreation Use and Demand Component

The Recreation Use and Demand Component of this Recreation Study consists of 6 steps: (1) observational survey; (2) visitor use questionnaire; (3) interviews with user/friend's groups and recreation providers; (4) review of research publications and existing information; (5) assessment of regional uniqueness and significance of the project areas' primary recreation opportunities; and (6) regional demand assessment. The steps are described in more detail below.

Step 1 – Observational Survey

Observed recreation use occurring in the project area based on observational surveys should be used to estimate existing use. Observational surveys should be conducted during seasons of use for each location e.g., winter surveys for ice fishing at Bartz's Bay on Lake Hayward. Timing and sampling frequencies should be based on estimated use levels and the survey should be conducted at peak times during the day (e.g., peak angler time of day, dawn and dusk; water skiing, afternoon), on different types of days (weekday, weekend, holiday, or opening of fishing season). The observation data that should be recorded includes vehicle counts, angler counts,

counts of each type of watercraft (canoes, kayaks, pontoons, fishing, Stand Up Paddleboards, tubes), and day use/picnic area usage.

Step 2 – Visitor Use Questionnaire

A concise questionnaire focusing on visitor use and experience should be mailed to Trego Lake riparian landowners and be fielded at the identified recreation sites when people are most likely to be present. The survey should be conducted during various days during the survey period including weekdays and weekend as well as holidays. A review of past visitor data should be assessed to determine appropriateness of target survey dates with considerations for current season use patterns and any potential unexpected conditions or events taken into account. The questionnaire should be crafted to collect information from recreationists about recreation, activity participation, accessibility needs, areas visited, user conflicts, perceived crowding and safety, visitor profile, visual impressions, and satisfaction with or desire for recreational opportunities and facilities including level and quality of interpretation and posted information in the project areas.

The questionnaire should provide an opportunity for visitors to express any potential concerns over the current condition of and future possibilities for recreation and recreation facilities in the project areas. Recommended questions for the questionnaire are provided at the end of the study request. The draft questionnaire should be shared with NPS and other interested stakeholders for comment.

Step 3 – Interviews with User Groups and Recreation Providers

Interviews should be conducted with a variety of identified regional and local recreation providers, user groups, and outdoor recreation tourism organizations associated with recreation in the project areas and in the project vicinity. Examples include Trego Lake District and the Chambers of Commerce and tourism organizations of local communities. These entities should be interviewed to gather additional information on current use, user preferences and needs, perceived regional uniqueness and significance of recreation opportunities within the project areas, existing data, and observations in the project areas for both existing and potential future users.

Step 4 – Review of Research Publications and Existing Information

Recent relevant Wisconsin-based user preference surveys and other outdoor recreation surveys about recreation demand in the project areas should be gathered and reviewed. These include the most recent state and county recreation management plans identified in the PAD including the Wisconsin Statewide Comprehensive Outdoor Recreation Plans (SCORPs). The Applicant should also search for more current surveys that analyze the project and facility areas' outdoor recreation participation rates and growth needs in northern Wisconsin to help address how the project recreation facilities are helping to meet demands of the greater area. This includes increasing population growth in the Twin Cities, Minnesota, Metropolitan Statistical Area, a two-hour drive, ecotourism and second home use trends. The newly created state Office of Outdoor Recreation in Wisconsin may provide contemporary information. Demand and user

preference studies at various scales covering Wisconsin, but especially those addressing northern sections of the state, should be reviewed for their applicability to the project areas. Recreation activity and participation trends information should be examined from the existing demand studies and reports.

Step 5 – Assessment of Regional Uniqueness and Significance of the Project Areas' Primary Recreation Opportunities

Regional uniqueness and significance of the project areas' primary recreation opportunities should be evaluated. Site-specific factors that contribute to the uniqueness of the project areas can inform the demand analysis and needs assessment. Where available, information should be gathered for sites including types of designation including water/canoe trail designation, types of recreation opportunities available, visitation statistics (including information on visitors' origin), and general popularity for regional outdoor recreation areas.

Step 6 – Regional Demand Assessment

The recreation demand analysis should compare demand with the existing supply of recreation opportunities and use patterns. A gap analysis should be performed by comparing relative demand to supply, with consideration for trends and variations in user groups based on research and forecasts of population growth. By comparing this information to a detailed inventory of existing recreation opportunities and using information gathered in the observational surveys, visitor use questionnaires, structured interviews, and focus groups, it will be possible to determine whether there is a need for modifications to existing facilities and/or for the development of additional facilities and recreation amenities.

4) Recreation Needs Assessment

A needs assessment is an analysis of all recreation-related study results. Consequently, the methods to complete the needs assessment consist of all the methods used to complete the elements of this Study Description as well as methods described in the NPS Study Request #3: Hydraulics, Sedimentation, and Channel Change Study (Trego).

d. Analysis

The information gathered by the recreation study will assess the suitability of targeted facilities in terms of meeting the changing needs of recreation users in the project areas. The analysis will include developing existing and projected visitor-use estimates, along with existing and projected demand (including unmet demand) for recreational opportunities over the 40 to 50-year license term. The facility inventory assessment data collected should be analyzed to identify short- and long-term improvement needs of the new license. The recreation demand analysis should provide relevant information about user preferences and needs as related to the targeted recreation facilities provided by the Project. The Draft Recreation Report should include recommendations for monitoring every 6 years of recreation use, visitor demand evaluation, and facility condition over the life of the license. A courtesy copy of the Draft be shared with NPS and other interested stakeholders for comment.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7)

The cost would be contingent on Applicant staff availability and/or the billing rate arrangement with the Applicant's consultants (rate is not known).

In summary, this recreation study would provide necessary information regarding the project-related recreation facilities, visitor use and demographics, demand and needs at targeted recreation facilities.

This study requests additional visitor counts and survey collection to adequately address existing use in the Project Vicinity and ensure that the results for each Recreation Area can be characterized. An alternative study on recreation has not been proposed.

Requested Survey Questionnaire

SECTION 1 - YOUR TRIP CHARACTERISTICS

1. On the enclosed map, please place an X on the location where you received this survey.

2. Below is a list of activities available. Please indicate:

(A) Which of these activities have you participated in **on your current visit** to the (area name)

(B) Which **ONE** of these activities is your **PRIMARY ACTIVITY** on this trip to the area?

ACTIVITY	(A) Participated in ON THIS TRIP (Check all that apply)	(B) PRIMARY ACTIVITY (Check only one)
Shoreline/tailwater fishing		
Fishing from a boat		
Motorized boating		
Non-motorized boating		
Swimming		
Picnicking		
Wildlife Viewing		
Other (specify)		

3. (A): Were there any activities that you and your group wanted to do on this visit to (area name) that you were not able to?

□NO

□YES

(B) If YES: What was it? _____ (open-ended)

(C) Which of the following reasons, if any, explain why you did not engage in the activity?

- ☐ Rules or regulations did not allow for activity
- ☐ Area was temporarily closed to the public
- ☐ Not enough time
- ☐ Safety concerns
- ☐ Not enough information about the activity
- ☐ Too crowded
- ☐ Difficult road or trail access
- ☐ No road or trail access
- ☐ Unsatisfactory conditions of facilities
- ☐ Resource damage due to overuse
- ☐ No facilities or services
- ☐ Bad weather
- ☐ Flooding or other natural hazard
- ☐ Other (please specify)

4. Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services?

- ☐ Yes
- ☐ No

If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in? (Please describe): _____

SECTION 2 - EXISTING CONDITIONS

5. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir? [Select one number for each or indicate it was not applicable to your visit.]

LOCATION/AREA

1) Not at all crowded 2) Slightly crowded 3) Moderately crowded 4) Very crowded
5) Extremely crowded (check box)Not applicable t the place you received this survey

	1	2	3	4	5	☐
In parking areas	1	2	3	4	5	☐
On the trails	1	2	3	4	5	☐
At a developed campground	1	2	3	4	5	☐
At a boat-in campsite	1	2	3	4	5	☐
While fishing from the shoreline	1	2	3	4	5	☐
While boating/fishing from a boat	1	2	3	4	5	☐

(B) If you felt crowded, did you modify your recreation plans because you felt crowded?
☐ YES ☐ NO

(C) If YES, what did you do?

☐ Moved to a new location ☐ Chose not to recreate

☐ Changed the time of day ☐ Continued with current plans

☐ Changed your activity ☐ Other:_____

6. During the planning process for your visit, how did the possibility of crowds affect your trip plans? (Please select one response)

☐ It did not affect my plans

☐ I visited at a time of day I thought would be less crowded

☐ I visited on a day of the week I thought would be less crowded

☐ I avoided places here I thought would be crowded today

☐ Other (please specify)

7 Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ NO ☐ YES. If YES, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)		
	Proximity	Loudness	Other (specify)
Motorized boaters	☐	☐	☐ _____
Non-motorized watercraft	☐	☐	☐ _____
Vehicles	☐	☐	☐ _____

8. How satisfied were you with the following **amenities** at this recreation facility/reservoir today.

***Important**: Please only circle a number for the items **that you used during your current visit** to this specific recreation facility/reservoir. Also, please **check** the "Did Not Use" box, if you did not use the item or it does not exist at the specific recreation facility.*

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very	Did Not Use	If you were dissatisfied for any reason, please explain why:
FACILITIES AND	Restroom	1	2	3	4	5	☐	
		1	2	3	4	5	☐	
	Picnic sites	1	2	3	4	5	☐	
		1	2	3	4	5	☐	
		1	2	3	4	5	☐	
	Trash receptacles	1	2	3	4	5	☐	

	Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied	Did Not Use	If you were dissatisfied for any reason, please explain why:
Vehicle parking areas	1	2	3	4	5	☐	
Boat launch parking area	1	2	3	4	5	☐	
Boat launch	1	2	3	4	5	☐	
Boat dock	1	2	3	4	5	☐	
Other:_____	1	2	3	4	5	☐	
Roads to the facility	1	2	3	4	5	☐	
Trails	1	2	3	4	5	☐	
Signage to the facility	1	2	3	4	5	☐	
Signage within the facility	1	2	3	4	5	☐	
Other:_____	1	2	3	4	5	☐	

9. How did you obtain information to plan your current trip? (Please select all that apply)

☐ Federal or State website

☐ City, local, or municipal website

☐ Xcel website

☐ Other websites

☐

☐ Maps, brochures, pamphlets

☐ Visitor bureaus/centers

☐ Previous visits

☐ Word of mouth

☐ Social media (e.g., Facebook, Twitter, etc.)

☐ Travel guides and tour books

☐ Newspaper/magazine article

☐ Radio/TV broadcasts

☐ Other (specify):

_____

SECTION 3 - ABOUT YOU

10. What is the ZIP code where you live or country if not in the United States?

ZIP code: _____ or, country (if not the United States):

11. What is your Age: _____.

12. What is your Gender? □ Male □ Female □ Non-binary

13. Which of these categories best indicates your race and ethnicity? Answer only for yourself. Please select **one or more**.

□ American Indian/Alaskan
□ Native Hawaiian/other Pacific
□ Black/African-American
□ Asian
□ Hispanic or Latino
□ Not Hispanic or
□ White
□ Don't know

14. Please let us know if you have any additional comments regarding your recreation experience during your visit: (contact information)

NPS STUDY REQUEST #2: SHORELINE SURVEY

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS proposes a comprehensive shoreline study that involves a detailed inventory of shoreline erosion, erosion controls, docks, and aquatic vegetation limiting recreational access to the shoreline within the project boundaries. The objective of this study is to determine the existing shoreline conditions and to provide the basis for making recommendations for protecting and enhancing the project shorelines.

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System; the river is part of the St. Croix National Scenic Riverway. Resource management goals are to protect and enhance free flow, water quality and outstandingly remarkable river values (values) that led to the designation of the river into the NWSRS in 1968. Values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS 2017).

The presence of the hydropower projects is recognized in the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values should be identified so that protection and enhancement measures can be implemented. In addition, the FERC guidelines and the Federal Power Act provide direction to give equal consideration to non-hydropower resources including scenic, recreational, and other environmental values of the project. As federal agencies operating in the public interest, both NPS and FERC are charged with making resource management decisions based on sound information about public needs and interests.

The NPS is responsible for reviewing shoreline protection measures that require Federal authorization to ensure that standards under Section 7 of the Wild and Scenic Rivers Act are satisfied. The applicable standard is that the project would not have a direct and adverse effect on the values for which the river was designated.

Criteria 3: Resource Agency Status of Requestor 18 CFR (§5.9(b)(3))

The NPS is a resource agency.

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§518 CFR.9(b)(4))

The PAD description of aesthetic resources/visual character is very broad and does not provide detail about the visual experience for recreational users, boating or fishing on the reservoirs. The PAD provides very general information about the current land use, vegetative cover, and amount of development of the shoreline. There is no specific mention of bank stabilization measures on the impoundments although photos of project facilities included in the PAD show rock rip rap on the dams and embankments including around the Hayward canoe access.

It appears there has been significant growth in the number of structures along the Trego impoundment within a limited area causing an increase in structure density. Cumulatively, these developments may change the scenic values for which the impounded segments of the Namekagon are managed:

- DNR, 1989 – Identifies approximately 120 homes, cottages, and resorts adjacent to the Trego flowage with development comprising 25% of the shoreline.
- C. Peterson, Trego Lake District, pers. Comm. March 26, 2021 – 240 residences on the lake; there are relatively few bank stabilization measures, including some 'walls'.

Aquatic vegetation management has been a continuing activity under the current license. There is no evidence of detailed mapping to document changes over time, although the PAD identifies additional species of aquatic invasive plants that were addressed in the current license and an increase in the presence of highly valued wild rice. Maps included in the required annual 'Purple Loosestrife' Monitoring Reports for Article 410 of the Hayward project are very general, using the 1964 bathymetric map as a base; these are insufficient to determining changes over time.

Shoreline surveys by qualified archeologists are planned in accordance with Historic Properties Programmatic Agreements for the Trego and Hayward projects. To date, periodic surveys have not identified erosion concerns. Including inventory of other shoreline resources as part of these periodic assessments may enhance efficiencies.

The NPS needs more detailed information on shoreline condition and changes to coordinate with the licensee, local jurisdictions, and landowners to address management needs within the Park, including the specific requirements associated with review of water resources projects on a Wild and Scenic River.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

The current licenses for Hayward and Trego include standard articles for the use and occupancy of project lands and waters. This gives the licensee authority to authorize measures such as riprap and small boat docks without approval by the FERC. However, such authorization must be consistent with the purposes of protecting and enhancing the scenic, recreational, and environmental values of the project (FERC, 2012). Although the project boundary does not include a shoreline buffer, the resources to be studied extend into the water and thus have a clear nexus to project operations.

The requested study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license.

Review of shoreline protection measures implemented by the licensee, such as the use of riprap and other construction as part of their robust program for dam safety in collaboration with the FERC Dam Safety Office, have not routinely included consultation with the NPS. The NPS has responsibility to review such water resources projects under Section 7 of the Wild and Scenic Rivers Act.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

Study Method Part 1 – The NPS recommends conducting a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still). The High-Definition Stream Survey (HDSS) method (Trutta, 2019) is one method used in recent FERC hydropower licensing proceedings, which enables mapping and a visual record of stream and shoreline characteristics and data from a variety of sensors. The approach has been used to classify streambank condition, ranging from fully functional, functional, slightly impaired, and non-functional (Connell et. al. 2019). It has been used to classify streambank modification in terms of native/unmodified, modified, and highly modified. It also has been used to classify unique manmade or natural features based on type, condition, and location similar to Yetman (2001) and could be used to identify sedimentation features such as in-channel bars, vegetated islands, and in-channel vegetation. In addition, the approach has also been used with side-scan sonar to create cross-sectional bathymetric transects. Such an approach could also be integrated in the NPS requested sediment study.

Evaluate, quantify, photograph and map shoreline conditions on the Hayward and Trego project boundary shorelines, including:

- Streambank condition
- Bank stabilization types and condition
- Docks/piers
- Public access locations
- Presence/extent/type of aquatic vegetation (especially nuisance and invasive plants, but also highly valued wild rice)

Objectives include:

1. Create georeferenced photographic database and map of shoreline conditions.
2. Identify areas in need of management attention for shoreline erosion, cultural resource protection, vegetation management, and public access.
3. Facilitate evaluation of change over time to ensure protection of visual/scenic/aesthetic, recreation, cultural, and natural resources.
4. Facilitate communication between the licensee, NPS, shoreline property owners, and local jurisdictions about shoreline protection practices and NPS Wild and Scenic River Act requirements to review shoreline treatments and to protect and enhance river values.

Study Method Part 2 – In addition, the NPS recommends that the licensee review its records to document changes in shoreline conditions on lands owned by the licensee within the project boundaries that have occurred over the life of the current licenses.

Objectives include:

1. Compare existing shoreline conditions with past conditions available from the licensee's records.
2. Create a list and brief description of shoreline stabilization and other construction projects conducted by the licensee.
3. Identify whether consultation with the NPS was conducted for licensee activities.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7))

Study Method Part 1 - The complete cost for field work, video production, classification and reporting can range from approximately $2,000 to $4,000/mile. The longer the segment surveyed decreases overall per mile costs, while the overall number of different classifications requested increases the per mile cost. An alternative study incorporating a comprehensive shoreline review and assessment has not been proposed.

Study Method Part 2 – This would likely require a few hours of staff time by the licensee.

References:

Connell, B. A., Ayers, P., Ludwig, A., Neff, K., & Parham, J. E. (2019). Georeferenced Video Mapping to Classify Streambank Erosion Susceptibility. *Journal of Spatial Hydrology, 15*(2).

FERC, Guidance for Shoreline Management Planning at Hydropower Projects, July 2012. Last accessed 3/31/2021 https://www.ferc.gov/sites/default/files/2020-04/smpbook.pdf

NPS St. Croix National Scenic Riverway, *Foundation Document*, 2017. Accessed 4/5/2021 https://www.nps.gov/sacn/learn/management/foundation-document.htm

Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021: https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850582&accessionnumber=20200410-5091

WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage,* May 1989. Accessed 3/27/2021 https://elibrary.ferc.gov/eLibrary/docinfo?document_id=13774147

Yetman, K.T. 2001. Stream Corridor Assessment Survey. Watershed Restoration Division Chesapeake & Coastal Watershed Services Maryland Dept. of Natural Resources Annapolis, MD.

NPS STUDY REQUEST #3: HYDRAULICS, SEDIMENTATION, AND CHANNEL CHANGE

Criteria 1: Study Description and Objectives 18 CFR (§5.9(b)(1))

The NPS requests a study to evaluate the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology. The primary goal of this study is to determine whether the area proposed for removal from the Trego boundary in the vicinity of the U.S. Highway 53 bridge is influenced by project operations and is needed for project purposes such as public recreation, shoreline control, or protection of environmental resources as described in FERC regulations (18 CFR 4.41(h)(2); 18 CFR 4.51(h)(2)); 18 CFR 4.61(f)). This proposal will characterize changes in channel planform and shoreline position; update the 1989 WI DNR study, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage* and bathymetry available from 1966; and build upon this existing data to determine the effects of continued hydropower project operations on sedimentation and flooding in the Namekagon River and Trego Lake. Study results will also help inform recommendations related to potential flooding and ongoing management activities (e.g., dredging and vegetation management) that are used to mitigate sediment deposition, the growth of nuisance and invasive aquatic vegetation and the related loss of recreation access particularly under changing climate scenarios.

Criteria 2: Resource Management Goals 18 CFR (§5.9(b)(2))

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and of the National Park System and is included in the St. Croix National Scenic Riverway. The NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and the Namekagon tributary in a natural condition, to protect and enhance the exceptional natural, scenic, and cultural resources of the riverway and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic resources, cultural resources, recreation, and scenic/aesthetic resources (NPS, 2017).

The presence of the hydro projects is recognized as the baseline condition for the National Wild and Scenic River designation. However, continuing impacts on resource values must be identified so that protection and enhancement measures can be implemented.

Criteria 3: Resource Agency Status of Requestor and Relevant Public Interest 18 CFR (§5.9(b)(3))

Requestor is a resource agency.

Criteria 4: Existing Information and Need for Additional Information 18 CFR (§5.9(b)(4))

The PAD presents information about prior studies identifying sediment sources and references studies that the sediment load is small compared with other WI rivers. However, the upper end of Trego Lake has experienced sedimentation issues and aquatic plant problems since at least the 1980s (US Corps of Engineers, as referenced by WI DNR, 1989). A 1989 evaluation of the sedimentation processes for the Trego flowage was conducted by the Wisconsin Department of Natural Resources. The 1989 study noted that without further action sedimentation problems in the inlet area, increased nuisance aquatic vegetation, and loss of recreational access would continue. The PAD includes comments from the Town of Trego and others stating that aquatic vegetation limits access to the Trego Town Park Landing upstream of U.S. Highway 53.

The PAD presents recent topographic data to justify proposed boundary changes. This raises questions about whether the upstream extent of the maximum operating elevation of the project has changed since the boundary was originally surveyed (either through reservoir sedimentation or floodplain deposition).

The PAD attributes flooding concerns raised by the Town of Trego to occasional ice jams in the vicinity of the Highway 53 bridge. This perspective fails to address the effects of continued sedimentation caused by the project on local river hydraulics and flooding. Annual precipitation and heavy rain events are expected to increase in Wisconsin over the life of the new license (NOAA, 2017).

Available information about sediment dynamics and bathymetry dates from the late 1980s and 1960s, respectively. Given continuing issues related to sediment deposition, the proposed boundary change, and changing climate conditions, updated bathymetric data and analysis is needed to evaluate the ongoing impacts of the hydropower project and provide the basis for making recommendations about hydraulic and sediment-related issues.

Criteria 5: Nexus to Project 18 CFR (§5.9(b)(5))

Reservoir sedimentation is a complex process that varies with watershed sediment production and mode of deposition. The impoundment of water associated with hydropower operations can lead to reduced flow velocities, alter sediment transport and deposition, and cause the formation of deltas at the upstream end of reservoirs. Formation of deltas may cause aggradation of sediment further upstream, elevate channel bed levels and increase flood risks. In addition, sedimentation in the reservoir can result in the establishment of nuisance aquatic vegetation and cause negative effects on recreational opportunities and access. Sedimentation and aquatic vegetation encroachment at the head of the reservoir above Trego dam have been an ongoing issue for more than 30 years. The licensee has worked cooperatively with all stakeholders under the current license to address these issues. The continuing need to address sediment-related issues under the new license requires thorough investigation.

Hydraulic and sedimentation studies can be used to answer questions pertaining to many aspects of a hydropower project including the effects on upstream and downstream geomorphic and ecological systems. Results will help determine whether or not the boundary change proposed in the PAD is justified and evaluate the need to update management plans and practices used to mitigate for ongoing impacts associated with sedimentation, such as growth of aquatic vegetation, loss of recreation access, and potential flooding.

Criteria 6: Study Methodology 18 CFR (§5.9(b)(6))

The NPS recommends conducting a study to update existing data on the effects of Trego hydropower project operations on river hydraulics, sediment transport, and channel morphology in the Namekagon River upstream of Trego Lake. The study consists of four components: (1) analysis of existing aerial imagery; (2) collection of bathymetric data; (3) hydraulic modeling; and (4) synthesis.

Specific tasks and proposed standard methods include the following:

1. Channel and shoreline change analysis:
    a. Analyze aerial imagery for the period of record, available from the University of Wisconsin map library, to evaluate change in channel planform and shoreline position through time along the reservoir and upstream from the U.S. Highway 53 bridge. Channel margins and reservoir shoreline should be digitized using geographic information system (GIS) software and applying standard methods (Gilvear and Bryant, 2003).
    b. Quantify information on patterns in sediment deposition, bank/shoreline erosion, delta growth, and changes in aerial extent of aquatic vegetation through time.

2. Bathymetric survey and analysis:
    a. Acquire a sufficiently detailed channel and lake bathymetry upstream from Trego dam to evaluate changes in bed elevation and support subsequent hydraulic modeling. Bathymetric data should be acquired using single-beam sonar integrated with GNSS positioning system and can be integrated with existing LiDAR to develop a high-resolution terrain model of the project area.
    b. Bathymetric transects should be compared to previous surveys to:
        i. Quantify volumes of sediment deposition and erosion that have occurred in the flowage since 1988 (WI DNR, 1989), and
        ii. Estimate average rate of reservoir sedimentation since 1988 and compare this rate to the rates reported previously by WI DNR for the period from dam construction to 1988.

3. Hydraulic modeling and analysis:
    a. Using data obtained from the bathymetric survey, apply the US Corps of Engineers HEC-RAS model (or similar) to develop a one-dimensional hydraulic

model extending a sufficient distance upstream from the U.S. Highway 53 bridge to accurately model hydraulics through the project site including backwater effects due to Trego hydropower project.

b. Evaluate the effect of the project on flood inundation under alternative climate scenarios. Methodologies to evaluate the impact of increasing precipitation and rainfall intensity are evolving and should be selected in consultation with the NPS.

4. Synthesis - The final study report should address the following licensing issues:
   a. Evaluate whether the upstream reach of the Namekagon River proposed for removal from the project boundary is impacted by the project and contributes to problems associated with sediment deposition in the reservoir and/or channel; vegetation growth and loss of recreation access; and flood risk to existing infrastructure and public access areas.
   b. Recommend updates to management plans and activities for sedimentation and vegetation (e.g., existing license Article 405; Barr Engineering, 1994; and WI DNR, GP-NO-2019-66-03813), and identify alternate methods to mitigate the impact of sediment deposition on aquatic plant growth, recreation access, and flooding.
   c. Evaluate the need for more detailed hydraulic and sediment transport modeling to quantify effects of sediment deposition on flood risk upstream from Trego dam.

Criteria 7: Level of Effort and Cost 18 CFR (§5.9(b)(7))

Although costs and level of effort depend on who would be conducting the work, a rough estimate is presented here:

- Channel and shoreline change analysis: $5,000
- Bathymetric surveys and analysis: $20,000 (this cost could potentially be reduced if combined with the longitudinal survey of the river and its banks, requested as part of the NPS Shoreline Survey.)
- Hydraulic modeling: $10,000
- Synthesis/Final report: 1-2 weeks of staff time.

An alternative study on channel changes and sedimentation has not been proposed. The NPS is potentially interested in partnering with the licensee and other stakeholders for a more comprehensive evaluation of hydropower power operations on river hydraulics, sediment transport, and channel processes, and the impacts on flooding, recreations uses and access, and the aquatic and riparian ecosystem.

References:

Barr Engineering, *Trego Flowage Macrophyte Survey and Vegetation Plan,* November 1994. Accessed 3/27/2021 https://tregolakedistrict.com/wp-content/uploads/2019/04/1994-Trego-Flowage-Lake-Plan.pdf

Gilvear, D. and Bryant, R., 2003, *Analysis of Aerial Photography and Other Remotely Sensed Data*, in Kondolf, F.M., and Piegay, H., Tools in Fluvial Geomorphology, John Wiley & Sons, Ltd. pp. 133-168.

NOAA National Centers for Environmental Information, 2017. Accessed 4/11/2021 https://statesummaries.ncics.org/chapter/wi/

University of Wisconsin Map Library. Accessed 4/08/2021 https://geography.wisc.edu/maplibrary/aerial-photography/

WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage,* May 1989. Accessed 3/27/2021 https://elibrary.ferc.gov/eLibrary/docinfo?document_id=13774147

WI DNR, General permit to maintenance dredge in a previous dredged area in Trego Lake, GP-NO-2019-66-03813, February 12, 2019. (Typo in permit, date corrected to February 12, 2020)

WI DNR, *Trego Lake - Washburn County, Wisconsin DNR Lake Map, Jun 1966.* Accessed 3/27/2021 https://dnr.wi.gov/lakes/maps/DNR/2712000a.pdf

TREGO LAKE DISTRICT

PO Box 184 TREGO WISCONSIN 54888

May 6, 2021

Ms. Kimberly D. Bose,
Secretary Federal Energy Regulatory Commission
888 First Street, NE
Washington DC. 20426

Electronic Filing

Re: Support of National Park Service Comments on the Preliminary Application Document and Study Requests for Hayward Hydroelectric Project (FERC Number P-2417) and Trego Hydroelectric Project (FERC Number P-2711)

Dear Secretary Bose,

The Trego Lake District Board of Commissioners supports the request for studies and comments by the National Park Service (NPS) regarding the Preliminary Application Document (PAD) for the Trego Hydroelectric Project (FERC Number P-2711). Trego Lake District encourages the completion of the three studies outlined in the NPS study requests: 1) Recreation Study (both projects), 2) Shoreline Survey (both projects), and 3) Hydraulics, Sedimentation, and Channel Change Study (Trego). See TLD Resolution attached.

Our comments on the proposed NPS studies will focus on their impact to Trego Lake and Trego Lake riparian owners who make up the membership of the Trego Lake District. Trego Lake District respectfully requests to be included in any future discussions regarding the finalizing of study plans.

Trego Lake is a 383-acre lake in Northwest Wisconsin created by the Trego Dam operated by Xcel Energy. Trego Lake offers a variety of activities to the general public including boating, canoeing/kayaking, fishing, swimming and other recreational activities. Trego Lake District (TLD) was first formed as an association in the 1980s but quickly was incorporated into a Lake District in 1989 for the protection and rehabilitation of Trego Lake. TLD is a local unit of government committed to improving and enhancing the lake and recreation by protecting fish, maintaining water quality, marking navigation channels, controlling weeds and aquatic invasive species, and reducing sedimentation buildup. TLD works to enhance the lake for the general public and riparian landowners. Trego Lake District includes the riparian landowners on Trego Lake from the Trego dam to U. S. Highway 53. We will review the NPS Study Requests in reverse order based on their importance to TLD.

Support of NPS Study Request #3: Hydraulics, Sedimentation, and Channel Change Study

An average of 2000 cubic yards of sediment accumulate in Trego Lake each year, as NPS notes in its study request[1]. Sediment creates an enormous issue for Trego Lake users and land owners. The information gathered in the NPS study would be invaluable to identify issues and develop actions to mitigate sediment

[1] WI DNR, *Evaluation of Sedimentation Processes and Management Alternatives in the Trego Flowage*, May 1989.

build-up, control growth of aquatic plants including aquatic invasive species (AIS) resulting from sedimentation buildup, and prevent the loss of recreational opportunities for people visiting the lake or living on the lake.

Since its creation, TLD has worked to address the sedimentation build-up and its impact on the lake. The sediment build-up creates recreational challenges for boating, making it impossible to access certain areas of the lake. Additionally, it has led to an increase in aquatic plant growth including AIS: curly leaf pond weed and hybrid/Eurasian water milfoil. Since a 1995 Federal Energy Regulatory Commission (FERC) modification of the Trego Dam license, Xcel Energy (in 1995 Northern States Power, NSP) and TLD have worked in partnership to improve recreation by harvesting aquatic vegetation that reduces the recreation opportunities of the lake for all and particularly impedes residents from fully utilizing the value of Trego Lake. TLD organizes the harvesting and Xcel pays for one harvest per year. The cost varies: $2500 in 2020 to $8000 in 2019, depending on service availability and time of harvest.

For over 35 years, TLD has been addressing sediment build up in the lake. Management of sediment and aquatic vegetation is an ongoing problem that was considered as part of the current license for Trego Dam and should be considered in its relicensing. A variety of options have been discussed including drawdowns, sediment traps, and dredging. In 2016, after a number of years developing a workable proposal, TLD was able to dredge channels to allow for a variety of power boat traffic. During this process, TLD worked with and received permits and/or approval from the various oversight agencies including: Wisconsin Department of Natural Resources (WDNR), Army Corps of Engineers, NPS, tribes and others. Landowners in the area and others recreating on Trego Lake were able to easily access the full lake. After a significant rain event 2 years later, the channels filled in creating problems accessing the lake. The TLD has recently purchased a small suction dredge to spot-dredge problematic areas within designated channels (permitted by the WDNR, and authorized by the Army Corps of Engineers) to allow for minimal power boat traffic. This summer will be our initial effort. Nearly a quarter of the landowners on the lake (roughly 60 properties) are impacted by the sediment buildup making some areas impassable.

Support for NPS Study Request #2: Shoreline Survey

The shoreline survey will identify erosion problem areas and aquatic vegetation on Trego Lake. As we note, sedimentation is a crucial issue, likely driven by erosion and resulting in excessive aquatic vegetation. Studies will help us understand and mitigate these issues.

TLD respectfully requests a more comprehensive look at sediment sources. Specifically, we ask you to extend the shoreline study to cover the Namekagon River between Hayward and Trego. This will help determine if the amount of sediment entering Trego Lake has increased and identify sources of sediment. This, coupled with NPS Study Request #3 will provide a greater overall picture of sediment problems. With this information, mitigation actions can be reviewed and developed to improve recreational opportunities for Trego Lake and the Namekagon River.

Support for NPS Study Request #1: Recreation Study

The recreation study proposed by NPS will set the stage for future improvements or enhancements of recreation opportunities on Trego Lake. TLD is happy to support and be involved in developing the picture this study creates. In the past, the recreation survey used by Xcel and its agents relied on a questionnaire at the Trego Town Landing. However, the study method was too narrow. The people using the lake most frequently, those living around it, were not methodically surveyed. Studying this crucial issue, as part of Xcel receiving a 40-year license to continue operating the dam, would ensure the entire lake formed by the dam is available for a range of recreational activities.

The recreation study proposed by NPS would offer a more complete picture of recreation on the lake. It includes a mailed survey to each riparian landowner on Trego Lake. Gathering this information provides more complete input to determine the needs and opportunities for recreating on Trego Lake. If TLD can assist in this survey process in any way, we would be happy to do so.

Support for certain NPS comments regarding the PAD.

As NPS has noted, TLD questions the reasoning behind Xcel's proposed change in the Trego Project Boundary as part of this 40-year relicensure. TLD is concerned about this proposed change because it could impact the sedimentation issue. Could a change in the project boundary permit Xcel to avoid its obligation to address sedimentation?

Additional input on NPS comments regarding the PAD.

As noted by NPS in their comments, a concern is the closing of the Wisconsin Department of Transportation access site on the Namekagon River in Trego because of the re-routing of the intersection of U. S. Highways 63 and 53. TLD is also concerned about these closures. The loss of this access point may divert recreators to the Trego Town Park landing which is congested with sediment and aquatic plants. In addition to the closed landings being used by those coming down the Namekagon River, it was also used by Trego riparian landowner canoeist, kayakers, and tubers to access the upper portions of Trego Lake. We think the three studies proposed by NPS are likely to document a need for improved access with the potential for modifications at the Trego Town Park landing.

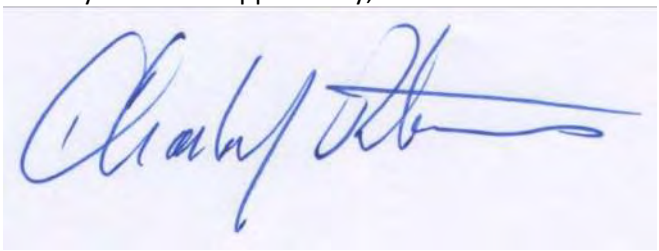
Conclusion

The TLD appreciates the opportunity to provide input on the relicensing of the dam and to support the study requests of NPS. TLD and Xcel Energy are currently in partnership to improve recreation on the lake by harvesting aquatic plants that impede boat travel and reduce the use of the lake to the general public and residents on the lake. With the discovery of AIS in the area, this effort is even more critical today.

Additionally, TLD is thankful for the work of NPS in responding to the PAD and its subsequent study requests. Their effort has been invaluable as we work to protect and rehabilitate Trego Lake. As noted earlier, TLD requests to be included in any future discussions regarding the finalizing and/or conducting of these studies.

Finally, if TLD can be of any assistance in these studies, we would be happy to do so. TLD has a website that includes current and historic documents about the lake: https://tregolakedistrict.com
If you have any question or comments, please do not hesitate to contact the district at: tld@trego.net

Thank you for this opportunity,



For the Board. . .
Charlie Petersen
TLD Board Chair

Attachment

Resolution Authorizing Trego Lake District Board of Commissioners to Support and Provide Information on National Park Service Study Requests Regarding the Relicensing of Trego Dam April 2021

WHEREAS, the Trego Lake District (TLD) is interested in the relicensing of Xcel Energy's hydroelectric dam creating Trego Lake.

WHEREAS, the process has begun for re-licensure of the dam and part of the Federal Energy Regulatory Commission's (FERC) process for re-licensure includes a request for possible areas to study that the dam project may affect.

WHEREAS, the National Park Service (NPS) has drafted three study proposals that identify key issues relating to Trego Lake and TLD concerns. The studies include: 1) Recreation Study, 2) Shoreline Survey, and 3) Hydraulics, Sedimentation, and Channel Change Study.

NOW, THEREFORE, BE IT RESOLVED, that the Trego Lake District Board of Commissioners is authorized to act in support of these study requests and submit a letter to FERC as testimony to this support. Additionally, the TLD will participate with NPS, and other interested parties, in providing information on these study areas to NPS and FERC as needed and/or requested.

Adopted this 17th day of April 2021.

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
2984 Shawano Avenue
Green Bay, WI 54313-6727

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

May 7, 2021

Federal Energy Regulatory Commission
Kimberly D. Bose, Secretary
888 First Street, N.E.
Washington, DC 20426

Matthew J. Miller
Hydro License Compliance Consultant
Northern States Power Company-Wisconsin, Xcel Energy
1414 W Hamilton Avenue, PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Comments on Preliminary Application Document for the Hayward Hydroelectric Project P-2417 and Trego Hydroelectric Project P-2711

Dear Mr. Miller:

The Wisconsin Department of Natural Resources (department) appreciates the opportunity to participate in the process to relicense the Hayward and Trego hydroelectric dams as proposed in the Preliminary Application Document (PAD). These dams are licensed by Xcel Energy (Xcel), under projects P-2417 and P-2711.

The Hayward Project is located in the City of Hayward, Sawyer County, Wisconsin. The Trego Project is located in the Town of Trego, Washburn County, Wisconsin.

The department has limited information regarding natural resource information associated with the hydroelectric dams and their project areas. Studies associated with Hayward and Trego relicensing have different purposes, from a short term, long term, and cumulative impact. The department has carefully considered our responsibilities under the Clean Water Act and Navigable Waters Public Trust Doctrine for the proposed relicensing of Hayward and Trego.

We are providing comments to the PAD and are recommending that the following studies be completed. Each study is presented as appropriate for the various alternatives that could be evaluated as part of the comprehensive review and assessment of the project area. Our requests for information and studies focus on the continued operation of the Hayward and Trego dams.

As Xcel Energy begins to evaluate the array of study requests and determine their study proposal and next steps, the department will continue to provide guidance and recommendations. The licensee should continue to work with the department to collect resource information and develop study plans and protocols. If new information becomes available through the relicensing process, we reserve the rights to require additional studies to gather appropriate information.

To save time and costs, the department recommends that studies be combined, and that the licensee meet with the stakeholders who have requested studies to explore their options and still achieve desired data collection. We also recommend exploring the use of citizen monitoring groups and organizations.

Please be aware that Scientific Collectors Permits may be required to complete various surveys. Please work with the department to obtain appropriate permits and approvals prior to the collection of data.

Please note that the department cannot guarantee the accuracy of the information related to FERC project monitoring that is stored in the department's Surface Water Integrated Monitoring System (SWIMS), its repository lakes pages, and other associated department websites. Please contact the statewide FERC coordinator for the most current and accurate information on FERC projects.

The department will provide additional outreach to the tribes, as appropriate.

Please direct all inquiries to the Project Manager, Cheryl Laatsch, Statewide FERC Coordinator.

If you have any questions or comments regarding our recommendations, please contact me at 920-387-7869, or Cheryl.Laatsch@wisconsin.gov. We look forward to working with you.

Regards,

Cheryl Laatsch
Statewide FERC Coordinator
Wisconsin Department of Natural Resources

Comments on Pre-Application Document (PAD)

Relicensing of Hayward (P-2417) and Trego (P-2711) Projects

General:

Throughout the PAD, Xcel references data that is greater than 10 years old (for example, 3.2.1.1 references NSPW data from 1991). Additionally, some of the department websites that were referenced do not provide publishing or revision dates for the collected data and summaries (for example, 3.2.1.6 bathymetry data is actually from a 1964 map, 4.1.7 WDNR 2020a is data from 2010), and the department cannot verify if this data is still applicable to present day conditions at the Projects.

Please verify that the PAD reflects current project conditions.

3.2.1.1 Hayward Dam

A mixture of sand and bentonite material was placed over the apron in locations where holes have historically been seen. The downstream apron is a concrete slab located over rock-filled timber cribbing with thicknesses varying from 1 to 3 feet. The voids in the timber cribbing beneath the apron are grouted.

- Provide details on how the repairs have held up.
- Provide details on if there are ongoing monitoring of the voids and apron deficiencies.
- Provide details on the last time these voids and apron deficiencies were inspected.

3.2.2 Hayward Project Boundary

The current and proposed Project boundaries are depicted in Figure 3.2.2-1 on the following page and in the existing Exhibit G included as Appendix 3.2.2-1. The Licensee is proposing to increase the acreage within the Project boundary an additional 2.8 acres. The increase includes a portion of the reservoir currently occupied by the Project, but not currently included in the Project boundary (Mead & Hunt, 2020).

- It is difficult to clearly understand the proposed project boundary on Figure 3.2.2-1. Please provide an updated map or additional side-by-side boundary comparisons.
- Provide details if flowage easements are in place for the new project boundary area.

3.3.2 Trego Project Boundary

The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary. This results in an overall decrease of acreage within the Project boundary of 29.1 (submerged) acres.

- Please clarify why LiDAR data was not applied to the Hayward project. The department requests consistent approaches between the projects.

3.4.1.1 Current Operation (Hayward)

Under normal operating conditions, the Licensee is required to maintain the reservoir at a target elevation of 1,187.4 feet but can fluctuate around the target elevation such that the reservoir is maintained between 1,187.0 feet (minimum) and 1,187.5 feet (maximum).

- Provide details on why the target elevation of the reservoir is 1,187.4 feet, when the maximum reservoir elevation is 1,187.5 feet. This target elevations only leaves a margin of 0.1 feet.
- Provide details on why the specific reservoir elevation license requirements for Hayward are different than Trego's reservoir target elevations fluctuations (the Licensee maintains the Project reservoir at a target elevation of 1034.9 feet, with fluctuations limited to +/- 0.3 feet around the target elevation).

The plant is manually operated with controls installed for automatic shutdown in case of operational emergencies. Whenever a plant shutdown occurs or high or low headwater levels are detected, staff at the Licensee's Wissota Hydroelectric Project control center are automatically notified.

- Define the terms "high" and "low" for headwater levels.

Tailwater is monitored manually via a staff gage downstream of the powerhouse.

- Provide details on the location of the staff gage and the frequency of monitoring and calibration.

Flows in excess of the 8 cfs minimum flow are primarily passed through the powerhouse. Flows in excess of the Project's hydraulic capacity are passed through the overflow spillway.

- Clarify how this is meeting run-of-river operations. This does not appear to be equal inflow/outflow, as excess flows will go downstream.
- Clarify why excess flows are not passed through the overflow spillway.

3.4.2.1 Current Operation

The Project currently operates in a run-of-river mode where discharge measured immediately downstream of the Project tailrace approximates the sum of inflows to the Project reservoir

- Provide more information on how sum of inflow is calculated.
- Provide details on water usage for the spillway and powerhouse and the amount of water flowing into these areas versus flowing out of these areas.

Headwater and tailwater elevations are continuously monitored electronically and manually confirmed with staff gages mounted on the Project headworks and tailwater.

- Provide the locations of where elevations are being electronically and manually collected.

4.1 General Description of the Project Area (18 CFR § 5.6(d)(3)(xiii))

There are two FERC-licensed hydroelectric projects and three state-regulated dams on the Namekagon River; all are listed from upstream to downstream in ***Table 4.1-1*** *and are shown in* ***Figure 4.1-1****. The FERC-regulated*

dams include the Hayward and Trego Projects. The state-regulated facilities do not generate power and are regulated by the State of Wisconsin.

- Provide details on how these state-regulated facilities impact or effect the Hayward and Trego projects.
    - Department database shows that Phipps and Pac-Wa-Wong are owned by the U.S. Department of Interior. The most recent files we have are from 1995 for Phipps Dam.

    - Namekagon is State regulated and located 27 miles upstream of Hayward Project. This is a run of river dam with 17-ft fixed crest weir and two 4-ft stoplog bays. The dam was designed to pass the Q1000-yr event with 2.4 feet of freeboard before overtopping.

4.2.3.1 Hayward Project, 4.2.3.2 Trego Project

The combination of NSPW shoreline ownership, minimization of reservoir fluctuation, existing native riparian vegetation buffers, local shoreland regulations, and Upper St. Croix and Namekagon River Management Plan provide adequate protection from wide-spread shoreline erosion and over development in the vicinity of the Hayward Project.

- Provide a map and table of Xcel ownership, public lands, and private ownership within the Hayward and Trego FERC boundaries.

4.3.2 Streamflow, Gage Data, and Flow Statistics

- Provide a map showing all gauge locations for the Hayward and Trego projects.

Monthly flow duration curves for the Trego Project were developed based on discharge information collected by the Licensee. While there is a USGS gage in the vicinity of the Trego Project, it does not record daily flow data needed to develop flow duration curves and the USGS gage at Leonards is not located close enough to provide statistically accurate flow information

- Provide greater detail on these two gauging stations and why these gauges cannot provide relevant flow data.

4.3.2.2 Trego Project

There is a drainage area of 488 square miles at the Trego Project. Based on the data for the analyzed period, the average annual calendar year flow at Trego Project was 540 cfs, the maximum annual average calendar year flow was 579 cfs in 2019, and the minimum annual average calendar year flow was 469 cfs in 2015.

- Provide the relevancy and significance of the years 2015 and 2019.
- The department requests flow data from the past 20 years for the Hayward and Trego projects. This includes duration curves, low flows, high flows, spring run-off, dry years, wet years, etc.

4.3.4 Instream flow

- Discuss and evaluate current instream flow data for the Hayward and Trego projects.

4.3.7.1 River Water Quality Standards

- The upper confidence bound for Hayward Lake residence time is 6 days, therefore, Hayward Lake is considered an impounded flowing water.
- The upper confidence bound for Trego Lake residence time is 11 days, therefore, Trego Lake is considered an impounded flowing water.
- Verify if state standards are being met at the Hayward and Trego project.
- Trego Lake is considered an impaired water and is 303(d) listed for the Recreation designated use, due to high chlorophyll-a concentrations, and will addressed as part of the St. Croix Nutrient TMDL expiring in 2025.
- Trego Project should be subject to the Warm-Large temperature criteria (see table below from Chapter NR 102.2 – Water Quality Standards for Wisconsin Surface Waters)
- Hayward Projec =t should be subject to Coldwater temperature criteria (see table below from Chapter NR 102.2 – Water Quality Standards for Wisconsin Surface Waters)

Table 2
Ambient Temperatures and Water Quality Criteria for Temperature for Non–Specific Waters
(All values are expressed as degrees Fahrenheit)

	Cold[4]			Warm — Large[5]			Warm — Small[6]			LFF[7]		
Month	Ta[1]	SL[2]	A[3]	Ta	SL	A	Ta	SL	A	Ta	SL	A
JAN	35	47	68	33	49	76	33	49	76	37	54	78
FEB	36	47	68	33	50	76	34	50	76	39	54	79
MAR	39	51	69	36	52	76	38	52	77	43	57	80
APR	47	57	70	46	55	79	48	55	79	50	63	81
MAY	56	63	72	60	65	82	58	65	82	59	70	84
JUN	62	67	72	71	75	85	66	76	84	64	77	85
JUL	64	67	73	75	80	86	69	81	85	69	81	86
AUG	63	65	73	74	79	86	67	81	84	68	79	86
SEP	57	60	72	65	72	84	60	73	82	63	73	85
OCT	49	53	70	52	61	80	50	61	80	55	63	83
NOV	41	48	69	39	50	77	40	49	77	46	54	80
DEC	37	47	69	33	49	76	35	49	76	40	54	79

1 Ta = ambient temperature
2 SL = sub–lethal criteria
3 A = acute criteria
4 Cold = waters with a fish and aquatic life use designation of "cold water community"
5 Warm – Large = waters with a fish and aquatic life use designation of "warm water sport fish community" or "warm water forage fish community" and unidirectional 7Q10 flows ≥ 200 cfs (129 mgd)
6 Warm – Small = waters with a fish and aquatic life use designation of "warm sport fish community" or "warm water forage fish community "and uni–directional 7Q10 flows < 200 cfs (129 mgd)
7 LFF = waters with a fish and aquatic life use designation of "limited forage fish community"

4.4.1.1 Fish Stocking Data

- Describe the purpose of fish stocking at these projects, including information on frequency, methods, and timelines of stocking events.

4.4.1.2 Mussels

- Data provided by the department included the year of observation, but this is not included in table 4.4.1.2-1

4.4.3.1 Hayward Project

The WDNR further acknowledged that Hayward Lake did not provide good walleye habitat, and even in the absence of fish entrainment, the original goal of 3 walleye per/acre would not be possible to achieve. The WDNR also concluded there was no compelling resource-based reason to plan for drawdowns

- This information should be updated since the FERC 2012 statement.
- Provide current status of walleye and walleye habitat at the Hayward Project.

4.5.1 Botanical Species

- Boreal Forest was not a forest type in the NW Sands Ecological Landscape historically.

4.5.2. Wildlife

- Acknowledge which species have NHC-listed status.
- Identify species that are state or federally listed under 4.7 Rare, Threatened and Endangered Species.
- There is an inconsistency of the 4.5 list of species and the list in 4.7 (for example, the Northern Long-Eared Bat is listed in 4.5.2, however, 4.7.2.3 states that the species is not found within the vicinity of the projects).
- Marten and white tailed jackrabbit do not occur in the vicinity of these project boundaries.

4.5.3 Invasive Species

- Please update the references and reference lists for consistency.
- *Selected Regulated AIS* in WI may have been updated since 2016, and this flyer should only serve as a reference.

4.8.1.6 Hayward Project Informal Shoreline Fishing Area

The unimproved shoreline areas downstream of the spillway and powerhouse, which are owned by the Licensee, are often used as informal fishing areas

- Xcel should work with local municipality to maintain and enhance recreational opportunities, especially in areas that are known to have active use.

4.8.2.3 Town of Trego Park Landing

- Photo 4.8.2.3-1 shows presence of active erosion at the boat landing and will need repair.

Study Requests

Relicensing of Hayward (P-2417) and Trego (P-2711) Projects

(Study requests to be applied to both Hayward and Trego Projects, unless otherwise noted)

ASSESSMENT OF CURRENT DAM OPERATIONS

• Goals and Objectives: Determine if the Project is meeting the requirements of minimum flows and run-of-river operations; including documenting how downstream river flows are managed appropriately to limit water level fluctuations.

• Relevant DNR Management Goals: Review the current operations relative to maintaining consistent reservoir elevations and downstream flows that mimic background hydrology, as achieved by run-of-river operations.

• Existing Information: For the Hayward Project, a minimum flow of 8 cfs or inflow, whichever is less, is released at all times into the bypass reach, as stated in the current license. The Trego Project does not have minimum flow requirements.

• Operation nexus to resource and how informs license: Ensure Project operates within limits of hydrologic modification through run-of-river, and not causing divergence in flows that harm the downstream aquatic ecosystem.

• Methodology: Desktop review of existing inflow and outflow data, including an evaluation report of run-of-river and operations requirements.

• Level of Effort and Cost: Staff time is expected to be 20-40 hours at $125 per hour equaling $2,500-$5,000 for data analysis and report.

ASSESSMENT OF MINIMUM FLOW, DRAWDOWNS, AND RESOURCE IMPACTS DOWNSTREAM OF THE TAILWATER

• Goals and Objectives: Provide an assessment of the average range of flows, including minimums and maximums and their relevance, associated with run-of-river operations and facility capacity. Determine if the project minimum flow of 8 cfs at the Hayward Project and target reservoir elevations of the Trego Project are providing sufficient flows and environment for aquatic resources.

• Relevant DNR Management Goals: Evaluate the current minimum flow and ensure that the minimum flow does not have an adverse impact on the aquatic resources within the Project boundary and downstream of the Project. Ensure that the aquatic environment is maintained in a healthy state, which includes protection of rare and listed species. Consideration for impacts to wildlife that will be hibernating would be adversely affected by drawdowns. Sediment loading impacts from frequent drawdowns and loss of recreational opportunities, due to limited access, are affected by drawdowns. If a drawdown or refill is performed too quickly, turbid water can flow down river, depending on the water flow rate. Sediment can also settle out at the base of the dam, creating water quality and habitat issues.

• Existing Information:

> **Hayward**: For the Hayward Project, a minimum flow of 8 cfs or inflow, whichever is less, is released at all times into the bypass reach, as stated in the current license.

Trego: The Trego Project does not have minimum flow requirements and does not have a bypassed reach.

The department has concerns for otters, furbearers, and other wildlife if water levels are not managed similar to current operations. Turtles, frogs, and other herps would be negatively affected if water levels are drawndown after October 1st.

• Operation nexus to resource and how informs license: Ensure Project is meeting the intent of run-of-river, and not causing divergence in flows that harm the downstream aquatic ecosystem.

• Methodology: In-stream flow study, which includes a description of current habitat conditions within the bypass channel under current operation and flows to determine if the current minimum flows are impacting available habitat, fish, and macroinvertebrate communities. Assess various flow regimes to determine what is appropriate to minimize and avoid adverse impact on the cold-water resource.

• Level of Effort and Cost: Staff time is expected to be 20-40 hours of field work at $125 per hour, plus costs for equipment.

ASSESSMENT OF STREAM FLOWS, CHANNEL DIMENSIONS, AND LINEAR GRADIENT

• Goals & Objective: Determine impacts the Project has on the existing stream flows, channel dimensions and linear gradient of Namekagon River downstream of the Project.

• Relevant DNR Management Goals: The proposed study would investigate the impacts the Project would have on the existing stream flows, channel dimensions, and linear gradient of the Namekagon River. The impacts that the Project may cause on the existing stream flows, channel dimensions and linear gradient may alter resources and recreational and developmental management plans for the future.

• Existing Information: Data is limited relating to flow, channel dimensions, and linear gradient impacts within the Project boundary.

• Operation nexus to resource and how informs license: The relicensing of Hayward and Trego has the potential to have short term and long-term impacts on the aquatic community downstream of the impoundment. These impacts include, but are not limited to, dewatering and limiting available aquatic habitat in the downstream river channel depending on stream discharge and dam operation. These impacts can vary by season as well as daily. Proper management of the resource will help ensure that adequate flows are available to aquatic life at the proper time and thermal regime.

• Methodology: Conduct a flow study to determine stream morphology downstream of the Project at various flows, including width, depth, wetted perimeter and substrate composition. The study should identify any wetlands that are flooded. This should include available aquatic habitat under current operation through flood flow conditions. Quantitative Habitat Assessment Methodology should be used to document habitat conditions. Refer to existing management efforts (recreational, resource, habitat) to investigate the impacts the proposed Project would have.

• Level of Effort and Costs: 40 hours of fieldwork and 40 hours of report writing at $125 per hour, plus equipment costs.

ASSESSMENT OF WATER QUALITY

• Goals & Objectives: The department is requesting at least one year of water quality data collection. Depending on the first year of data, a second year of water quality studies may be requested. Assess and monitor the following water quality parameters:

Total Phosphorus	Sulfate, Total Mercury	Total Suspended Solids
Chlorophyll-a	Methyl Mercury	Sediment Accumulation
Dissolved Oxygen (DO)	Dissolved Phosphorus	Alkalinity
Temperature	Nitrate (plus nitrite)	Secchi Depth
Conductivity	Ammonia	Color
pH	Chloride	Iron, Manganese, and/or Sulfide
Total Nitrogen	Bacteria	Cyanobacteria

• Relevant DNR Management Goals:

Total Phosphorus: One of the primary causes of eutrophication and most widespread pollutant in waterbodies statewide and nationally. Impoundments are unlikely to raise the concentration of phosphorus in the downstream river but play a role in the transformation, such as the ratio of dissolved phosphorus to total phosphorus. Dam operation might influence internal phosphorus loading to the impoundment by affecting the mixing regime as water levels change.

Chlorophyll-a: A measurement of the amount of algae in a waterbody, one of the primary manifestations of eutrophication. As impoundments increase surface area, slow and warm water are likely to produce more chlorophyll-a, per unit phosphorus/nitrogen, than the upstream or downstream river. Impoundments may produce chlorophyll-a in the lake environment that is then passed to the downstream river.

Dissolved Oxygen: Dissolved oxygen is critical for the health and survival of aquatic organisms. Deep impoundments may stratify and become oxygen depleted in deep water. Impoundments may then cause a decrease in dissolved oxygen in the downstream river, especially if there is bottom withdrawal of a eutrophic impoundment, or an impoundment that stratifies. Additionally, eutrophic impoundments may transform nutrients into organic matter (mainly algae) that then flows into the river, decomposes and reduces oxygen.

Temperature: Temperature regime of a waterbody structures community composition of fish, invertebrates, plants, etc. Temperature also effects rates of chemical reactions, ecosystem productivity and the ability for gasses to dissolve in water. Impoundments can increase water temperatures by slowing water velocity and increasing surface area to absorb solar radiation. Additionally, deep impoundments may cause deep water temperatures to decrease if there is stratification. Dam operations can influence downstream temperature by changing/mixing withdrawal location, top versus bottom draw (among others).

Conductivity: High concentrations of dissolved ions, measured as conductivity, can impair the osmoregulation of organisms with gills and other semipermeable membranes. Sources of elevated conductivity are likely from nonpoint and certain point source discharges. However, conductivity is important for classifying the impoundment and stream and is therefore needed as background information.

pH: pH can control the biologic availability, solubility and speciation of chemicals in water. Although wild rice does well in slightly acidic waters (pH 5.9 – 6.2), even moderately acidic water may irritate the gills of aquatic fish and insects or reduce the hatching success of fish eggs. Eutrophication increases swings in pH during the algal growth and die-off phases. Highly eutrophic impoundments may release high or low pH to the river downstream. In addition, fluctuating water levels can acidify the impoundment by exposing the waterbody bed to air and then flushing sulfate into the water when lake levels rise again or when it rains. Dam operation probably has very little opportunity to mitigate dramatic pH swings at short timescales, but operations that cause sufficient changes in water levels may affect pH at a seasonal or interannual time scale.

Total Nitrogen: An oversupply of nitrogen is one of the primary causes of eutrophication. A lack of nitrogen limits wild rice development. Impoundments are unlikely to raise the concentration of nitrogen in the downstream river. Although some planktonic algae can fix atmospheric nitrogen, this amount is likely overwhelmed by the amount of nitrogen coming in from the watershed via tributary streams. Impoundments do play a role in the transformation, such as the ratio of dissolved inorganic nitrogen to organic nitrogen.

Sulfate, Total Mercury, Methyl Mercury: Dam operations can influence the sulfur and ultimately the mercury cycle. In short, long-term drawdowns can eventually lead to increased sulfate runoff when it rains. This acidifies the water and can then enhance methyl mercury concentrations in water and methyl mercury in fish. Sulfate can also be converted to toxic sulfide which affects the mitochondria of plants. When sulfate is high, sulfides are also usually high and therefore toxic to wild rice and other plants. This process has been demonstrated in formation of new reservoirs and in the regulation of existing reservoirs. Impoundments can cause this process to happen. Water levels will need to be managed to prevent increased total mercury and high sulfate levels.

Dissolved Phosphorus: An oversupply of phosphorus is one of the primary causes of eutrophication and most widespread pollutant in waterbodies, statewide and nationally. Low phosphorus levels limit wild rice seedling success and development. Impoundments are unlikely to raise the concentration of phosphorus in the downstream river, but play a role in the transformation, such as the ratio of dissolved phosphorus to total phosphorus. Dam operation might influence internal phosphorus loading to the impoundment by affecting the mixing regime as water levels change.

Nitrate (plus nitrite): One of the bioavailable forms of nitrogen, a primary cause of eutrophication. Impoundments are unlikely to raise the concentration of nitrate in the downstream river. Although some planktonic algae can fix atmospheric nitrogen, this amount is likely overwhelmed by the amount of nitrate coming in from the watershed via tributary streams.

Ammonia: One of the bioavailable forms of nitrogen, a primary cause of eutrophication. Impoundments are unlikely to raise the concentration of ammonia in the downstream river.

Chloride: Chloride, at elevated levels is toxic to fish, invertebrates and amphibians. At lower levels, it can negatively affect diversity, productivity, and increase the density of water. Chloride is increasing statewide and nationally in waterbodies that have even small percentages of their watershed in urbanized land use. The impoundment is unlikely to transform or change chloride levels from the incoming tributaries (assuming long-term stable water levels). The major exception being if the shore is heavily developed and there are major applications of road salt or point sources with high chlorides.

Bacteria: Bacterial indicators, such as E. coli, are used to detect the presence of fecal contamination in waterbodies to protect recreational uses. Impoundments are unlikely to increase E. coli in downstream

rivers, unless there is heavy recreation (campgrounds, beaches, non-sewered sanitation) on the impoundment.

Total Suspended Solids (TSS): High concentrations of TSS can inhibit visibility for predators, damage gill structure of fishes, and lead to high rates of sedimentation in streams and alter benthic habitat. Impoundments are likely to lower TSS concentrations in the downstream river. In extreme cases where sediment build-up behind a dam structure is high, there may be some chance of increased concentrations of TSS. Dam operation is unlikely to influence TSS unless there is a catastrophic event, drawdown or using ash cinders as a sealant.

Sediment Accumulation Behind Dam: Dams trap sediments upstream. Ecological concerns include increasing turbidity upstream and smothering spawning beds in the reservoir and upstream. Sediment build up can also threaten the longevity of the dam itself.

Alkalinity: Alkalinity itself is not regulated, but it is important for determining sensitivity to acidification and the biological communities that can live there. Alkalinity does not have criteria or thresholds; it is used to help understand lake characteristics. Alkalinity can be measured in concert with conductivity and pH with a single water sample.

Secchi Depth: Secchi depth measures water clarity and is a general indicator of lake health. The impoundment could affect Secchi depth through its effects on eutrophication and suspended sediments. Dam operations can influence internal nutrient loading and chlorophyll *a* (see above), and thus, also water clarity.

Color: Color refers to how much colored organic matter is in the water, staining it brown. Water color is important for understanding the ecology of the lake. Highly stained waters reduce water clarity and in turn, can affect algal and plant growth and even fish growth. The impoundment is unlikely to affect color, but color will be important for understanding the ecology of the impoundment. Color does not have criteria or thresholds; it is used to help understand lake characteristics.

Iron, Manganese, and/or Sulfide: These are reducing substances that can have high concentrations in the hypolimnion of reservoirs under anoxic conditions. They use oxygen through their own chemical transformations and can further increase oxygen demand. In addition, iron binds phosphorus under oxic conditions, but releases phosphorus under anoxic conditions. Therefore, reservoirs with high iron could be prone to internal phosphorus loading if they go anoxic in the hypolimnion. May be necessary to manage impoundments that stratify and become anoxic. May be necessary to manage impoundments that stratify and become anoxic. Dam operations can impact stratification and mixing, and thus, the concentration of these substances and internal nutrient loading. The department does not have criteria or thresholds for these substances; they would be used to help understand cycling of nutrients, mercury, etc., and oxygen dynamics within a lake

Cyanobacteria cell counts and cyanotoxins: Harmful Algal Blooms are of concern for human health, recreation, and fish and aquatic life. High concentrations of chlorophyll *a* are often correlated with high concentrations of cyanobacteria and cyanotoxins, but not in all cases. These indicators need to be measured independently for evaluation. As impoundments increase surface area, slow and warm water they likely to produce more chl *a* per unit phosphorus/nitrogen, than the upstream or downstream river. This could also include more cyanobacteria and cyanotoxins as well. Recent studies of dams across wide geographic areas show that cyanobacterial blooms are more prevalent when dams are drawn down. Temperatures increase along with water residence times and nutrient concentrations, all of which favor

cyanobacteria. Dam operations can influence the likelihood of cyanobacterial blooms. The department recommends following EPA's recommended cyanobacteria thresholds. The department's standard operating procedures and assessment methodology should be followed for monitoring, reporting and review. Highly recommended in reservoirs/impoundments that are known to suffer from harmful algal blooms. In addition to routine monitoring, samples may be taken in response to reports of algal blooms/sickness. Not necessary where chlorophyll concentrations are low and there are no reports of algal blooms.

• Existing Information:

Hayward: Water quality monitoring is not required in the current license. Water clarity data was collected at the Hayward Project 2010-2017. Hayward Lake is a designated Area of Special Natural Resources Interest (ASNRI) as an Outstanding and Exceptional Area, a Priority Navigable Waterway (PNW) Musky Area, and a PNW Walleye Area. The Namekagon River that flows through the Hayward Project is an ASNRI Wild and Scenic River, ASNRI Trout Stream, and a PNW Musky Area.

Trego: Water quality monitoring is not required in the current license. Water quality parameters were collected at the Trego Project 2010-2014 and 2016-2020. Satellite water clarity was collected at the Trego Project in 2015. Trego Lake is an ASNRI Outstanding and Exceptional Area and ASNRI Wild Rice Area. The Namekagon River that flows through the Trego Project is a PNW Musky Area.

• Operation nexus to resource and how informs license: Ensure compliance of state water quality standards and how operations are meeting those standards. The operation of the dam affects the water quality of the impoundment and downstream resources. The overall goal of the request is to further understand the current water quality conditions of the reservoir and river resources which will help inform management decisions in the future. Limited water quality data presented in the PAD is not representative of current or future water quality conditions.

• Methodology: The department classifies Hayward Lake as an impounded flowing water, where a water residence time is less than 14 days. According to current department information, the upper confidence limit for water residence time for Hayward Lake is 6 days. This means that river monitoring protocols should be applied instead of lake protocols upstream of the impounded area and downstream of the dam. Lake protocols should be applied within the deep hole of the impounded area.

The department classifies Trego Lake as an impounded flowing water, where a water residence time is less than 14 days. According to current department information, the upper confidence limit for water residence time for Trego Lake is 11 days. This means that river monitoring protocols should be applied instead of lake protocols upstream of the impounded area and downstream of the dam. Lake protocols should be applied within the deep hole of the impounded area.

River monitoring methods (including continuous monitoring) should be performed in at least three locations within the project area (or best appropriate location), including one location downstream of the dam, one location within the impounded area (within the deep area of the impoundment, typically near the dam), and one location upstream of the impounded area.

Data should be collected or analyzed using the DNR WISCALM Guidance, surface water grab sampling protocols, and the Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, 2020). A list of standard operating procedures can be found in the appendix of the most current department Wisconsin Consolidated Assessment and Listing Methodology (WisCALM,

https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html), in addition to protocols listed in the table below:

One (1) sample location upstream of the impounded area and one (1) sample location downstream of the dam			
Parameter	**Method**	**Frequency – At least one year of studies requested**	**DNR Protocols**
Total phosphorus	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Chlorophyll *a*	Grab samples	Monthly, July 15 – September 15 **3 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, 2020)
Dissolved Oxygen	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
Temperature	Field measurement	Continuous, year-round	Use instruction manual from manufacturer
Conductivity	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
pH	Field measurement	Continuous, July – September	Use instruction manual from manufacturer
Dissolved Phosphorus	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Total Nitrogen	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Sulfate, Total Mercury	Grab samples	Possibly 1x in spring	Nutrient Grab Sample Protocol
Methyl Mercury	Fish Tissue Samples	Possibly 1x in spring	Contact DNR Fisheries Biologist
TSS	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Nitrate (plus nitrite)	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Ammonia	Grab samples	Monthly, May – Oct **6 total**	Nutrient Grab Sample Protocol
Chloride	Grab samples	Monthly, May – Oct **6 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Bacteria	Grab samples	Monthly, May – Oct **6 total**	Citizens Monitoring Bacteria: A training manual for monitoring E. coli http://dnr.wi.gov/lakes/forms/ecoli_may162005.pdf
Nutrient Grab Sample Protocol:https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=114118765 **Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, Revised 2020):** **https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf**			

One (1) sample location within the impounded area (deep hole			
Parameter	**Method**	**Frequency – At least one year of studies requested**	**DNR Protocols**
Total Phosphorus (TP)	Field fixed, persulfate digestion	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Chlorophyll *a*	Water filtered in facility's lab or mail to SLH	3x July 15 - Sep 15 **3 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Dissolved Oxygen	Field, Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Temperature	Field, Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Conductivity & pH (optional)	Profile at 1 m intervals	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Conductivity, pH, Alkalinity	Field collected, then sent to lab	1x during July 15 - Sep 15 **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Dissolved Phosphorus	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Clarity (Secchi)	Field	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Secchi Disk Procedures)
Color	Field collected, then sent to lab	1x during July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Total Nitrogen	Field fixed (sulfuric acid)	1x during July 15 - Sep 15 **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Sulfate, Total Mercury	Field collected, then sent to lab	Possibly 1x in spring	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Methyl Mercury	Fish tissue. See appendix for explanation.	Possibly 1x in spring	Contact DNR Fisheries Biologist
Nitrate (plus nitrite)	Field fixed (sulfuric acid)	1x during July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)

Ammonia	Field collected, then sent to lab	Probably 1x July 15 - Sep 15 – **1 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Chloride	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Iron, Manganese, and/or Sulfide	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Total suspended solids (TSS)	Field collected, then sent to lab	Spring turnover + 3x July 15 - Sep 15 **4 total**	Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)
Cyanobacteria/ cyanotoxins	Contact DNR Water Quality Biologist		
Bacteria	Field collected, then sent to lab	Dependent on system & tied to public beaches – Contact Water Quality Biologist	Citizens Monitoring Bacteria: A training manual for monitoring E. coli http://dnr.wi.gov/lakes/forms/ecoli_may162005.pdf

Wisconsin Citizen Lake Monitoring Training Manual (Secchi Disk Procedures, Revised 2020):
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/SecchiMan.pdf

Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures, Revised 2020):
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf

For the analytes without state standards, they should be analyzed by mean and median values and reported in a table by date and time annually.

Sediment accumulation should be assessed and mapped behind the dam. This includes estimated depth and volume of sediment held within the impoundment.

Sampling Locations: Apply river monitoring methods in the river in the impounded area, downstream of the dam, and upstream of the impounded area.

- **In the Impounded Area:** One or more stations within the main impounded area. At least one station should be located in the deep area of the impoundment, which would typically be near the dam. However, it must be located outside of the hazard zone demarcated by buoys. For large impoundments an additional station or two may be required in the middle and upper reaches of the impounded area, along the thalweg, to characterize water quality throughout the impoundment. For those with a more complex system of tributary arms or large bays, additional monitoring stations may be recommended to characterize those areas.

- **Downstream of the dam:** One station. In cases where some of a river's flow is diverted through the dam and another portion of the flow is not, the station should be located below the mixing zone (see the DNR's "Guidance for Mixing Zones, Zones of Initial Dilution, and Rapid Mixing"). It should also be placed in an area that is safe to access (some areas may be too swift-flowing) and if possible where vandalism of equipment is less likely.
    - In certain cases, a second station immediately below the dam may be required if low DO is expected to be an issue due to bottom draw releases and/or low DO in the impounded area.

- **Upstream of the impounded area:** Monitoring inflows can provide a point of comparison with waters in the impoundment and downstream and help identify pollution sources. One river station upstream of the impounded area may be required if:
    - There is not another station upstream of the facility's impounded area that is being monitored by another facility upstream (in areas with several consecutive dams).
    - There is a water quality problem identified downstream or in the impounded area which needs additional upstream data to determine the cause of the issue.

• Level of Effort and Costs: Six field days plus with two people $125 per hour plus costs for equipment. Estimated 40 hours for report writing and chemical analysis. Additional field work may be required to monitor/maintain continuous monitoring sensors.

ASSESSMENT OF SEDIMENATION AT TREGO DAM

• Goals & Objectives: Assess sedimentation upstream of Trego Dam near where the boundary is proposed to be removed.

• Relevant DNR Management Goals: Dams trap sediments upstream. Ecological concerns include increasing turbidity upstream and smothering spawning beds in the reservoir and upstream. Sediment build up can also threaten the longevity of the dam itself.

• Existing Information: During the JAM presentation, the local Trego Lake association shared concerns with sedimentation at the Trego dam, as well as where the proposed FERC boundary is being removed. The lake association also has concerns of flooding in this portion of the project boundary.

• Operation nexus to resource and how informs license: Ensure compliance of state water quality standards and how operations are meeting those standards. The operation of the dam affects the water quality of the impoundment and downstream resources. The overall goal of the request is to further understand the current water quality and sedimentation conditions of the reservoir and river resources which will help inform management decisions in the future.

• Methodology: Sediment accumulation should be assessed and measured downstream of HWY 53 through the project area that is being proposed for removal. Assessments of sediment deposits and sediment depth measurements can be collected along multiple transects, including the bay areas north and west of Leisch Road.

• Level of Effort and Costs: 40 hours of desktop review, and data summary at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF WILDLIFE AND WILDLIFE HABITAT

• Goals & Objectives: Document wildlife presence and diversity, habitat types, and general wildlife and vegetation abundance within the Project area. The goal of this study is to evaluate the distribution and composition of vegetation, wildlife, and wildlife habitats, including wetlands, and the effects operations of those

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, including listed species. This information will be beneficial to understanding the current environment, and potential needs for resource management associated with the Project.

• Existing Information: Limited or no wildlife surveys or data have been collected within the Project boundary. Additionally, the PAD does not include any field assessment or surveys of wildlife habitat or use.

Trego: The department does not own land so we do not have any wildlife or fishery area management plans for this area of land. The only survey conducted in this area was the bear snare survey (which showed an abundance of bears).

The department has concerns for otters, furbearers, and other wildlife if water levels are not managed similar to current operations. Turtles, frogs, and other herps would be negatively affected if water levels are drawn down after October 1st.

Hayward: From a game species standpoint, wildlife impacts are presumed to be low. The game "species" that would see the largest direct impact would be waterfowl and furbearers. The Waterfowl Management Plan was approved by the department and Wisconsin Natural Resources Board as of January 2020 and lays out the goals for Wisconsin's waterfowl.

Water dwelling or using furbearers could also be impacted in water conditions changes from its current state. Like the waterfowl plan, the department Beaver Management Plan can be used for reference.

There is bald eagle territory on Lake Hayward, with two nests by the Lumberjack Bowl and a newer nest just north of Hwy 77.

Waterfowl Management Plan (2020): https://p.widencdn.net/uffph8/WisconsinWaterfowlPlan

Beaver Management Plan (2015): https://p.widencdn.net/axlcfq/WM0610

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on habitat and wildlife use of affected habitats. Proper management of the resource will help to minimize any adverse impacts associated with the removal, restoration, and relicensing activities.

• Methodology: Using a qualified biologist or ecologist knowledgeable in local vegetation, identify, classify, and delineate on a map major vegetation cover types within project area. Existing aerial photography, on the ground surveys, or a combination of the two to identify and map the cover types may be used. The biologist/ecologist will record all wildlife present.

During the summer and fall (migration), ground-truth any remote-sensing mapping efforts, record all wildlife observed (directly or indirectly) and document any terrestrial invasive species detected during survey efforts. Describe each cover type by species composition, successional stage, and aerial extent (acreage) within the survey area, including invasive species. As an example, the methodology expressed in the following reference could be used: https://www.fs.fed.us/research/publications/gtr/gtr_wo89/gtr_wo89.pdf

• Level of Effort and Costs: 80 hours of desktop review, field work, and data summary at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF FISHERIES AT TREGO PROJECT

• Goals & Objectives: Define the diversity and abundance of the fish community within the Trego Project.

• Relevant DNR Management Goal: Understand the existing environment. The department manages public water for recreational use, such as fishing, protection and management of species, and the overall health of the fishery of the state.

• Existing Information: The PAD states that department data was provided for upstream of Trego Lake, downstream of Trego Lake, and within Trego Lake for 2003-2019. Trego Lake is an ASNRI Outstanding and Exceptional Area and ASNRI Wild Rice Area. The Namekagon River that flows through the Trego Project is a PNW Musky Area.

The department has concerns on Lake Sturgeon entrainment at the Trego Dam. Lake Sturgeon are currently stocked by the department in the Namekagon River (above Trego Lake) and within Trego Lake in hopes of re-establishing this population, however, with entrainment, larger adult sturgeon can leave the lake but cannot return.

• Operation nexus to resource and how informs license: Having current fish survey information will help department staff make informed management decisions regarding the fishery.

• Methodology:

Seasonal catch per unit effort (CPUE) surveys in the spring, summer, and fall to quantify fish population relative abundance and summary report to document the species available to recreational fishers and general fish community composition.

Early Spring Fyke Netting: Three to five fyke nets (front frame 4’x6’), set the week of ice out.

Early Spring Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 45-55 degrees

Late Spring Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 60 – 70 degrees.

Summer Fyke netting (June-early August): Three to five fyke nets (front frame 4'x6'), set when water temps are approaching 70 degrees.

Fall Electroshocking: Maxi boom to survey the entire shoreline with two dippers, when water temps are between 55-65 degrees

• Level of Effort and Costs: Estimated $125 per hour, plus equipment costs.

Early Spring Fyke Netting: Nets would be checked for 3 - 5 days, approximately 2 - 4 hours a day to set, check, move and workup the fish.

Early Spring Electroshocking: Approximately 1-2 nights of electrofishing (depending on 2 or 4 boats), approximately 6 hours per boat/night, 8 2-mile stations.

Late Spring Electroshocking: Approximately 2-4 nights of electrofishing (depending on 1 or 2 boats), approximately 4 hours per night

Summer Fyke Netting: Approximately 2 to 4 hours a day to set, check, move and workup the fish. The nets would be deployed for 3 to 4 net nights , usually set on a Monday, checked daily and removed Thursday or Friday of that same week.

Fall Electroshocking: Approximately 2-4 nights of electrofishing (depending on 1 or 2 boats), approximately 4 hours per night, 4 stations

ASSESSMENT OF FISH ENTRAINMENT AND FISH MOVEMENT

• Goals & Objectives: The department has concerns on Lake Sturgeon entrainment at Trego dam. Assess fish entrainment at the Trego Project and Hayward Project and better understand fish movement from above to below the dams. The department has concerns with Lake Sturgeion entra

• Relevant DNR Management Goals: Understand the existing environment. The department manages public water for recreational use, such as fishing, protection and management of species, and the overall health of the fishery of the state.

• Existing Information:

Trego: The department has documented at least seven lake sturgeon that have entrained the dam (from Trego Lake to Namekagon River below) and survived to be recaptured below Trego Dam. There are likely many more sturgeon and other fish species that are entraining below Trego Dam and surviving. The department suspects that muskellunge are also doing this but haven't been able to document that through our fish surveys.

This dam is a major block to fish passage and migration for the Namekagon River, the most notable species that is impacted are lake sturgeon. Lake Sturgeon are currently stocked by the department in the Namekagon River (above Trego Lake) and Trego Lake in hopes of re-establishing this population. However, with entrainment, larger adult sturgeon can leave the lake but cannot return.

Trego Project has 1.5" spacing for both trash racks (one for each turbine), with a 1.2 feet/second intake velocity at maximum flow.

Hayward: Department fisheries biologists are interested in the fishery below the Hayward dam, and some of the most popular fish species are species coming from Hayward Lake upstream.

Hayward Project has 1.5" trash rack spacing with a 1.5 feet/second intake velocity at full gate.

• Operation nexus to resource and how informs license: Having current fish movement information (e.g. when fish are passing the dam, how many fish are passing the dam) and survival information will help department staff make informed management decisions regarding the fishery.

• Methodology: Model a tagging study after existing research to look at entrainment of sturgeon, muskie, and walleye. This research could use radio tagging or hydroacoustic telemetry.

• Level of Effort and Costs: Fieldwork and data reporting at $125 per hour, plus equipment costs

MACROINVERTEBRATE SURVEY

• Goals & Objectives: Assess the water quality using macroinvertebrate bio-indicators downstream of the impoundment.

• Relevant DNR Management Goals: The department is charged with managing the water quality of the waters of the state and meeting designated criteria under the Clean Water Act.

• Existing Information: Macroinvertebrate data is not available for the Hayward and Trego Projects.

• Operation nexus to resource and how informs license: Macroinvertebrates are likely impacted by segmentation of the river, and impoundments can impact communities due to changing thermal and/or flow regimes. These bio-indicators are used to assess the health of the resource.

• Methodology: Collect a wadable macroinvertebrate sample, if possible, downstream of the flowage using the department's Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2017). If the stream is not wadeable, a large river macroinvertebrate sample should be collected. Data should be analyzed using the current department WISCALM Guidance. Wisconsin DNR Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2017) and Large River Macroinvertebrate Sampling (2015), as appropriate. Data should be analyzed using the current department WISCALM Guidance. Macroinvertebrates should be collected upstream of the reservoir in the riverine reach, in the bypass channel and downstream of the powerhouse in the fully mixed zone.

Large River Macroinvertebrate Sampling (2015)
https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=120273145

Wadable Streams Macroinvertebrate Sampling (2017)
http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=150708168

• Level of Effort and Costs: One day of field work with an estimated 20 hours of field and data analysis at $125 per hour equals $2,500. Lab analysis at state certified lab estimated to cost $1,000. Mobilization, travel, and equipment is estimated at $2,000.

AQUATIC AND TERRESTRIAL INVASIVE SPECIES SURVEY

• Goals & Objectives: Evaluate the presence/absence of invasive species listed in NR40, including habitat preferences, within the Project area.

• Relevant DNR Management Goal: Minimize the transport and establishment of existing invasive species and establish management practices to reduce new invasive species. Compliance with NR40.

• Existing Information: Chinese mystery snail, curly-leaf pondweed, Eurasian water milfoil, and hybrid Eurasian/northern water milfoil have been observed at the Hayward Project. Zebra mussel eDNA, qPCR analysis was conducted in 2019; results were negative. Chinese mystery snails, curly-leaf pondweed, Eurasian water milfoil, and Japanese mystery snails have been observed at the Trego Project. Early Detection Monitoring was conducted at the Trego Project in 2017. Purple loosestrife is monitored annually and is observed at Hayward Project. Purple loosestrife is not monitored in the current license for Trego Project.

• Operation nexus to resource and how informs license: The Project may influence invasive species that have the potential to directly or indirectly cause economic or environmental harm or harm to human health, including harm to native species, biodiversity, natural scenic beauty and natural ecosystem structure, function or sustainability; harm to the long−term genetic integrity of native species; harm to recreational, commercial, industrial and other uses of natural resources in the state; and harm to the safety or wellbeing of humans, including vulnerable or sensitive individuals. – per NR40.

• Methodology: Use department Early Detection Early Response Protocols. Additional methodology may be needed for terrestrial species, and other methodologies such as point-intercept may be appropriate if combing this study with other studies.

• Level of Effort and Costs: 40 hours of field work and reporting at $125 per hour equals $5,000. Mobilization, equipment, and supplies are estimated at $10,000.

AQUATIC PLANT SURVEY

• Goals & Objectives: The goal of the aquatic plant study is to provide baseline data on the condition of the aquatic plant community in the Project.

• Relevant DNR Management Goals: The proposed aquatic plant study will provide baseline aquatic plant information to determine if management practices would be needed to enhance the existing aquatic plant community, and overall health of the Project reservoir as a bio indicator. Water levels can influence aquatic vegetation.

• Existing Information: In-water plant community data is limited within the Project boundary.

• Operation nexus to resource and how informs license: The study results will provide baseline aquatic plant data. The data informs the Department of the effects on the surface water resource and would be used to formulate management options. Plant density and diversity of aquatic and native species are important for establishing varies management plans and protecting the resource.

• Methodology: The information collected from this study includes an assessment of the density and diversity of macrophytes, which includes frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization. The aquatic invasive species study should be conducted according to the department's Recommended Baseline Monitoring of Aquatic Plants in Wisconsin.

• Level of Effort and Costs: 40 hours of fieldwork and 40 hours of reporting at $125 per hour, plus equipment costs.

MUSSEL STUDY

• Goals & Objectives: Determine the effects of barriers to mussel distribution and diversity within the Project area and Namekagon River. Determine freshwater mussel density and diversity, including characterizing mussel habitat within the Project area. The study would provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Project area.

• Relevant DNR Management Goals: This information will help the resource agencies determine if any best management practices are needed to protect listed species, as well as any management measures to protect or enhancement the existing freshwater mussel population.

• Existing Information: No federally or state threatened/endangered or special concern mussel species are known to occur in the impounded sections of the reservoirs, however listed species may occur downstream from the dams or further upstream from the impounded reaches of the reservoirs.

• Operation nexus to resource and how informs license: The operations of the Project could influence the freshwater mussel species located within the Project boundary. The results of the survey will provide essential information to determine if any protection measures, restoration, or enhancements would be necessary as a management requirement associated with the relicensing of the dam.

• Methodology: A qualitative and quantitative survey for freshwater mussels should be conducted within the Project area and downstream of the dam structure, on the Namekagon River. Some methods that can be used are the department's Guidelines for Sampling Freshwater Mussels in Wadable Streams and the department's Quantitative Habitat Assessment Methodology. Methodology should be discussed with the department for quantitative surveys. A Mussel Survey Plan should be submitted to the department for review at least 2 weeks (1 month preferred) prior to implementation.

Mussel sampling should be conducted when water temperatures exceed 50°F to minimize thermal stress to the resource. This period will allow mussels disturbed during sampling to re-establish themselves into the substrate.

Qualitative timed searches should first be conducted to assess habitat suitability and presence of freshwater mussels. Sites will be located below each barrier within the study area, plus one site upstream of the Project area. Starting locations should be representative of available habitat within the sampling reach. As a minimum, timed searches will be 4 per/hrs or a total search distance of 200 m in riverine sections of the project area and up to 8 per/hrs within reservoirs.

Based on results of qualitative surveys, quantitative surveys may be required. Quantitative sampling using quadrat samples will be used to determine population density, community composition, age and total length distributions, living/dead and sex ratios. One quantitative site will be located on the Project area where mussel habitat is determined suitable and where past sampling has occurred. The sampling unit will consist of a 30m transect with 10 equally spaced 1/4m2 quadrats every three meters along the unit. Each transect extends perpendicular from shore. Up to 300 1/4 m2 quadrats are sampled, collecting all living bivalves and empty shells. Mussels are brought to the surface in a 3 mm mesh-sized bag where they are identified to species, aged, and shell measurements recorded. All live mussels are then returned along the same transect they were collected.

• Level of Effort and Cost: An estimate of 80 hours of field work and 40 hours to analyze data and draft a report at an estimated $125 per hour, plus equipment costs.

ASSESSMENT OF RARE AND ENDANGERED SPECIES

• Goals & Objectives: Rare plants and animals have been found within, adjacent to, and in habitats similar to the study area. It would be recommended to complete plant and animal surveys for these species to determine if they occur within the study area and to further our understanding of their populations within this area. This will also inform the licensee as to where these plant and animal locations are.

• Relevant DNR Management Goals: The department has responsibility to manage plants and animals, including listed species. This information will be beneficial to understanding the current environment, and potential needs for resource management associated with the Project. The licensee is also required to follow state Endangered Species laws.

• Existing Information: An Endangered Resources Review has been performed for current Hayward and Trego Project boundaries, but will need to be updated with proposed project boundary changes that are presented within the PAD.

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on vegetation and animals-- in particular, wood turtles and their habitat. Proper management of the resource will help to minimize any adverse impacts associated with the removal, restoration, and relicensing activities.

• Methodology: Using a qualified botanist knowledgeable in area vegetation and specific species, identify, classify, and delineate on a map rare, threatened, or endangered plant species within the Project area. Using a qualified biologist or ecologist, conduct presence/absence surveys for specific rare, threatened, or endangered animal species.

• Level of Effort and Cost: 40 hours of desktop review and 40 hours of fieldwork, plus equipment costs.

WOOD TURTLE SURVEYS

• Goals & Objectives: Wood turtles are listed as Threatened in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys, population modelling and natural nest site surveys are three examples of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The main goal of this study request is to determine whether any wood turtle nest sites occur within the Project boundary at either Hayward or Trego.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the wood turtle. This study will be beneficial to understanding the current environment and potential needs for resource management associated within both Project boundaries. Two of the main threats to wood turtles across their range are: 1. Adult mortality due to vehicle collisions 2. Predation of eggs and hatchlings at nest sites, resulting in poor recruitment in many river systems. Wood turtles are particularly susceptible to nest predation due to their tendency to nest colonially and nest in the same location every year, providing a pattern that is recognizable by nest predators, such as raccoon and fox. In an effort to improve recruitment, the department has employed several strategies to protect existing nest sites and create protected artificial nest sites. If any

natural nest sites are found within the Project boundaries at Hayward or Trego, the department will work with the licensee to protect these nest sites from predation as well as from negative human-related impacts.

• Existing Information: Wood turtles are known to be present near this Project boundary, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of these Projects has the potential to have short term and long-term impacts on wood turtles and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to wood turtles are related to seasonal water level fluctuations during vulnerable life history stages, both upstream and downstream. If nest sites are present downstream of the dam, increasing downstream water levels during the period following egg laying in June until hatchling emergence in August/September could cause nest failure if nests become submerged for extended periods of time. Depending on timing, winter drawdowns could have impacts on wood turtles upstream of the dam if the water level is lowered to a point where overwintering turtles are exposed to the elements due to low water levels where they are hibernating.

• Methodology: Using a qualified biologist or ecologist, wood turtle nesting site surveys are requested, following the protocol listed below.

Wood turtle nesting site surveys: Beginning in early to mid-June, and extending until approximately the first week in July, wood turtle nesting activity can be surveyed by conducting daily searches for adult wood turtles and/or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring/summer and is within approximately 200 feet of the river's edge. Note that this can include gravel parking areas, roads or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to a lack of suitable conditions for turtle nesting.

• Level of Effort and Costs: 40-60 hours at $125 per hour, plus equipment costs.

1. Wood turtle nesting site surveys: Assess nest site suitability within the project boundary, focusing on free-flowing river stretches. Desktop review followed by ground truthing.
2. Wood turtle nesting site surveys, Spring/Summer: Daily surveys of suitable nesting sites (if any are found) for four weeks (Assume 1 hour per survey).

BLANDING'S TURTLE SURVEYS AT HAYWARD PROJECT

• Goals & Objectives: Blanding's turtles are a Special Concern species in Wisconsin. In an effort to better understand the abundance and distribution of this species, we are requesting that Blanding's turtle surveys are conducted within the Hayward and Trego project boundaries. The overall goal of this survey request is to determine whether any Blanding's turtle nest sites occur within the Project boundaries.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the Blanding's turtle. This study will be beneficial to understanding the current environment and potential needs for resource management associated within the Project boundary. Two of the main threats to Blanding's turtles across their range are: 1. Adult mortality due to vehicle collisions 2. Predation of eggs and hatchlings at nest sites, resulting in poor recruitment in many systems. If any natural nest sites are found within the current or proposed Project boundary, the department will work with the licensee to protect these nest sites from predation as well as from negative human-related impacts.

• Existing Information: Blanding's turtles are known to be present near these Project boundaries, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of these Projects has the potential to have short term and long-term impacts on Blanding's turtles and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to Blanding's turtles are related to seasonal water level fluctuations during vulnerable life history stages. If nest sites are present downstream of the dam, increasing downstream water levels during the period following egg laying in June until hatchling emergence in August/September could cause nest failure if nests become submerged for extended periods of time. Depending on timing, winter drawdowns could have impacts on Blanding's turtles upstream of the dam if the water level is lowered to a point where overwintering turtles are exposed to the elements due to low water levels where they are hibernating.

• Methodology: Using a qualified biologist or ecologist, Blanding's turtle nesting site surveys are requested, following the protocol listed below.

1. Blanding's turtle nesting site surveys: Beginning in early to mid-June, and extending until approximately the first week in July, Blanding's turtle nesting activity can be surveyed by conducting daily searches for adult Blanding's turtles and/or evidence of recent nesting activity in suitable nesting habitat. Suitable nesting habitat includes a sand or sand/gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring/summer and is within approximately 200 feet of the water's edge. Note that this can include gravel parking areas, roads or shoulders of paved roads. Many portions of the project boundary can likely be eliminated from these nesting surveys due to a lack of suitable conditions for turtle nesting.

• Level of Effort and Costs: 40-60 hours at $125 per hour, plus equipment costs.

1. Blanding's turtle nesting site surveys: Assess nest site suitability within the project boundary. Desktop review followed by ground truthing.
2. Blanding's turtle nesting site surveys, Spring/Summer: Daily surveys of suitable nesting sites (if any are found) for four weeks (Assume 1 hour per survey).

MINK FROG SURVEYS AT HAYWARD PROJECT

• Goals & Objectives: Mink Frogs are listed as a species of Special Concern in Wisconsin. In an effort to better understand the abundance and distribution of this species, several survey and management efforts are taking place across northern Wisconsin within a number of different river systems. Presence/absence surveys are an example of existing work that is being done across the range of this species in Wisconsin, which is primarily the northern one-third of the state. The overall goal of this survey request is to further our knowledge of the distribution of Mink Frogs within the watershed more broadly. The main objectives of this study request are to determine if Mink Frogs are present within the Project boundary of the dam.

• Relevant DNR Management Goals: The department has responsibility to manage wildlife, which includes the Mink Frog. This survey study will be beneficial to understanding the current environment and potential needs for resource management associated within the Project boundary.

• Existing Information: Mink Frogs are known to be present within this Project boundary, however, survey data is limited.

• Operation nexus to resource and how informs license: The relicensing of the Project has the potential to have short term and long-term impacts on Mink Frogs and habitat use. Proper management of the resources will help to minimize any adverse impacts associated with the restoration and relicensing activities. Examples of possible impacts to Mink Frogs are related to seasonal water level fluctuations during vulnerable life history stages, both upstream and downstream.

• Methodology: Using a qualified biologist or ecologist, conduct calling (presence/absence) surveys for Mink Frogs.

1. Calling or presence/absence surveys for Mink Frogs: Follow the Mink Frog Survey Protocols where suitable habitat is present: https://wiatri.net/inventory/frogtoadsurvey/Volunteer/Mink/MinkFrogSurveyProtocols.pdf.

• Level of Effort and Costs: 20 hours at $125 per hour, plus equipment costs.

1. Presence/absence surveys for Mink Frogs, June 6 – July 15, 2021: Two surveys per week for four weeks (assume 2 hours per survey). These surveys should focus on free-flowing river stretches where adjacent bog habitat is present.

ASSESSMENT OF RIVERINE AND RESERVOIR HABITAT

• Goals & Objectives: Define, measure, and assess the stream habitat conditions upstream and downstream of the hydropower facilities at current and proposed elevations. Define, measure, and assess the reservoir habitat, including upstream and downstream of the reservoir at current and proposed elevations. Determine if degradation is occurring and if resources are affected.

• Relevant DNR Management Goals: Obtaining recent habitat assessment information is critical for future management actions and establishing baseline data. Water level fluctuations due to drawdowns may affect aquatic habitat; impacts of drawdowns on the resource should be assessed. Obtaining information on how/if new water levels will cause shoreline erosion as a new ordinary high water mark is established

• Existing Information: The PAD states that “the Lake Hayward shoreline was surveyed for archaeological evidence in 1998 and 2003. The surveys concluded the reservoir shoreline was very stable and well vegetated with little or no erosion.” The PAD states that “the Trego Lake shoreline was surveyed for archaeological evidence in 1998 and 2003. The surveys concluded the reservoir shoreline was very stable and well vegetated with little or no erosion.” The PAD stats that “riparian habitat is heavily developed on Hayward Lake and moderately developed on Trego Lake.”

• Operation nexus to resource and how informs license: Having updated habitat assessment information is critical for evaluating the effects of the project on the reservoir and downstream ecosystem. It will provide baseline data to current conditions and assist with management recommendations of any current or future needs. The data can be used to help guide water resource management associated with the Project.

• Methodology: The riverine habitat within the project area downstream from the dam should be evaluated with the department Quantitative Habitat Assessment methodology in the wadable stretches of the Project at the time of each fish survey, as well as in the wadeable stretches of the Namekagon River at various flows or estimates. For the reservoir, department shoreland habitat protocol should be used. Newly impounded areas and any wetlands that could be affected by the new water level should be mapped. Please work with the department do determine which protocol should be used for different locations.

• Level of Effort and Costs: 80 hours of field work and 40 hours of data analysis and reporting at $125 per hour, plus equipment costs.

ASSESSMENT OF RECREATION

• Goals & Objectives: Evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing, with consideration for the different seasonal uses.

• Relevant DNR Management Goals: The Department supports a wide array of recreational use. We support the need for recreational use surveys that consider a broad array of users. A quantitative recreational use survey completed within the Project boundary will evaluate potential changes associated with any modifications to water levels and operations. Information needs to be gathered in order to understand the current use, and potential future uses.

• Existing Information:

Hayward Project: Hayward Lake is an ASNRI Outstanding and Exceptional Stream designation. Below the dam is a PNW Musky water. The ASNRI designation also points to the Wild and Scenic River status for the Namekagon River, that is protected by federal law. Hayward Lake has a boat ramp 0.3 miles upstream from the dam, just east of the Highway 27 crossing. Hayward Lake also has a recreational fishing pier approximately ½ mile upstream from the dam.

Trego: Trego Lake, on the Namekagon River has designated ASRNI status as an Outstanding and Exceptional area. It also has Wild Rice present and retains the designation for that reason as well. Tribal consultation will be necessary to determine any changes to this waterbody and how it might impact wild rice.

Just downstream from the Trego dam is a canoe landing popular with non-motorized watercraft that use the riverway. This area being national scenic riverway, this reach is managed for paddlers and camping where several primitive water-only access campsites are available. Trego Lake has two boat ramps for motorized boats, and a canoe/kayak launch on the east side of Trego. This area is extremely popular with non-motorized boats and tubes, with a large rental business on the east side of Trego.

• Operation nexus to resource and how informs license: Hydro operations, management of impoundments, water level changes, and sufficient public access can have a significant impact on recreational value. Adequate information is necessary to determine what impacts may be occurring from the hydro operations, and what recreational opportunities may be enhanced.

• Methodology: Desktop assessment, including review of the State of Wisconsin 2019 to 2023 Statewide Comprehensive Outdoor Recreation Plan (SCORP), released in March 2019, public surveys, and existing recreational sites. This includes assessment of current uses, level of use, evaluation for additional recreational features.

• Level of Effort and Cost: 40 hours of desktop review and fieldwork at $125 per hour, plus equipment costs.

ASSESSMENT OF PROPOSED PROJECT BOUNDARY

• Goals & Objectives: Quantitative assessment of acres of wildlife habitat and surface water that would be modified with a proposed change in Project boundary. This includes impacts to public access and recreational activities.

• Relevant DNR Management Goals: Protection of natural resources and providing public recreational opportunities are part of the Department's mission.

• Existing Information: The PAD states for the Hayward Project that "the Licensee is proposing to increase the acreage within the Project boundary an additional 2.8 acres. The increase includes a portion of the reservoir currently occupied by the Project, but not currently included in the Project boundary." The PAD states for the Trego Project that "The use of LiDAR data to review the current Project boundary identified that the upper extent of the existing Project boundary contains a portion of free-flowing Namekagon River that is not impounded at the maximum operating elevation of 1,035.2 feet and therefore is not necessary for project operations. Therefore, in developing the proposed Project boundary for this document, the unimpounded or free-flowing upstream reach has been removed from the proposed Project boundary. This results in an overall decrease of acreage within the Project boundary of 29.1 (submerged) acres."

• Operation nexus to resource and how informs license: The riparian areas are critical in protecting water quality and fish and wildlife habitat in the Namekagon system. Recreation and public access, along with natural resource protection are all part of the Public Trust Doctrine in Wisconsin.

• Methodology: Desktop evaluation of wetland and riparian habitat. Identify changes in acreage in wetland and habitat, as well as changes in acreage and use in reactional features. Additionally, identify if any of the areas proposed to be exclude from the Project boundary provide habitat for listed species.

• Level of Effort and Cost: 40 hours of desktop review at $125 per hour.

TREGO LAKE DISTRICT

PO Box 184 TREGO WISCONSIN 54888

August 27, 2021

Darrin Johnson
FERC Compliance and Licensing, Water
Mead and Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: TLD comments to Section P, Proposed Study Summary for Hayward and Trego Hydroelectric Project relicensing

Mr. Johnson,

The Trego Lake District (TLD) would like to thank the consultant for Xcel Energy, Mead and Hunt, for supporting studies on recreation, aquatic plants, and aquatic invasive species. Additionally, TLD is pleased with the study focusing on water quality. However, TLD strongly recommends conducting the sedimentation studies suggested by NPS and WDNR in the relicensing of Trego Dam. The 1995 FERC Order states: ". . . the licensee is responsible for providing the recreating public access to the upper portion of the reservoir, . . ."[1] To provide this access, the licensee (Xcel Energy), must study and address the sedimentation issue which directly affects the growth of aquatic plants, aquatic invasive species, and recreation.

TLD believes sedimentation study is necessary because of differing responses on sediment build up from FERC during the licensing process in the 1990s; Xcel's proposal to remove areas from the project area that were impacted by the accumulation of sediment over the past 60 years (1962 to current); and Xcel's acceptance of provisions in the 1990s relicensing intended to mitigate excessive aquatic plant growth, likely caused by increased sedimentation.

In reviewing documents regarding the relicensing of the Trego dam in the 1990s, FERC draws different conclusions to the data. A February 27, 1992 FERC Environmental Assessment states:

> *"Since the project's construction in 1927, considerable (emphasis added) sediment deposition has occurred, creating wetlands in inlets of the Trego impoundment, particularly the upstream end where the Namekagon River enters. In this area, 3 to 8*

[1] https://drive.google.com/file/d/1RRwJ02Wx3S0YnmseAQdqO-nAACbRmDdQ/view

feet of sediment has been deposited (an estimated 145,000 cubic yards). Estimates show that 2000 cubic yards of sediment per year continue to settle in the upper reaches of the impoundment (WDNR, 1989). As a result of the shallow conditions, aquatic plants invade such areas, especially in the 15-acre Namekagon River inlet area."[2]

The FERC Environmental Assessment cited highlights the significant impact of the estimated sediment rate, not just the amount of deposit. Additionally, the 1992 Environmental Assessment goes on to recommend developing a management plan to assess an option to address sedimentation and plant growth (a rejected drawdown plan, then supported by TLD). It recommends that "the issue be reevaluated on a recurring basis every four years because of the high value of project impoundment for recreational activity as part of a National Wild and Scenic River." This points out the complex and confusing roles sedimentation plays in Trego Lake and the need for sufficient data, critical analysis, and action plans on mitigating its impact.

To illustrate the issue for Trego Lake using the data provided in the 1988 COE study, it would be as if 14,500[3] dump trucks dropped sediment into the lake west of the Highway 53 bridge and east of the mouth of Potato Creek over the 61-year period. While this may be a "minimal" amount as identified in the consultant's document, it is a significant amount to Trego Lake and the members of TLD located in that area. A 1962 Wisconsin Department of Natural Resources (WDNR) contour map[4] shows the area measuring roughly 3 feet in depth. The addition of 6 feet of sediment over the next 60 years – the time from COE 1988 study plus the shortest of licensing timeframes (30 year) – would overwhelm this area and/or push sediment further into Trego Lake. Trego Lake has already gone 32 years without significant study on the impact of sedimentation and an additional 30 plus years without study would be contrary to Xcel's legal obligations to address recreation and subsequent environmental impacts on the project area.

Further, Xcel Energy wants to reduce the footprint of the project at this very point in the lake. Their reasoning is that it is "not impounded at the maximum operating elevation of 1,035.2 feet." If you compare back to the 1962 WDNR contour map, this area has filled in from sediment and now Xcel Energy wants to exclude the area, and issue, from the project area. This action seems highly suspect. In addition to questioning the boundary reduction, TLD supports the WDNR's current request for study: "Sediment accumulation should be assessed and measured downstream of Hwy 53 through the project area that is being proposed for removal. Assessments of sediment deposits and sediment depth measurements can be collected along multiple transects, including the bay areas, north and west of Leisch Road." Plus, TLD supports sedimentation study east of the Highway 53 bridge to the boundary of the current project area.

Finally, the FERC Order Modifying and Approving Drawdown Needs Analysis issued October 31, 1995 states:

Sedimentation and macrophyte growth make the upper one-third of the lake difficult to access for recreational purposes in the spring and summer months. The licensee recommends a localized macrophyte management plan which involved harvesting,

[2] https://tregolakedistrict.com/wp-content/uploads/2021/03/Environmental-Assessment-for-Dam-License-Februart-27-1992.pdf
[3] https://www.google.com/search?client=safari&rls=en&q=how+many+cubic+yards+of+sand+in+one+dump+truck&ie=UTF-8&oe=UTF-8
[4] https://dnr.wi.gov/lakes/maps/DNR/2712000a.pdf

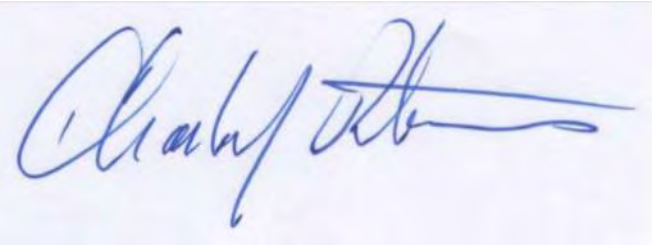
chemical control, hand raking, or a combination of these options to clear paths to enable boats to reach open water and to clear areas in front of residences for swimming and wading purposes.[5]

The language in this Order and subsequent "Vegetation Management Plan"[6] provided a basis for Xcel Energy and TLD to work together to address the impact of sedimentation on excessive aquatic plant growth in the lake. The plant growth is a result of shallow waters caused by sedimentation buildup in Trego Lake. With this language and action, Xcel Energy has recognized that sedimentation has an impact on Trego Lake.

TLD has been working since its inception in 1989[7] "to support and encourage the preservation of the natural beauty, peacefulness, safety, and recreational value of the shoreline and waters of Trego Lake, and to coordinate with the various public and private organizations involved in these efforts"[8] and has assumed the responsibility for TLD members to have full access to the lake as noted in the FERC order.

We urge you to include the sedimentation studies as part of the relicensing process for Xcel.

The TLD appreciates the opportunity to provide comments here and for all detailed study plans regarding Hayward and Trego Hydroelectric Project relicensing. We look forward to working with the licensee, stakeholders, and FERC on the licensing process for these projects. Should you have any questions regarding these comments, please contact me at 612-803-8765 or cjpetersen@msn.com



For the Board. . .
Charlie Petersen
Trego Lake District Board Chair

Cc: FERC

[5] https://drive.google.com/file/d/1RRwJ02Wx3S0YnmseAQdqO-nAACbRmDdQ/view
[6] https://drive.google.com/file/d/1WI4_hkXZ8SFnRV3wj9oGglTnLXpNrezm/view
[7] https://drive.google.com/file/d/1i-E9Gj-Q5bteZPh1WpFcpAjuBiF2Jupt/view
[8] Trego Lake District mission statement

Document Accession #: 20210901-5018 Filed Date: 09/01/2021

United States Department of the Interior

NATIONAL PARK SERVICE
St. Croix National Scenic Riverway
401 North Hamilton Street
Saint Croix Falls, WI 54024

In Reply, Refer To:
1.A.1. (SACN)

August 31, 2021

Darrin Johnson
Darrin.Johnson@meadhunt.com
FERC Compliance and Licensing, Water
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Summary of Study Comments and Responses for Hayward (p-2417) and Trego (p-2711)

Dear Mr. Johnson,

The National Park Service (NPS) appreciates the opportunity to provide comments on the *Summary of Study Comments and Responses* prepared by Mead & Hunt for Xcel Energy for the Hayward and Trego hydroelectric projects on the Namekagon River, within the St. Croix National Scenic Riverway administered by the NPS. We received this proposed study summary by email dated August 2, 2021. We understand that you will address any comments received within 30 days prior to the submission to FERC.

The NPS requests to be included as an interested stakeholder and have an opportunity to review and comment on all detailed study plans. We understand that individual detailed study plans will be sent out for review and comment at some time in 2021 as part of the Stage 1 Consultation Process. More details on this schedule will help the NPS respond to these consultation opportunities.

Based on the Summary, of the three studies requested by the NPS, the licensee proposes:

O. Recreation Study – including all four components recommended by the NPS;

P. Sedimentation, Hydraulics, and Channel Change Study at Trego – integrate some components of this request into the Aquatic and Terrestrial Invasives Study (ATIS) and the Cultural/Historic Resources Study; and

Q. Shoreline Survey - integrate some components of this request into the Aquatic and Terrestrial Invasives Study (ATIS), the Cultural/Historic Resources Study, and the Recreation Study.

The NPS offers the following comments on our requested studies and the plan to integrate some components into other studies.

O. Recreation Study

1) Comments on NSPW response

   a) We are encouraged by NSPW's plans to conduct the four-part comprehensive recreation study as proposed by NPS. We encourage NSPW to use the detailed methodology described and recreation survey template provided in our study request and look forward to reviewing NSPW's draft detailed recreation study plan later this year.

2) We have the following suggested edits:

   a) Table of Contents "O. Recreation Study" should state NPS rather than WDNR

   b) "O. Recreation Study":
      i) the section header should state NPS rather than WDNR
      ii) under "NPS Comments(s)" remove the first paragraph since it constitutes WDNR's study request rather than the NPS study request
      iii) under "NSPW Response," correct in the first paragraph the third component (3) to "a recreation use and demand assessment" per our study request, replacing "a recreation use and demand analysis"
      iv) under the listing of recreation sites and facilities correct the first bullet under Trego Project sites to state "Town of Trego Park Landing" rather than "Town of Trego Park"

P. Sedimentation, Hydraulics and Channel Change Study at Trego Dam

1) Comments on NSPW response

   a) NSPW references the Corps of Engineers Study cited in current license documents. The study concluded that the sediment load and deposition is low compared to other Wisconsin rivers.
      i) NPS agrees that the amount of sediment supplied by the upstream watershed may be small relative to other Wisconsin river systems, but it is well documented in the Trego licensing record that sedimentation and vegetation growth in the upper reaches of Trego Flowage are a continuing problem. These issues have been addressed in the current license and we expect that protection, mitigation, and enhancement measures will be included in the subsequent license.

   b) NSPW asserts that sediment is not caused by project operations, and thus is not proposing to conduct a sediment study.
      i) The NPS considers that the Trego dam is a key component of the project and associated operations. The NPS requested this study to evaluate the extent that the existence of the Trego Dam is responsible for sediment deposition at the upper reaches of the Trego Flowage. The Trego Flowage is not a natural lake - it is a man-made reservoir. Thus, although production and transport of sediment from the

upstream watershed are natural processes, the sedimentation occurring in the Trego flowage is associated with the ongoing impact of the project dam. The May 1989 WDNR Evaluation Report cited in our study requests notes that between three and eight feet of sediment accumulated in the upper most 15 acre inlet area between 1927 and 1988, though it is not specific about where this area is located.

c) NSPW notes that updated vegetation and bathymetric maps of the reservoir will be developed as part of the ATIS study.
   i) The point measurements described as part of the ATIS study will not be adequate to evaluate changes in bathymetry resulting from continued sedimentation in the project area. The NPS suggests that a bathymetric survey of sufficient density and data quality be conducted to develop an accurate updated bathymetric map of the reservoir.

d) NSPW is not including the NPS proposed hydraulic modeling because it asserts that hydraulic effects are driven primarily by the volume of inflow, not the operation of the Project.
   i) Again, the NPS requested the study to understand the extent that the hydraulic effects are associated with backwater effects of the Trego Dam and that this information is needed to understand sediment deposition and upstream flood risk. This information is critical for understanding whether the proposed boundary change is appropriate, given the importance of this area for recreation access and its influence on sedimentation and plant growth further downstream.

e) The Study summary does not address the following components of the NPS study request: Channel and shoreline change analysis; Bathymetric survey and analysis comparison to previous surveys; Synthesis – proposed boundary change issues associated with flood risk to existing infrastructure and public access areas.
   i) Although the licensee plans to provide some updated bathymetric data as part of the ATIS study, the NPS suggests that the detailed study plan should include analysis of change from previous surveys. The NPS assumes that issues related to sediment deposition, aquatic plant growth, and recreation access (including flooding) will be addressed as part of the ATIS and Recreation studies, and lead to protection, mitigation, and enhancement measures in the subsequent license.

2) NPS recommendations

a) Please reconsider the need for a more detailed sediment, hydraulic and channel change study. The NPS study request would update the analysis by the Corps of Engineers used as the basis for understanding sediment dynamics in the current license. It would also clarify the role of the Trego Dam and associated operations in sediment, aquatic vegetation, flooding, and recreation; help identify approaches for addressing ongoing impacts; and inform response to the proposed boundary change.

b) Any mapping (e.g., shoreline condition, vegetation, substrate) should be completed using geospatial platforms to facilitate analysis of change over time. Techniques proposed in the NPS shoreline study should be considered.

Q. Shoreline Survey

1) Comments on NSPW response

a) NSPW plans to monitor the Project shoreline for erosion and identify failing shoreline stabilization measures as part of the Cultural Resources Study. NSPW will not collect information about docks within the Project boundary because it relies on WDNR to regulate docks on the project shoreline. NSPW will provide information about public access locations as part of the recreation study. NSPW will provide information about aquatic vegetation, including Wild Rice, as part of the ATIS study.

i) The NPS looks forward to receiving the detailed study plan and encourages the use of the NPS recommended study methodology to create a georeferenced photographic database and map of shoreline conditions. This approach would provide additional baseline information on the type and condition of shoreline stabilization measures, and not merely an indication of whether it is failing. It would also facilitate identification of areas in need of management attention and other objectives identified in the NPS shoreline study request. It would provide the basis for making recommendations for protecting and enhancing the project shorelines.

b) NSPW rejected the NPS study request to document changes in shoreline conditions on lands owned by the licensee because it asserts that the NPS does not have authority over these projects and the licensee is not required to consult with NPS on construction projects conducted under Part 12 of the Federal Power Act.

i) The NPS does have authority over water resources construction projects to assure that construction does not have adverse impacts on the Namekagon. Although the FERC is the lead Federal agency with oversight for dam safety construction, no department or agency of the United States is authorized to assist in the construction of any water resources project on or directly affecting a component of the national wild and scenic rivers system that has a direct and adverse effect on the values for which it was designated, as determined by the Secretary charged with its administration, under Section 7 of the Wild and Scenic Rivers Act (16 U.S.C. §§1271 et seq.). The NPS administers the Namekagon River as part of the St. Croix National Scenic Riverway, a National Wild and Scenic River. Thus prior to Federal agency approval of construction activities (e.g., FERC, U.S. Army Corps of Engineers), NPS review is necessary.

ii) Although, the licensee does not have an explicit requirement to consult with the NPS under Part 12 of the Federal Power Act and the FERC has administrative and supervisory responsibilities over dam safety modifications, the licensee is responsible for using sound and prudent engineering practices in any actions relating to the design, construction, operation, maintenance, use, repair, or modification of a water power project or project works. By requesting this study, the NPS seeks to document baseline conditions and improve its coordination with the licensee to ensure that dam safety construction is consistent with river values over the term of the next license. Early coordination can help ensure that projects are designed to protect river values (such as scenic and recreational resources) and meet the standards of the Wild and Scenic Rivers Act.

In addition, the NPS offers the following comments on other proposed studies:

C. Assessment of Minimum Flow and Resource Impacts Downstream of the Tailwater – WDNR

- The NPS supports the WDNR proposed assessment. It is appropriate to evaluate whether habitat improvements made under Article 406 of the current Hayward license will continue to achieve desired results under a subsequent license.

F. Cultural /Historical Resources Study – NSPW

- Any mapping (e.g., shoreline condition, vegetation, substrate) should be completed using geospatial platforms to facilitate analysis of change over time. Techniques proposed in the NPS shoreline study should be considered.

I. Aquatic and Terrestrial Invasive Species (ATIS) Study – WDNR

- The shoreline boat survey could also be used to identify shoreline stabilization and condition.
- The NPS supports the inclusion of Wild Rice in this study, as described in the NSPW response on the Rare and Endangered Species Study.

Thank you for your consideration of these additional comments as you continue to develop and refine your study plan. The NPS looks forward to the opportunity to continue to collaborate on the continued operation of the Hayward and Trego projects. If you have any questions about our response, please contact Susan Rosebrough at susan_rosebrough@nps.gov or (206) 220-4121.

Sincerely,

JULIET GALONSKA
Digitally signed by JULIET GALONSKA
Date: 2021.08.31 08:27:56 -05'00'

Juliet L. Galonska
Superintendent

Document Content(s)

FinalNPSProposed Study SummaryTregoHayward.pdf 1

Recreation Study Plan Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Friday, November 5, 2021 8:07 AM
To: angietornes@gmail.com; cheryl.laatsch@wisconsin.gov
Cc: Darrin Johnson; Miller, Matthew J; Crotty, Scott A; Maurer, Brey J; Shawn Puzen
Subject: Draft Hayward-Trego Recreation Study Plan for your Review
Attachments: 20211104 Draft Hayward-Trego Recreation Use Study Plan Complete.pdf

Good Morning,

Attached for your review is the proposed Recreation Study Plan.

We are sending this study plan for your review right now because it requires the surveys to begin in January of 2022. Therefore, we need to move this plan through the review ahead of the other plans.

Please provide your comments as soon as possible, but no later than December 5, 2021.

Please do not hesitate to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Draft Study Plan

Recreation Study

Prepared for

Prepared by

Mead & Hunt

meadhunt.com

November 2021

1. Introduction

Northern States Power Company – Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 (Hayward) and 2711 (Trego), expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit final license applications to FERC no later than November 30, 2023. The final license applications, in part, must include an evaluation of the existing recreational facilities associated with each Project along with proposed recreation enhancements.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The National Park Service (NPS) and Wisconsin Department of Natural Resources (WDNR) requested a study of recreation facilities and an investigation of recreation enhancements as part of the relicensing process.

NPS requested that the Licensee conduct an inventory of recreation opportunities and facilities including determining recreation demand using field observations, user surveys, and focus groups and estimating recreation needs based on the data gathered.

WDNR requested that the Licensee evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing, with consideration for the different seasonal uses.

This study plan is consistent with the NPS and WDNR requests.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to provide a subjective assessment of existing recreation facility conditions as well as recommended enhancements. The study will also determine the capacity of existing facilities to help assess current and future user demand, produce sufficient information to evaluate such impacts, and provide the rationale for recommended recreation enhancements.

2.2 Background and Existing Information

Recreation in the vicinity of the Projects is dominated by activity near the Projects' facilities. The existing recreational facilities within the Projects will be evaluated for recreational use and improvements.

The last recreation studies for the Projects were completed in 2020 and filed with FERC on February 24, 2021. The Hayward report indicated that "...the Lake Hayward area offers a sufficient amount of recreational opportunities for both land and water-based activities. The recreational facilities, while limited in number, are in good condition and receive regular maintenance and upgrades when required.

The number and size/capacity of the facilities appear sufficient to accommodate the current amount of use on all but the busiest of days" (NSPW, 2021).

The Trego report indicated that "…the Trego Flowage area offers reasonable opportunities for both water and land-based recreational activities, including opportunities for overnight recreation (i.e., camping, night fishing, etc.). Although the number of recreational facilities is limited, most are in good condition and receive routine maintenance. The number and capacity of the facilities appear sufficient to accommodate current recreational use on all but the busiest days, despite the apparent observed increase in recreational activity related to COVID-19."

In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP did not identify any specific recreation needs in the immediate vicinity of the Projects.

The SCORP places an emphasis on nature-based recreational opportunities including hiking, fishing, and boating. For both Projects, the Licensee currently provides a carry-in access on the reservoir, a tailrace fishing area downstream of the powerhouse, and a canoe portage that helps fulfill recreation needs. These recreational opportunities are consistent with the SCORP.

2.3 Nexus between Project Operations and Effects on Resources

Hydro operations, including fluctuations in reservoir elevation, and insufficient public access can limit recreational opportunities. Adequate information is necessary to determine what impacts may be occurring from hydro operations as well as which recreational opportunities may be enhanced.

2.4 Study Area

Since it is believed no additional recreation sites are necessary, the inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1.

Table 2.4-1. Recreation Sites to be Inventoried and Surveyed for Existing Use

Hayward Canoe Portage Take-Out and Carry-In Reservoir Access
Hayward Canoe Portage Trail and Put-In
Hayward Informal Tailwater Bank Fishing Area
Hayward City Boat Landing
Hayward City Beach & Barrier-Free Fishing Pier
Hayward Bartz's Bay Informal Ice Fishing Access[1]
Town of Trego Park Boat Landing
Town of Trego Boat Landing
Trego North Tailwater Access (Canoe Portage)
Trego South Tailwater Access

[1] Bartz's Bay Informal Ice Fishing Access will only be surveyed during the January and February survey periods.

2.5 Methodology[2]

2.5.1 Recreation Inventory

Each of the recreation sites listed in Table 2.4-1 will be inventoried during the summer using the forms attached as Appendix 1 to collect information on recreation amenities and capacity. The following types of information will be recorded:

1) The primary type(s) of recreation provided at the site.
2) Existing sanitation facilities (if any).
3) Type of vehicle access and parking capacity (if any).
4) The presence and type (if any) of barrier-free facilities.
5) The GPS location of the facility.
6) Photographs of the recreation site, amenities, signage, and entryways to the site from the main road(s), including photographs of any adverse impacts the site may have on environmental resources including shoreline erosion.

2.5.2 Facility Condition Assessment

During at least one visit to each of the recreation sites listed in Table 2.4-1, the condition of each amenity or feature (including recreational wayfinding signs and interpretive signs) and its immediate vicinity will be assessed. A rating for each site will be made according to the following scale:

1) Not Usable and Needs Replacement
2) Needs Repair
3) Needs Maintenance or cleaning
4) Good Working Condition (does not need any attention)
5) Facility Lacking; need to install facility or otherwise add enhancement (identify item).

If a rating is assigned indicating that additional attention is required, the specific item that needs additional attention will be noted on the form.

2.5.3 Recreation Use Survey

Recreation use surveys will be conducted during visits to each of the recreation sites listed in Table 2.4-1. The surveys will last at least one hour per site between the hours of 7:00 a.m. and 7:00 p.m. Surveying will be completed on a rotating schedule to avoid surveys from repeatedly being conducted at the same time of day and will also account for time-of-day use patterns. The recreation use survey form included in Appendix 2 will be administered to users to gather their opinion about the existing recreation facilities and opportunities. The survey will record the number of people in a party, their primary reason for visiting the site, their perception of level of use, and their opinions regarding the amount and types of recreation opportunities offered within

[2] Please note: The methodology does not include regional demand assessment or recreation needs assessment. These analyses will be completed as part of the License Application.

the proposed Project vicinity. The recreation use surveys will be conducted according to the following schedule in Table 2.5.3-1

Table 2.5.3-1. Recreation Use Survey Schedule

Survey Month	Recurrence Interval
January	One randomly selected weekend day.
February	One randomly selected weekend day.
April	One randomly selected weekend day.
May	One randomly selected weekend day. One day during Memorial Day weekend.
June	One randomly selected weekday. Two randomly selected weekend day.
July	One randomly selected weekday. Two randomly selected weekend day.
August	One randomly selected weekday. Two randomly selected weekend day.
September	One weekend day the weekend following Labor Day weekend.

2.5.4 Spot Counts

When first arriving at each recreation site where recreation use surveys will be collected, a spot count will be conducted using the recreation use spot count form enclosed in Appendix 3. This information will be statistically analyzed to develop recreational use figures for the Projects. This information will be summarized by season and activity for each type of use in the study report.

2.5.5 Future and Potential Recreation

To assess future recreation needs within the Project vicinity, the questionnaire enclosed in Appendix 4 will be sent to municipalities and other entities responsible for existing recreation within the Project vicinity. Specifically, the questionnaire will be sent to the City of Hayward, Hayward Area Chamber of Commerce, and Sawyer County for the Hayward Project and the Town of Trego, Trego Lake District, and Washburn County for the Trego Project.

Each entity will be allowed 30 days to respond to the questionnaire and their responses will be incorporated into the license application[3].

2.6 Consistency with Generally Accepted Scientific Practice

The overall design of the recreational survey is similar to that commonly used in relicensing proceedings and is consistent with generally accepted methods for recreation studies.

[3] Even though the original study summary indicated a report would be developed, NSPW has found the most-efficient way to display the data is in the license application because it can provide the full picture of proposed recreational mitigation and enhancement measures in context with all other proposed mitigation and enhancement measures included in the license application. Therefore, no study report will be developed for the recreation study.

2.7 Project Schedule and Deliverables

NSPW anticipates that field work will begin in January 2022 (for winter surveys) and be completed by mid-September. The study results will be incorporated into the license application along with additional recreational mitigation and enhancement recommendations (if any).

3. Consultation

The Recreation study was requested by the NPS and WDNR. As a result, the Licensee consulted with the NPS and WDNR on the study plan as discussed in the following sections.

3.1 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the NPS for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

3.2 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

4. References

EA Engineering. 2021a. Recreation Report for the Hayward Hydroelectric Project (FERC Project No. 2417). February 2021.

EA Engineering. 2021b. Recreation Report for the Trego Hydroelectric Project (FERC Project No. 2417). February 2021.

Appendix 1 – Recreation Site Inventory Form

Recreation Inventory and Condition Assessment								
Location:						Date:		
Hayward Hydroelectric Project P-2417								
Survey Person:								
GPS Location:								
Amenity Photo Numbers:								
Shoreline Photo Numbers:								
Entryway Photo Number:								
Type of Amenity:	**Quanitity of Amenities:**	**Condition of Amenity:** -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)				**Notes:**	**Barrier Free?** (Y or N)	
Boat Launch	Lanes: 1 Launches: 1	N	R	M	G			
Scenic Overlook		N	R	M	G			
Tailwater Access		N	R	M	G			
Restroom		N	R	M	G			
Trash Receptacles		N	R	M	G		NA	
Other (picnic units, informal trails, camping, etc.)		N	R	M	G			
Parking	**No. Spaces (each type):**					**Condition:**		**Notes:**
	Standard:	Barrier-Free:	Trailer:	Other (specify):				
						N R M G		Gravel?
Signage:	**Number:**	**Condition:**				**Comments: Provide Details on which signs need attention.**		
FERC Project Sign		N	R	M	G			
Regulations Signs		N	R	M	G			
Directional		N	R	M	G			
Interpretive		N	R	M	G			

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

Recreation Inventory and Condition Assessment									
Location:							Date:		
Trego Hydroelectric Project P-2711									
Survey Person:									
GPS Location:									
Amenity Photo Numbers:									
Shoreline Photo Numbers:									
Entryway Photo Number:									
Type of Amenity:		**Quanitity of Amenitie**		**Condition of Amenity:** -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)				**Notes:**	**Barrier Free?** (Y or N)
Boat Launch		Lanes: 1	Launches: 1	N	R	M	G		
Scenic Overlook				N	R	M	G		
Tailwater Access				N	R	M	G		
Restroom				N	R	M	G		
Trash Receptacles				N	R	M	G		NA
Other (picnic units, informal trails, camping, etc.)				N	R	M	G		
Parking		**No. Spaces (each type):**						**Condition:**	**Notes:**
		Standard:	Barrier-Free:	Trailer:	Other (specify):				
								N R M G	Gravel?
Signage:	**Number:**	**Condition:**				**Comments: Provide Details on which signs need attention.**			
FERC Project Sign		N	R	M	G				
Regulations Signs		N	R	M	G				
Directional		N	R	M	G				
Interpretive		N	R	M	G				

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

Appendix 2 – Recreation Use Survey Form

ON-SITE/IN-PERSON RECREATION INTERVIEW

Hayward & Trego Hydroelectric Projects (FERC Nos. 2417 and 2711)

NPS Recreation Survey Questionnaire

Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of applying for subsequent licenses from the Federal Energy Regulatory Commission (FERC) to continue to operate and maintain the existing Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by NSPW. To obtain a license for the Projects, NSPW must submit a final license application to FERC no later than November 30, 2023. As part of the relicensing process, NSPW is conducting several environmental studies which will enable FERC to prepare an environmental report. The purpose of this survey is to collect information about recreational use and visitors' experiences at public recreation facilities around the Hayward and Trego Project reservoirs.

What is the ZIP code where you live or country if not in the United States?

ZIP code: _____ or, country (if not the United States): _____

What is your age: _____

What is your gender? ☐ Male ☐ Female ☐ Non-binary

Which of these categories best indicates your race and ethnicity? Answer only for yourself.

Please select one or more.

- ☐ American Indian/Alaskan
- ☐ Native Hawaiian/other Pacific
- ☐ Black/African-American
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ Not Hispanic or Latino
- ☐ White
- ☐ Don't know

Please let us know if you have any additional comments regarding your recreation experience during your visit: (contact information)

_____

_____

_____

_____

1. Check the box on the location where you received this survey:

Hayward Project:

- ☐ Hayward Canoe Portage Take-out and Carry-In Access
- ☐ Hayward Canoe Portage Trail and Put-in
- ☐ Informal Tailwater Bank Fishing Access
- ☐ City of Hayward Boat Landing
- ☐ City of Hayward Beach/Fishing Pier
- ☐ Bartz's Bay Informal Ice Fishing Access

Trego Project:

- ☐ Town of Trego Park Boat Landing
- ☐ Town of Trego Boat Landing
- ☐ Trego North Tailwater Access/Canoe Portage
- ☐ Trego South Tailwater Access

2. Below is a list of activities available. Please indicate:

(A) Which of these activities have you participated in **on your current visit** to the area.

(B) Which **ONE** of these activities is your **PRIMARY ACTIVITY** on this trip to the area?

ACTIVITY	(A) Participated in ON THIS TRIP (Check all that apply)	(B) PRIMARY ACTIVITY (Check only one)
Shoreline/tailwater fishing		
Fishing from a boat		
Motorized boating		
Non-motorized boating		
Swimming		
Picnicking		
Wildlife Viewing		
Other (specify)		

3. (A): Were there any activities that you and your group wanted to do on this visit to (AREA) that you were not able to?

☐ YES ☐ NO

(B): If YES: What was it? _____

(C): Which of the following reasons, if any, explain why you did not engage in the activity?

☐ Rules or regulations did not allow for activity
☐ Area was temporarily closed to the public
☐ Not enough time
☐ Safety concerns
☐ Not enough information about the activity
☐ Too crowded
☐ Difficult road or trail access
☐ No road or trail access
☐ Unsatisfactory conditions of facilities
☐ Resource damage due to overuse
☐ No facilities or services
☐ Bad weather
☐ Flooding or other natural hazard
☐ Other (please specify) _____

4. Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services?

☐ YES ☐ NO

If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in?

(Please describe): _____

5. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir?

[Select one number for each or indicate it was not applicable to your visit.]

LOCATION / AREA	Not at all crowded	Slightly crowded	Moderately crowded	Very crowded	Extremely crowded	Not applicable
In parking areas	1	2	3	4	5	☐
On the trails	1	2	3	4	5	☐
At a developed campground	1	2	3	4	5	☐
At a boat-in campsite	1	2	3	4	5	☐
While fishing from the shoreline	1	2	3	4	5	☐
While boating/fishing from a boat	1	2	3	4	5	☐

(B) If you felt crowded, did you modify your recreation plans because you felt crowded?

☐ YES ☐ NO

(C) If YES, what did you do?

☐ Moved to a new location
☐ Changed the time of day
☐ Changed your activity
☐ Chose not to recreate
☐ Continued with current plans
☐ Other: _____

6. During the planning process for your visit, how did the possibility of crowds affect your trip plans?

(Please select one response)

☐ It did not affect my plans
☐ I visited at a time of day I thought would be less crowded
☐ I visited on a day of the week I thought would be less crowded
☐ I avoided places here I thought would be crowded today
☐ Other (please specify) _____

7. Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ YES ☐ NO

If yes, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)		
	Proximity	Loudness	Other (please specify)
Motorized boaters	☐	☐	☐ _____
Non-motorized watercraft	☐	☐	☐ _____
Vehicles	☐	☐	☐ _____

8. How satisfied were you with the following amenities at this recreation facility/reservoir today.

***Important**: Please only circle a number for the items **that you used during your current visit** to this specific recreation facility/reservoir. Also, please **check** the "Did Not Use" box, if you did not use the item or it does not exist at the specific recreation facility.*

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied	Did Not Use	If you were dissatisfied for any reason, please explain why:
	Restroom	**1**	**2**	**3**	**4**	**5**	☐	
	Picnic sites	**1**	**2**	**3**	**4**	**5**	☐	
	Trash receptacles	**1**	**2**	**3**	**4**	**5**	☐	
	Vehicle parking areas	**1**	**2**	**3**	**4**	**5**	☐	
	Boat launch parking area	**1**	**2**	**3**	**4**	**5**	☐	
	Boat launch	**1**	**2**	**3**	**4**	**5**	☐	
	Boat dock	**1**	**2**	**3**	**4**	**5**	☐	
	Other:	**1**	**2**	**3**	**4**	**5**	☐	
	Roads to facility	**1**	**2**	**3**	**4**	**5**	☐	
	Signage to the facility	**1**	**2**	**3**	**4**	**5**	☐	
	Signage within the facility	**1**	**2**	**3**	**4**	**5**	☐	
	Other:	**1**	**2**	**3**	**4**	**5**	☐	

9. How did you obtain information to plan your current trip? (Please select all that apply)

- ☐ Federal or State website
- ☐ City, local, or municipal website
- ☐ Xcel website
- ☐ Other websites
- ☐ Maps, brochures, pamphlets
- ☐ Visitor bureaus/centers
- ☐ Previous visits
- ☐ Word of mouth
- ☐ Social media (e.g., Facebook, Twitter, etc.)
- ☐ Travel guides and tour books
- ☐ Newspaper/magazine article
- ☐ Radio/TV broadcasts
- ☐ Other (specify): _____

Appendix 3 – Recreation Use Spot Count Form

Recreation Observation (Spot Count) Form																	
Date:										Time:							
Hayward Project P-2417																	
Survey Person:																Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:		Weather:				Wind Speed:											
			Recreation Activities														
Recreation Site		Number of People	ATV/Snowmobile	Shoreline Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	Notes		
Canoe Portage Take-Out & Carry-In Reservoir Access																	
Canoe Portage Trail and Put-In																	
Informal Tailwater Bank Fishing Area																	
Hayward City Boat Landing																	
Hayward City Beach/Barrier-Free Fishing Pier																	
Bartz's Bay Informal Ice Fishing Access (Jan & Feb only)																	
Additional Comments:																	

Recreation Observation (Spot Count) Form																	
Date:								Time:									
Trego Project P-2711																	
Survey Person:														Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.			
Temperature:		Weather:				Wind Speed:											
Recreation Site	Number of People	Recreation Activities															Notes
		ATV/Snowmobi	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking / Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)				
Town of Trego Park Boat Landing																	
Town of Trego Boat Landing																	
Trego North Tailwater Access (Canoe Portage)																	
Trego South Tailwater Access																	
Additional Comments:																	

Appendix 4 – Future and Potential Recreation Questionnaire

Xcel Energy is in the process of relicensing the Hayward and Trego Hydroelectric Projects (Projects) located on the Namekagon River in Sawyer and Washburn Counties, Wisconsin, respectively. Xcel Energy is gathering information about potential recreation needs in the vicinity of Projects.

The Hayward Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream of the Hayward Dam and 2 ½ miles upstream of the Hayward Dam. The Trego Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream of the Trego Dam and 5 ¾ mile upstream of the Trego Dam.

If you have any questions, please contact Matthew Miller at matthew.j.miller@xcelenergy.com or 715-737-1353.

1. Information about person completing the questionnaire:

Name & Title: _____

Organization: _____

Address: _____

_____

Phone: _____

Email Address: _____

2. Is your organization responsible for recreation sites, amenities, formal access sites, or planning for recreation sites within the Project vicinity as defined above?

☐ Yes ***(Please proceed to 2a below)*** ☐ No ***(No additional information is needed and thank you for your input)***

a. Please describe your primary function pertaining to recreation and list any recreation sites or access sites (formal or informal) in the Project vicinity you are responsible for in the space provided below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please proceed to question 2b on the next page.

b. Please list all recreation amenities available at each recreation site or access site you manage (e.g. docks, restrooms, parking areas, interpretive signage, picnic tables, trails, etc.) below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

c. Please provide the location of each site listed above using a map, street address, or GPS location: ***(Additional information may be provided on the final sheet of this questionnaire.)***

d. Have any of the sites or amenities listed in 2a and 2b exceeded capacity or not had sufficient parking? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, amenity and when capacity is exceeded.)*** ☐ No

Recreation Site/Amenity	**Event(s) Exceeding Capacity**

Please proceed to question 2e on the next page.

e. Do you have any planned improvements for the recreation sites listed in 2a and amenities listed in 2b or any plans for development of new recreation sites? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, planned improvement, and anticipated opening date below.)*** ☐ No

Planned Improvements/Locations	**Anticipated Opening Date**

f. Do you believe additional recreation sites/amenities are needed within the Project vicinity? **(Additional information may be provided on the final sheet of this questionnaire.)**

☐ Yes ***(Please list reasoning below.)*** ☐ No

Additional Recreation Sites/Amenities Reasoning

g. Please indicate if there is a specific representative you wish to designate as a follow-up contact to be used by Xcel Energy or their representative ***(Additional information may be provided on the final sheet of this questionnaire.)***

Representative Contact Information

Name: _____

Address: _____

_____

Phone: _____

Email: _____

Additional Information or Comments:
(***Please indicate applicable section***)

Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed. *Not responding within 30 days will indicate you or your agency are not aware of any relevant information regarding potential recreation needs in the vicinity of the Hayward or Trego Hydroelectric Projects*.

Comments, questions, and/or this completed questionnaire may also be sent via email to: Matthew.J.Miller@XcelEnergy.com

Appendix 5 – Documentation of Consultation

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
1.A.1

December 3, 2021

Mr. Shawn Puzen
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Recreation Study Plan, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) appreciates the opportunity to provide comments on the *Hayward and Trego Hydroelectric Projects Draft Recreation Study Plan* prepared by Mead & Hunt for Xcel Energy. The Recreation Study Plan is being developed for the Hayward and Trego hydroelectric projects, hereinafter (Projects), on the Namekagon River within the St. Croix National Scenic Riverway that is administered by the NPS. We received this proposed study plan by email dated November 5th, 2021. We understand that you will review and address these comments prior to study plan execution starting in January 2021.

1. Introduction

We concur and are pleased that this study plan is mostly consistent with the study request delineation and guidance the NPS submitted to Mead and Hunt on April 27, 2021. We offer the following comments to further enhance the study plan and survey instruments.

2. Study Plan Elements

2.1 Study Goals and Objectives

We concur that the objectives of this study include 1) provision of a subjective assessment of existing recreation facility conditions as well as recommended enhancements; and 2) determination of the capacity of existing facilities to help assess current and future user demand, produce sufficient information to evaluate such impacts, and provide the rationale for recommended recreation enhancements.

2.2 Background and Existing Information

We are pleased that the study plan allows for evaluation of the existing recreational facilities within the Projects for recreational use and improvements. These study plans address our April 27th, 2021, comment letter in which we disagreed with the findings in the Projects' recreation study reports completed in 2020 that "The number and size/capacity of the facilities appear

sufficient to accommodate the current amount of use on all but the busiest of days." (NSPW, 2021)

We note in the draft study plan a statement that "In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP did not identify any specific recreation needs in the immediate vicinity of the Projects." The SCORPS, by definition, do not identify specific recreation needs in immediate vicinities of specific targeted areas such as these Projects. We suggest deleting this sentence or clarifying by inserting the following:

> The SCORP identifies recreation needs by region rather than specific sites or project areas.

2.3 Nexus between Project Operations and Effects on Resources

We are pleased to see a discussion of hydro operations and insufficient public access noted in this section as well as the need for adequate information about impacts. In addition to highlighting fluctuations in reservoir elevation, it is also necessary to consider water depths. Additional studies recommended by the NPS about bathymetry and sedimentation will help inform this nexus. We look forward to reviewing your other study plans and how the results will be integrated with recreational issues.

2.4 Study Area

We recommend revising the first sentence in this section as follows:

> The need for additional recreation sites and/or enhancements are not clear given the problematic informal ice fishing on Hayward Lake's Bartz's Bay and recent closure of two access areas in the upstream area of the Trego Flowage. These closures may cause additional demand on existing sites within the project area. The inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1.

We are pleased to see inclusion of each site the NPS recommended for study including the Town of Trego Park Boat Landing and the Informal Ice Fishing Access site at Bartz's Bay. We concur that the Bartz's Bay site need only be surveyed during the January and February survey periods to capture ice fishing activity.

The proposed Recreation Study Plan and the resultant Recreation Study Report should state that the Town of Trego Park Boat Landing on the headwaters of Trego Lake would be omitted from Trego's revised project boundaries if Xcel's proposed project boundaries were approved.

2.5 Methodology

2 2.5.1 Recreation Inventory

We are pleased that the Recreation Site Inventory Form (Appendix 1) includes all amenity types we recommended. In the interest of consistency, please add "signage" to the list of items to be inventoried under this section since signage is included on the inventory form in the Appendix.

2.5.2 Facility Condition Assessment

We concur with your rating categories (see below) to evaluate condition of each site and documentation of the need for further attention (enhancement) to the facility if warranted.

1) Not Usable and Needs Replacement 2) Needs Repair 3) Needs Maintenance or cleaning 4) Good Working Condition (does not need any attention) 5) Facility Lacking; need to install facility or otherwise add enhancement (identify item).

We note an inconsistency between the list provided in the text above and the list on the forms found in Appendix 1. The latter lacks item Number 5, "Facility Lacking; need to install facility or otherwise add enhancement (identify item)." We recommend that Number 5 be restored to the list of the other four condition types on the forms under both "Type of Amenity" and "Signage." This option, for example, would be essential for evaluating Hayward's Bartz's Bay Informal Ice Fishing Access and identifying if other amenities, including signage, exist.

2.5.3 Recreation Use Survey

We are generally pleased with the sampling days per site during the peak season and appreciate inclusion of our suggestion to include measures to balance timing of interviews. We are concerned that one weekend day a month does not adequately cover the non-peak season use and recommend that at least two sampling days, one weekday and one weekend, be included per month at each surveyed site.

In addition, we are pleased that the Recreation Use Survey Interview Form (Appendix 2) is almost verbatim with the one NPS included in our study request. We suggest a few revisions. So that interviewees may fully understand the importance of providing input, please insert the following clarifying language into the introductory paragraph of the survey form:

> First sentence: rephrase to read "Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of applying for *40-year* subsequent licenses…" (Italics indicate inserted text.)
>
> Last sentence: rephrase to read "The purpose of this survey is to collect information about recreational use and visitors' experiences at public recreation facilities around the Hayward and Trego Project reservoirs *so that we may better assess existing and future recreational needs to be included in the licenses*." (Italics indicate inserted text.)

Under Question 2 insert among the list of activities "Ice fishing."

Revise the ninth response option under Question 3.(C) "Which of the following reasons, if any, explain why you did not engage in the activity?" The ninth item currently states "Unsatisfactory

conditions or facilities." We recommend revising this response to read "Unsatisfactory *facilities or conditions of land or water* (for example, navigability upon launching)." (Italics indicate inserted or reordered text.)

To provide a more amenable interview experience, we suggest following the order of questions recommended in our study guidance and returning the section regarding interviewee's demographic details (zip code/country of origin; age; gender; ethnicity; additional comments question) to the end of the interview after item Number 9. This ordering of items allows initial focus on site specifics such as location, recreational use, etc., rather than a person's demographics.

2.5.4 Recreation Use Spot Count

We appreciate the thoroughness of the Spot Count Form (Appendix 3) and recommend one change, moving "ATV/snowmobiling" next to "motorboating" so that motorized use is grouped together.

2.5.5 Future and Potential Recreation

We concur with the list of entities to which this questionnaire will be sent, including Trego Lake District. Please include the National Park Service St. Croix National Scenic Riverway in your list of recipients for both Hayward and Trego projects.

We recommend using the same introductory paragraph, including our suggested edits, found on the Recreation Use Survey Form (Section 2.5.3, above) as an introductory paragraph for the Future and Potential Recreation Questionnaire (Appendix 4). This would help readers understand the importance and context of the questionnaire.

We recommend adding to the questionnaire a map of each project with physical landmarks such as roads and recreation facilities so that participants are better able to focus their comments. In addition, respondents would be able to comply with one of the options for providing site location listed in Question 2.c., "Please provide the location of each site listed above using a map…"

As written, the questionnaire is targeted solely at land managing entities. However, this excludes important partners that help manage resources and/or have extensive knowledge about recreation use, trends, and potential enhancements. We recommend rewording questions to better suit the target audience. For example, Question 2 would read "Is your organization responsible for *or interested in* recreation sites, amenities, …." (Italics indicate inserted text.)

We recommend editing Question 2.f. so that respondents can suggest enhancements to an existing amenity, "Do you believe additional recreation sites/amenities are needed o*r are any enhancements needed at existing* recreation sites/amenities within the Project vicinity? (Additional information may be provided on the final sheet of this questionnaire.) …"

We recommend rewording the directions for returning completed questionnaires to "Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope *or via*

email at the email address below within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed." (Italics indicate inserted text.)

Lastly, we disagree with the conclusion found in Footnote 3, page 4, of this section that a separate Recreation Study Report is not necessary. While including all proposed mitigation and enhancement measures in the body of the license application provides a succinct summary, a separate Recreation Study Report provides a comprehensive review of the study plan, survey instruments, data, analysis, and resultant proposed mitigation and enhancement measures. Such a report is invaluable in providing clear access to the information above not only for license application review but also for review and use during the life of the license.

Conclusion

Thank you for your consideration of these additional comments as you develop your final study plan. The NPS looks forward to the results of this study as well as the opportunity to continue to collaborate with you throughout the licensing process. If you have any questions about our response, please contact Susan Rosebrough at susan_rosebrough@nps.gov or (206) 220-4121.

Sincerely,

THERESA HOGAN

Digitally signed by THERESA HOGAN
Date: 2021.12.04 09:06:56 -06'00'

Theresa L. Hogan
Acting Superintendent

Document Content(s)

NPS_CommentsTregoHaywardProposedRecreationStudyPlan.pdf.....1

WDNR Did Not Provide Comments on Recreation Study Plan

ATIS Study Plan Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Thursday, January 13, 2022 4:52 PM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; jharn@nps.gov; cjpetersen@msn.com
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject: Hayward and Trego Invasive Species DRAFT Monitoring Plan
Attachments: Appendix 3 Reduced.pdf; Appendix 2 Invasive Study Point Intercept Protocol.pdf; Appendix 4 Wisconsin Point Intercept Worksheet with addtl substrate info.xls; 20220113 Hayward Trego Draft ATIS Study Plan.pdf

Categories: Filed by Newforma

Good Afternoon,

Attached is a draft Hayward and Trego Invasive Species Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete an invasive species survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than February 11, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Draft Study Plan

Aquatic and Terrestrial Invasive Species Study

Prepared for

Xcel Energy®

Prepared by

Mead & Hunt

meadhunt.com

January 2022

1. Introduction

Northern States Power Company – Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 and 2711 respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a Final License Application (FLA) to FERC no later than November 30, 2023. The FLA, in part, must include an evaluation of the existing botanical resources (including invasive species) and potential impacts to botanical resources associated with continued Project operations.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that the Licensee complete an invasive species study as part of the relicensing process.

The WDNR recommended that the Licensee conduct an aquatic and terrestrial invasive species study using the WDNR Early Detection Early Response Protocols. The WDNR also noted that additional methodology may be needed for terrestrial species, and other methodologies such as point-intercept, may be appropriate if combined with other studies. The WDNR also requested in-water plant community data within the project boundaries of each Project to provide baseline information on the condition of the aquatic plant community.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this aquatic and terrestrial invasive species (ATIS) study is to provide baseline data on native and invasive aquatic and terrestrial species. The study also provides a method for identifying newly established invading species early enough to increase chances of control and will help prevent the spread of other nearby invasive species.

2.2 Background and Existing Information

There is limited information available regarding invasive species within the Project boundaries. WDNR Lake Facts and Figures webpage identified four invasive species within the Hayward Project, including Chinese mystery snail (*Cipangopaludina chinensis*), curly-leaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), and hybrid Eurasian/northern watermilfoil (*Myriophyllum spicatum x Myriophyullum sibiricum*) are present within the Project reservoir (WDNR 2020a). NSPW has also identified purple loosestrife (*Lythrum salicaria*) within the Project reservoir during annual purple loosestrife surveys.

The WDNR Lake Facts and Figures webpage identified four known invasive species within the Trego Project including Chinese mystery snails, curly-leaf pondweed, Eurasian water milfoil and Japanese mystery snails *(Cipangopaludina japonica)*.

2.3 Nexus between project operations and effects on resources

Invasive species can be introduced to Project waters and lands through recreational activities such as boating, bank fishing, and hiking. These species, once established within the Project boundary, can be transferred downstream through water releases or to areas outside of the Project boundary by recreationists.

2.4 Study Area

The ATIS Study will encompass the upstream and downstream areas inundated by the Namekagon River that are contained within the existing and proposed Project boundaries as outlined in the Pre-Application Document (PAD). It will also encompass upland areas owned in fee by the Licensee within the Project boundary, two recreation sites owned by the City of Hayward and two recreation sites owned by the Town of Trego. The study area is depicted in Appendix 1.

2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas

Samples will be collected in locations outlined in a point intercept grid provided by the WDNR. Sampling will be conducted completed once in June and once in late July or early August of 2022 to account for both early season and late season species. The sampling will be conducted completed by boat using either a pole-mounted or rope-mounted rake. The methods will be similar to approximating the protocol found in the WDNR Recommended Baseline Monitoring of Aquatic Plants in Wisconsin protocol (point-intercept protocol), including the voucher collection (see Appendix 2). The methodology will also incorporate as many parameters as applicable of those listed in Table 1, page 31 of the protocol.

One rake sample per collection site will be taken by lowering the rake to the bottom and slowly drawing it up to the surface. The sample will be inspected for the presence of invasive species as included in NR40[1]. Their presence and percentage of abundance within the sample will be recorded on a field data sheet accordingly along with the presence and percentage of abundance of native species.

Any areas that are not safely accessible will be noted in the report with one of the following reasons:

- Non-navigable (due to thick emergent plant growth or shallow water);
- Terrestrial (point intercept located in an upland area not owned by Licensee);
- Obstacle (rocks, dock, swim area);
- Temporary obstacle (temporary obstacle should be noted);
- No information (accidentally missed or inaccessible, state reason); and
- Other (provide brief description).

[1] https://dnr.wi.gov/topic/invasives/documents/NR40plantlist.pdf.

Vouchers shall be collected for all NR40 listed aquatic and terrestrial invasive species not currently verified within each Project. Steps for vouchering invasive plant species are listed as follows:

- Take a digital photo(s) of the plant in the setting where it was found. Try to capture details such as flowers, leaf shape, leaf and stem arrangement, and fruits. Include a common object in the photo such as a dollar bill, coin or pencil for a size scale, or stand next to tall plants.
- If possible, collect 5-10 intact specimens to ensure precise identification. Try to get the root system and all leaves, as well as seed heads and flowers when present. Place in a zip-lock bag with a damp paper towel. Place on ice and store in a refrigerator as soon as possible.
- Note the location of the plant you found. If using a GPS device please note the datum being used (e.g., WGS 84 {preferred}, UTM, WI Transverse Mercator, etc.).
- Notify Applicant Representative and then complete the WDNR Form 3200-125 – Aquatic Invasive Plant Incident Report and deliver it, your photo(s), and specimens to your WDNR AIS regional coordinator as soon as possible. See: https://dnr.wisconsin.gov/topic/Invasives/report.

Additional information on bed substrates will be collected at each sample point in water depths up to 15 feet deep. Under normal point-intercept protocols, the bed substrate is classified into one of three types; muck, sand, or rock. To assist in determining habitat within the littoral zone, bed substrates will be classified into one of the following nine substrate types: clay, silt, sand, gravel, cobble, boulder, bedrock, wood, or organic. The presence of woody debris on the bottom will also be identified during the rake sampling. Water depth information collected for all survey points during the survey will be used to develop a bathymetric map of each reservoir.

Areas not included in the point intercept grid will be monitored for the aquatic invasive rapid response species identified in the ***Wisconsin Aquatic Invasive Species Early Detector Handbook*** which is included in Appendix 3. If any rapid response species are identified in any of the surveying efforts, WDNR notification as described in Section 2.5.5 below will occur.

In addition to the rake sampling, one water sample will be collected in both the reservoir and the tailwater during the July/August survey period. The water samples will be provided to the WDNR invasive species coordinator who will then analyze them for the presence of spiny water flea (*Bythotrepohes longimanus*), fishhook water flea (*Cercopagis pengoi*), and zebra mussel (*Dreissena polymnorpha*).

In order to determine the presence/absence of Asian clam and other invasive macroinvertebrates, the Licensee will conduct sediment samples at all existing public boat landings. The sampling method will involve using a shovel to scoop approximately 6 inches of sediment into a net with a maximum 3/8-inch mesh. Fine sediment will be flushed out of the net and the remaining materials will be examined for Asian clam and other invasive macroinvertebrates.

2.5.2 Upland Shorelines Not Owned by the Licensee

Upland shoreline areas not owned by the Licensee will be surveyed from a boat (or on foot from the water where the use of a boat is not feasible, i.e., shallow areas) while moving slowly along the shoreline. During the survey, the locations of course woody habitat (greater than 4 inches in diameter and five feet in length) that is in the water and/or below the high-water line will be noted for future mapping. An overall characterization of the terrestrial plant community will also be made. Invasive terrestrial plants listed in NR40 will be noted and their locations on the shoreline identified by latitude and longitude. If any terrestrial invasive plants listed in NR40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of relative abundance and the extent of the area where the species is present will be recorded for future mapping. The route traveled during the boat-based surveys will also be recorded for future mapping.

2.5.3 Upland Shorelines Owned by the Licensee and Recreation Sites

At both Projects, an "on the ground" meander survey will be conducted on upland areas within the Project boundary owned by Licensee. At the Hayward Project, a meander survey will also take place at the Hayward City Boat Landing and the Hayward City Beach recreation sites. At the Trego Project, a meander survey will also take place at the Town of Trego Boat Landing and the Town of Trego Park Boat Landing.

In addition to surveying for terrestrial invasive species, an overall characterization of the terrestrial plant community will be made. If any terrestrial invasive plants listed in NR40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of each species relative abundance and areal coverage will be recorded for future mapping. The route traveled during the meander surveys will also be recorded for future mapping.

2.5.4 Personnel Qualifications

All surveys will be conducted by an individual with prior aquatic plant identification training and experience with aquatic and terrestrial invasive species monitoring[2].

2.5.5 Information Reporting

Should monitoring reveal a new occurrence of an invasive species listed in the ***Wisconsin Aquatic Invasive Species Early Detector Handbook,*** contained in Appendix 3, the WDNR shall be notified at invasive.species@wisconsin.gov as soon as possible, but no later than five working days after its discovery[3]. The notification shall include photographs and the online WDNR Early Detection Form.

[2] The contractor(s) selected to complete the work are responsible for obtaining all NPS and WDNR Scientific collector or other permits necessary to complete the work.
[3] In addition to notifying the WDNR, the consultant shall notify the Licensee representative.

Information collected during the study will be summarized in a final report. Completed survey sheets will be appended to the report. Based upon the data collected, additional invasive species mitigation and enhancement recommendations (if any) may be included in the FLA.

2.6 Consistency with generally accepted scientific practice

The ATIS Survey follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been approved by the Commission in post-licensing compliance plans.

2.7 Project Schedule and Deliverables

Results from this study will be summarized in an ATIS Study Report. The study report will include the following elements:

- Project information and background
- Study Area
- Methodology
- Study Results
- Analysis and Discussion
- Agency correspondence and/or consultation
- Literature cited

The written report will summarize the monitoring results including the location of each species observed and their relative abundance. The information will be provided in an Excel spreadsheet format following the point-intercept protocol. The survey locations depicting the presence of aquatic invasive species listed in NR 40 will be differentiated from the locations with negative sample results. The report will also include all field sheets and completed forms for any observed new occurrences of aquatic or terrestrial species as identified in the ***Wisconsin Aquatic Species Invasive Species Early Detector Handbook***, including the verification photographs.

Several maps will be developed and presented in the report including:

1) a map showing the overall predominant species along shoreline areas;
2) a map showing the locations of coarse woody habitat;
3) a map showing the locations and identities of invasive species observed during the surveys;
4) a map showing the substrates identified during the point-intercept survey;
5) a map showing the predominant substrate type and presence or absence of woody habitat;
6) a bathymetric map of the reservoir

NSPW anticipates that field work will be completed by the end of August 2022 and the draft study report will be available by October 31, 2022.

3. Consultation

The ATIS study was requested by WDNR. As a result, the Licensee consulted with WDNR as follows:

3.1 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

3.2 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the NPS for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

3.3 Trego Lake District

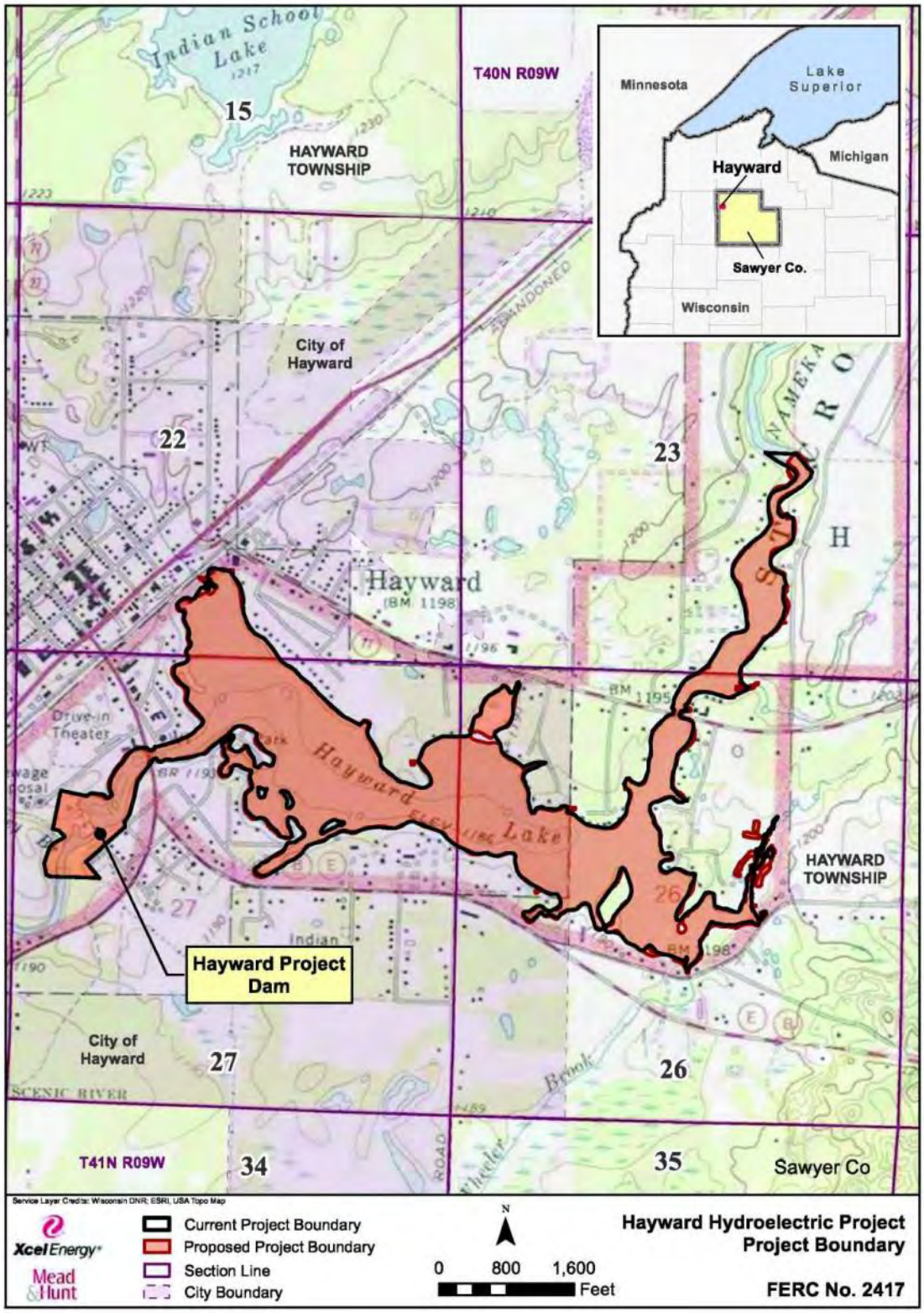
On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the TLD for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

4. References

Wisconsin Department of Natural Resources Website. (2020a). Hayward Lake. Facts and Figures. https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2725500&page=facts. Accessed July 27, 2020.

Wisconsin Department of Natural Resources Website. (2020b). Trego Lake. Facts and Figures. https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2712000&page=facts. Accessed July 27, 2020.

Appendix 1 – Invasive Species Study Area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1217
T40N R09W
15
HAYWARD TOWNSHIP
Minnesota
Lake Superior
Michigan
Hayward
Sawyer Co.
Wisconsin
City of Hayward
22
23
ABANDONED
Hayward
(BM 1198)
Drive-in Theater
Hayward Flowage
Lake
HAYWARD TOWNSHIP
Hayward Project Dam
City of Hayward
27
26
SCENIC RIVER
T41N R09W
34
35
Sawyer Co
Service Layer Credits: Wisconsin DNR; ESRI, USA Topo Map
Xcel Energy
Mead & Hunt
Current Project Boundary
Proposed Project Boundary
Section Line
City Boundary
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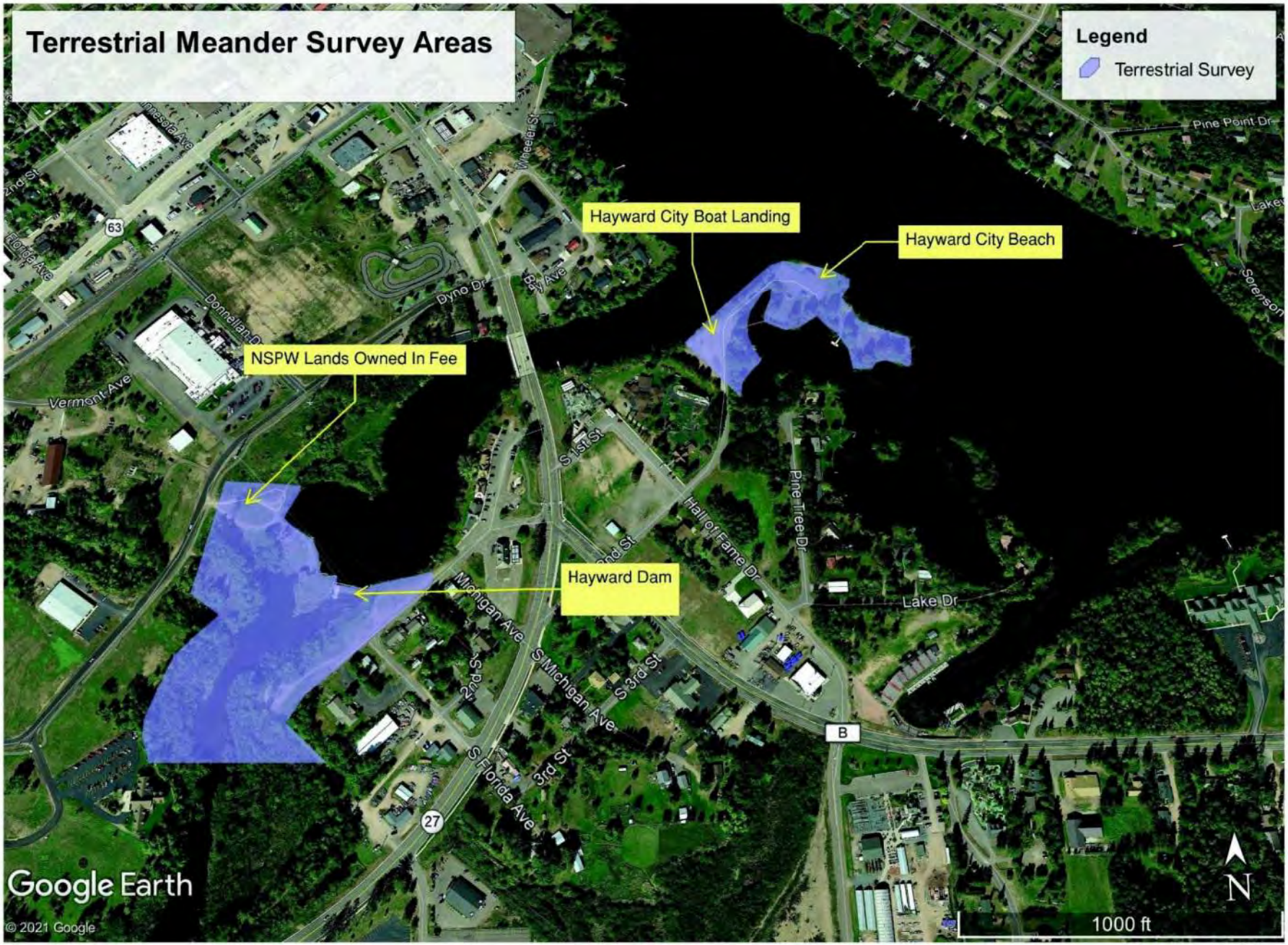
Feet
Hayward Hydroelectric Project
Project Boundary
FERC No. 2417


Terrestrial Meander Survey Areas
Legend
Terrestrial Survey
Hayward City Boat Landing
Hayward City Beach
NSPW Lands Owned In Fee
Hayward Dam
Pine Point Dr
Dyno Dr
Vermont Ave
S 1st St
Hall of Fame Dr
Pine Tree Dr
Lake Dr
Michigan Ave
S Michigan Ave
S 3rd St
3rd St
S Florida Ave
B
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27
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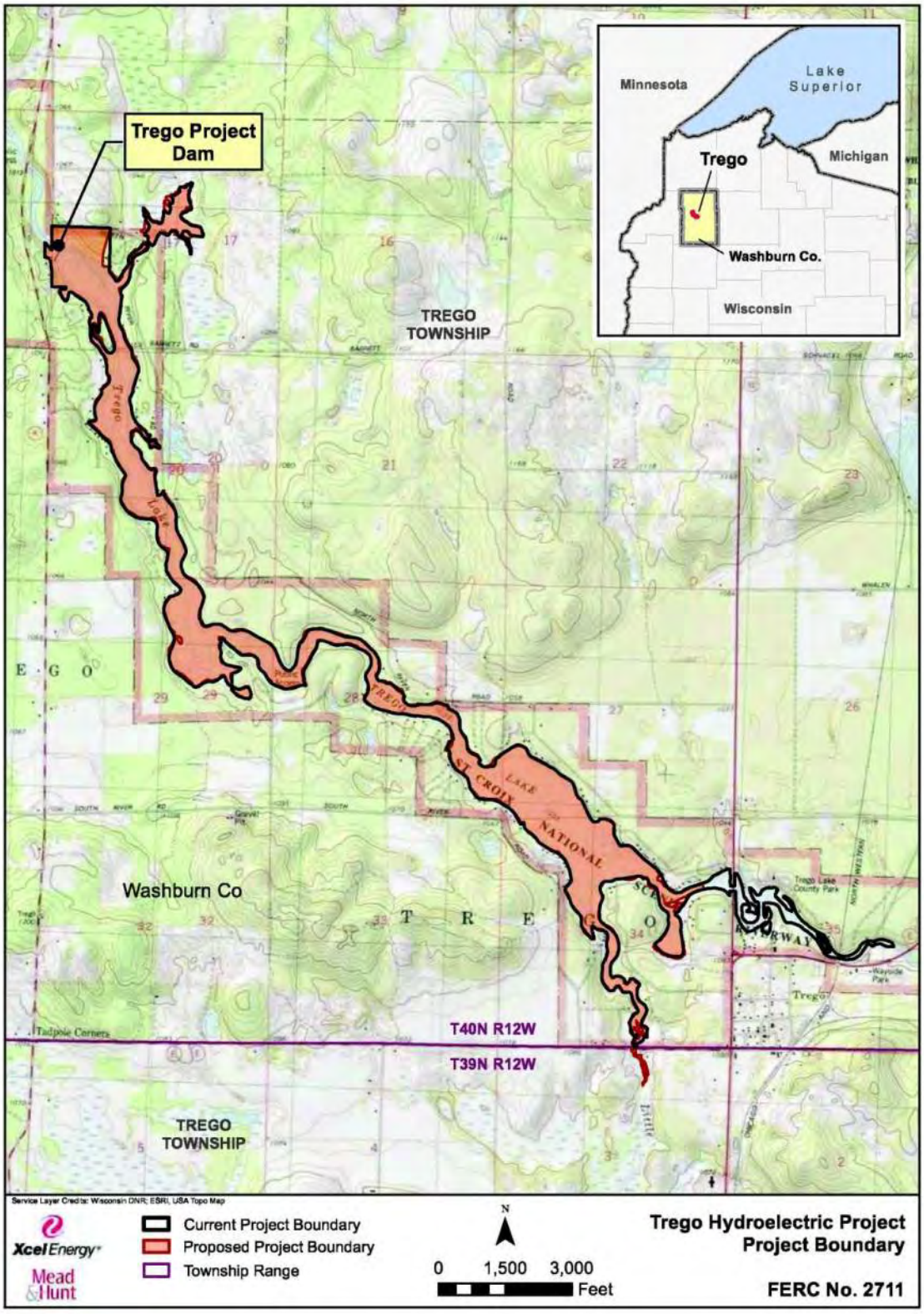
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Lake Superior
Michigan
Trego
Washburn Co.
Wisconsin
TREGO TOWNSHIP
Washburn Co
T40N R12W
T39N R12W
TREGO TOWNSHIP
Service Layer Credits: Wisconsin DNR; ESRI; USA Topo Map
Xcel Energy
Mead & Hunt
Current Project Boundary
Proposed Project Boundary
Township Range
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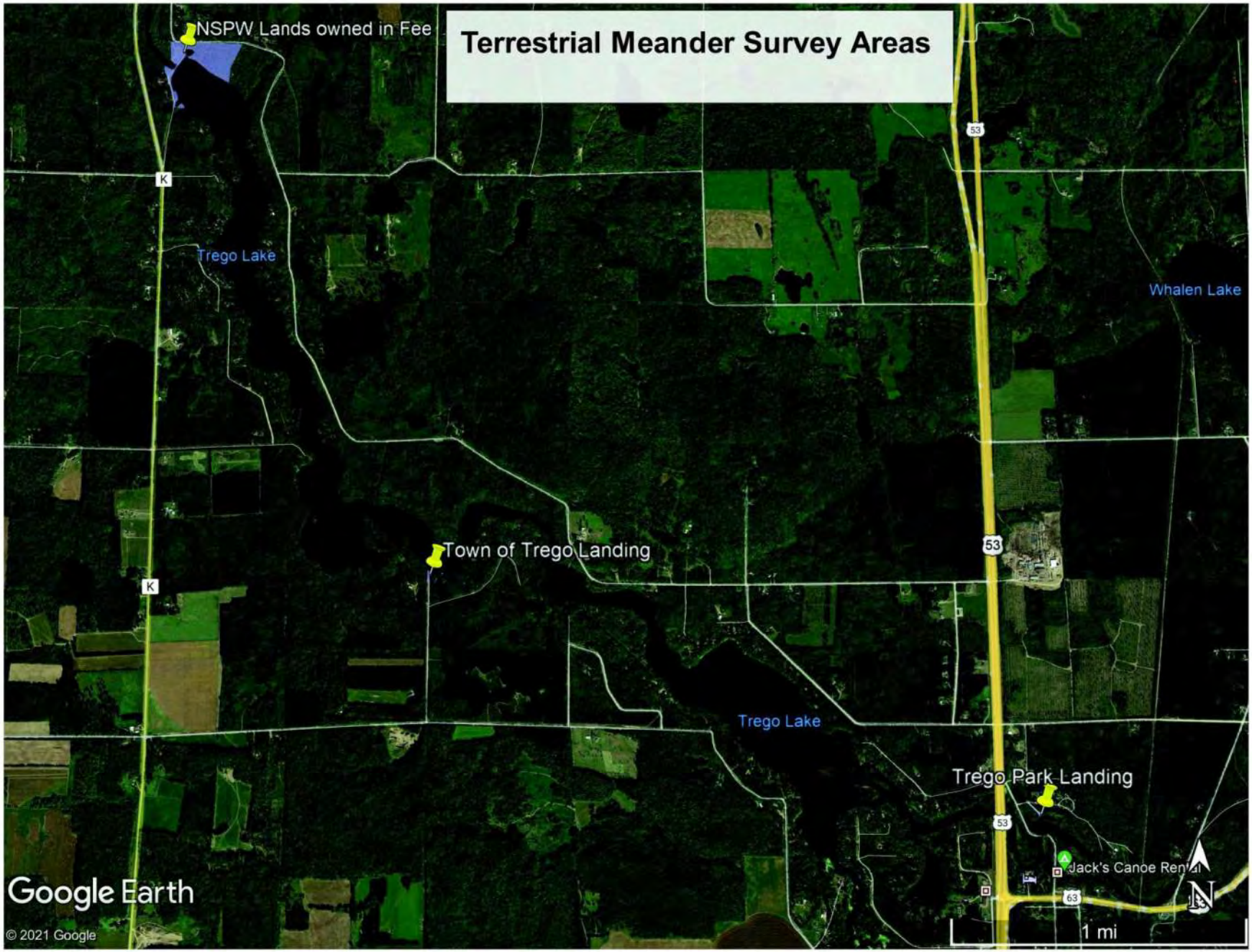
Feet
Trego Hydroelectric Project
Project Boundary
FERC No. 2711


Terrestrial Meander Survey Areas
NSPW Lands owned in Fee
Trego Lake
Whalen Lake
Town of Trego Landing
Trego Lake
Trego Park Landing
Jack's Canoe Rental
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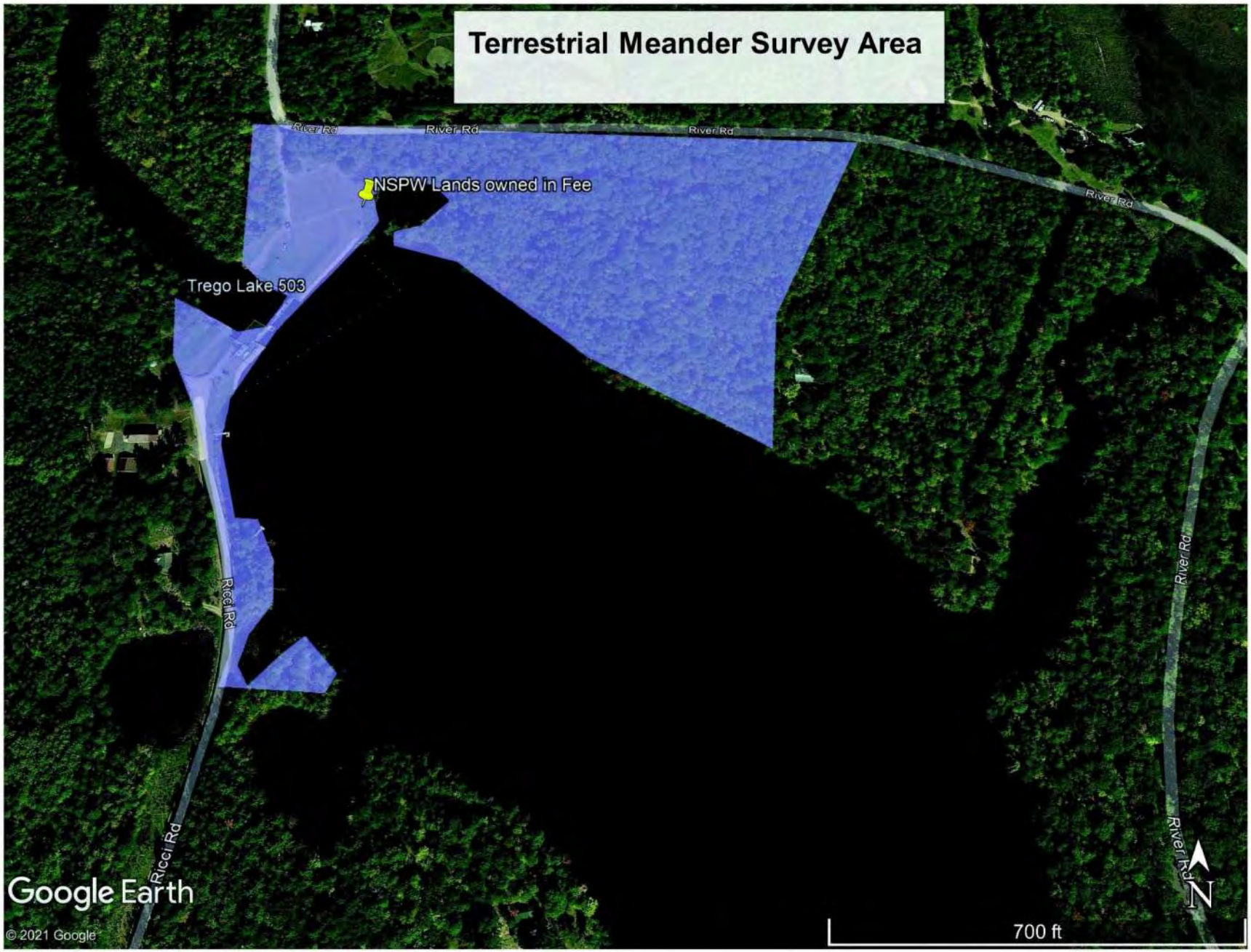
Terrestrial Meander Survey Area
River Rd
River Rd
River Rd
River Rd
NSPW Lands owned in Fee
Trego Lake 503
Ricci Rd
Ricci Rd
River Rd
River Rd
Google Earth
© 2021 Google
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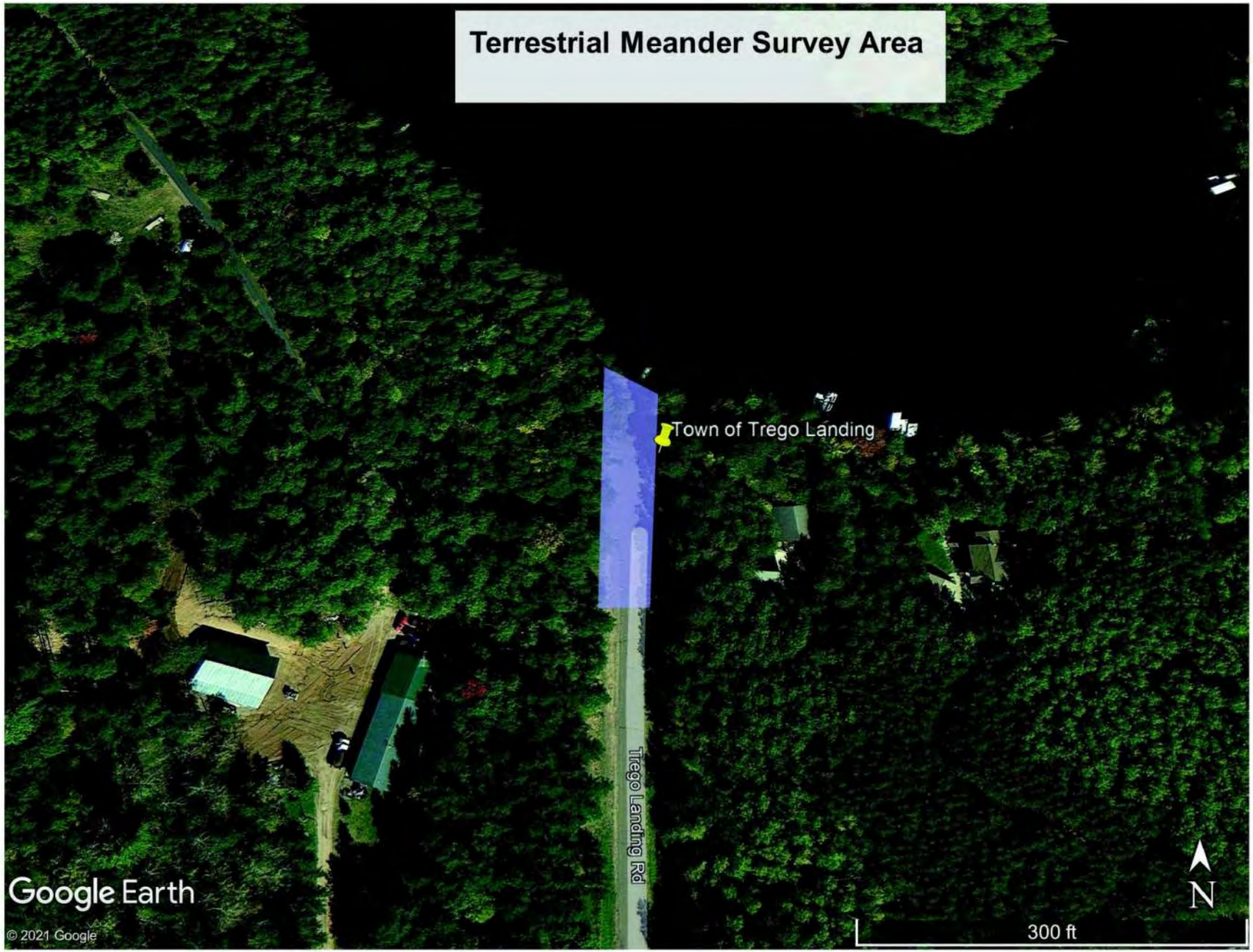
Terrestrial Meander Survey Area
Town of Trego Landing
Trego Landing Rd
Google Earth
© 2021 Google
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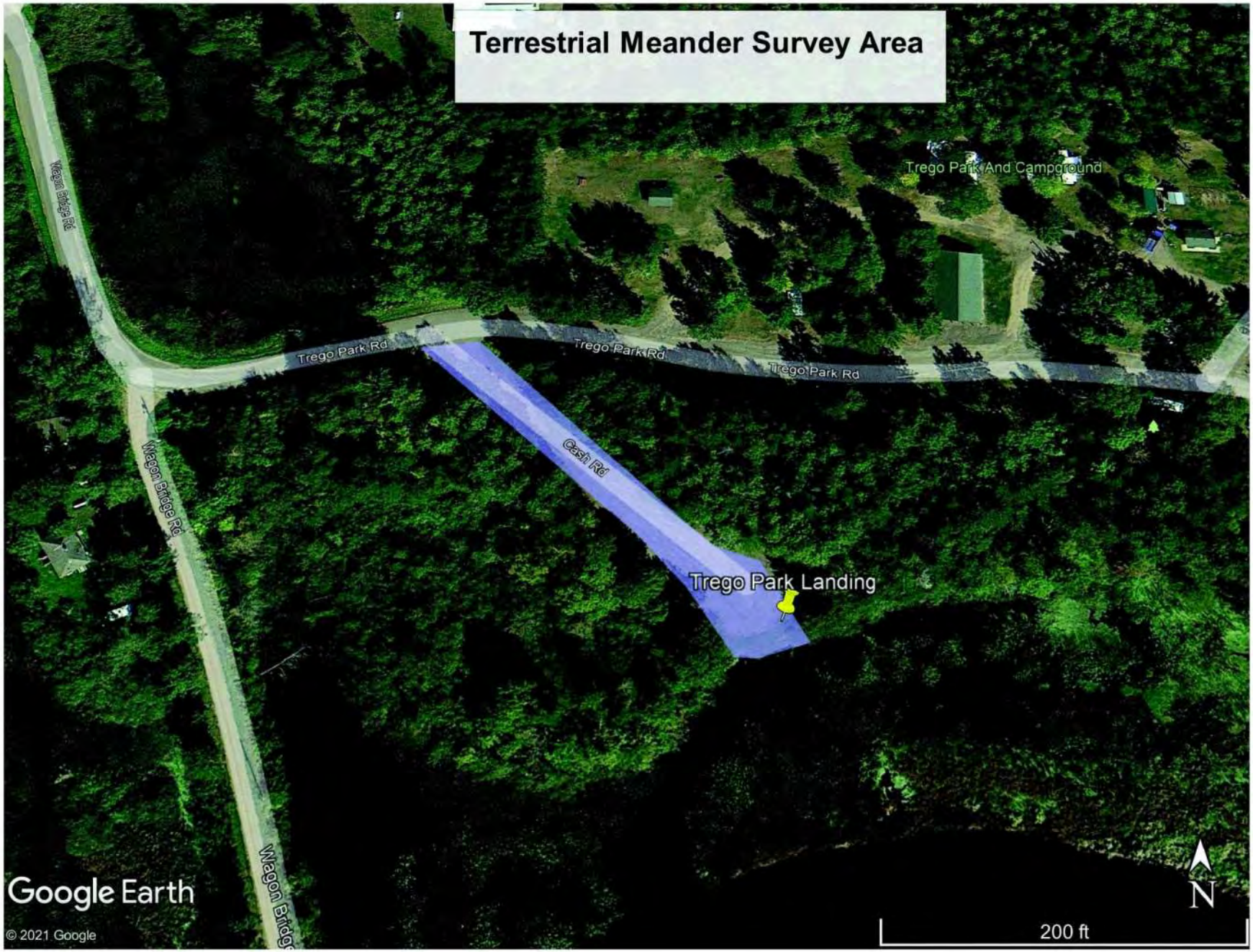
300 ft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Trego Park And Campground
Wagon Bridge Rd
Trego Park Rd
Trego Park Rd
Trego Park Rd
Cash Rd
Wagon Bridge Rd
Trego Park Landing
Wagon Bridge
Google Earth
© 2021 Google
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200 ft

Appendix 2 – Point Intercept Protocol-See Separate File

Recommended Baseline Monitoring of Aquatic Plants in Wisconsin:
Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell, Susan Knight, Kelly Wagner, Alison Mikulyuk, Michelle Nault, Meghan Porzky and Shaunna Chase

March 2010

Document citation:
Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

WISCONSIN
DEPT. OF NATURAL RESOURCES

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J. Hauxwell, Wisconsin Department of Natural Resources
B. Korth, University of Wisconsin-Extension
F. Koshere, Wisconsin Department of Natural Resources
A. Mikulyuk, Wisconsin Department of Natural Resources

Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell[1], Susan Knight[2], Kelly Wagner[1], Alison Mikulyuk[1], Michelle Nault[1], Meghan Porzky[1], and Shaunna Chase[1]

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Last Updated:
March 2010

EXECUTIVE SUMMARY

We outline a baseline monitoring protocol designed to quantitatively assess the distribution and abundance of aquatic plants in lake ecosystems. This protocol employs a point-intercept sampling design, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness. In addition, a qualitative survey is recommended to map obvious species and augment the species list generated through quantitative sampling. Application of this methodology allows: 1) assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization; and 2) comparisons of aquatic plant variables over time and among lakes. This document contains complete instructions for conducting a baseline aquatic plant survey, including details on obtaining an electronic file of site coordinates, uploading site coordinates into a Global Positioning System (GPS) receiver, conducting field work, entering data, working with data summaries, processing voucher specimens, and provides example applications of the collected data. Final products from each baseline survey will include: 1) raw data from the quantitative survey which provides individual site-by-site species distribution and rake fullness data, 2) summary statistics useful in characterizing and comparing populations, 3) additional species observations from the general qualitative survey, and 4) voucher specimens cataloguing species presence. All electronic data should be sent for long-term record-keeping to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

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INTRODUCTION

In lake ecosystems, the aquatic plant community serves as critical habitat and nursery for fish and other animals, a source of oxygen for all organisms, a refuge for prey as well as a foraging area for predators, a buffer against erosion and sediment resuspension from both waves and shoreline inputs, and can significantly contribute to overall lake primary productivity. Over the past several decades, losses of or changes in assemblages of native submersed aquatic vegetation has been a reoccurring phenomenon due to a relatively limited number of factors. Repeatedly, changes in landscapes and atmospheric conditions as a result of human activities have increasingly affected the ecology of adjacent aquatic systems, including aquatic plant communities. In addition, in-lake aquatic plant management activities have increased due to the increasing spread of invasive exotic plants[1].

The Wisconsin Department of Natural Resources (WDNR) is charged with protecting and enhancing the state's natural resources, including lake ecosystems. Given the many ecosystem services associated with aquatic plant communities as well as the recent threats to native species, it has become increasingly important to develop monitoring techniques to support science-based decision-making for effectively managing lake ecosystems. In this document, we present a quantitative, replicable monitoring protocol. Standardized, quantitative and replicable data are an essential part of strategic lake management for three reasons. First, good data allows us to better understand each individual lake; we can use survey data to produce detailed lake maps that show the locations of native, rare, or exotic plant species. Data can then be used as a baseline against which any changes in a lake associated with water clarity, exotic species introduction, water level, or lake management activity can be compared. Second, good data helps direct management by taking the conflict and guesswork out of planning. Aquatic plant management requires weighing a number of potential management options, some of which can be very costly or extensive. Baseline data allows lake groups to identify the most appropriate management options and design the best possible management plan. Additionally, by conducting quantitative comparisons between the aquatic plant communities before and after management actions, lake groups and managers may evaluate whether or not management goals were achieved. Third, by compiling and comparing survey information on lakes statewide, we are able to identify regional trends and refine our understanding of aquatic plant populations on a broader scale in both space and time.

SURVEY OBJECTIVE

In this document, we outline a baseline monitoring protocol designed to assess aquatic plant communities on a whole-lake scale. We recommend a formal quantitative survey conducted at pre-determined sampling locations distributed evenly throughout the lake, accompanied by a general qualitative survey to map obvious species and augment the species list generated through the quantitative survey. Our primary goals in adopting this methodology are to:

[1] Knight, S., and J. Hauxwell. 2009. Distribution and abundance of aquatic plants- human impacts. *In*: G. Likens (editor-in-chief), *Encyclopedia of Inland Waters*. Elsevier, Oxford, United Kingdom.

1) Collect quantitative data describing the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization for use in developing various management plans; and

2) Use the data to statistically compare aquatic plant variables over time and among lakes.

The importance of a statewide standardized protocol is that observed differences in a lake's plant community can be attributed to actual changes in the community over time, without the confounding variation that results from different field workers employing different sampling techniques.

The quantitative survey employs a point-intercept sampling design, adapted from terrestrial methods, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness ratings. Although the presence/absence data cannot be used to estimate biomass or percent cover, it is less sensitive to interannual or seasonal variations in plant abundance[2]. The method is also relatively rapid and cost-effective and can be used on the large scale to collect baseline data and statistically compare communities over time[2,3]. In summary, it has the following attributes for estimation of aquatic plant distribution and abundance:

- Systematic, quantitative, and replicable
- Appropriate for lakes that vary in depth, size, region, shoreline complexity, and vegetation distribution
- Evenly spaced distribution of sites results in a good coverage of the entire lake, precluding the random exclusion of niche habitats
- Procedural simplicity
- Inexpensive implementation
- Results are easily analyzed with scientifically rigorous statistical methods
- Spatial data preserved and can be mapped for both the managers' use and for clearly communicating distributional data with the public

These guidelines are intended to work on most lakes. However, modifications may be required if a lake is uniquely shaped so that a uniform distribution of points isn't representative (long, skinny lake shape), or if obtaining rake samples is difficult due to substrate (rocky/cobble bottom).

Please note that these are "baseline" recommendations. Additional monitoring activities may be warranted if the goal is to assess a specific management activity. For example, to gauge the ability of chemical spot-treatments to control relatively small stands of an exotic species in a

[2] Madsen, J.D. 1999. Point intercept and line intercept methods for aquatic plant management. Aquatic plant control technical note MI-02. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[3] Dodd-Williams, L., G.O. Dick, R.M. Smart and C.S. Owens. 2008. Point Intercept and Surface Observation GPS (SOG): A Comparison of Survey Methods – Lake Gaston, NC/VA. ERDC/TN APCRP-EA-19. Vicksburg, MS: U.S. Army Engineer Research and Development Center

Appendix 3 – Aquatic Invasive Species Early Detector Handbook-See Separate File

relatively large lake, we recommend additional mapping of the beds following the pre- and post-treatment protocol available in Appendix D of the Aquatic Plant Management guide[4].

Unlike the procedures used by the Citizen-Based Lake Monitoring Network, this protocol is not designed for most volunteers. The protocol requires at least one of the field workers be an experienced plant taxonomist and able to identify most plant species in the field. Less experienced volunteers may be able to help with data recording and navigation, but without the help of a professional aquatic ecologist, volunteers may not be able to conduct an entire plant survey without a significant degree of training or study.

SURVEY OVERVIEW

Sampling Sites

This method employs a point-intercept design in which a grid of sampling sites is distributed evenly over the entire lake surface (Figure 1). Lake organizations or individuals can request an electronic file of survey sites by contacting the WDNR Lake Coordinator from their region (see Appendix 1) with the lake name and county, as well as the town, range and section (TRS) or water body identification code (WBIC). Please make requests well in advance of planned field work to allow WDNR staff sufficient time for map creation (recommend at least 1 month). WDNR staff will determine the number of sites and grid resolution based on the estimated size of the littoral zone (the area in which plants grow) and shape of the lake. Grids will be scaled to produce a greater number of sites on lakes that are larger and have more complex shorelines. Lakes with a narrow littoral zone may be assigned a comparatively high number of sampling sites to achieve sufficient survey coverage. Once created, the sampling map (Figure 1) and an associated GPS text file containing the latitude and longitude information associated with each sample site will be provided electronically by the WDNR.

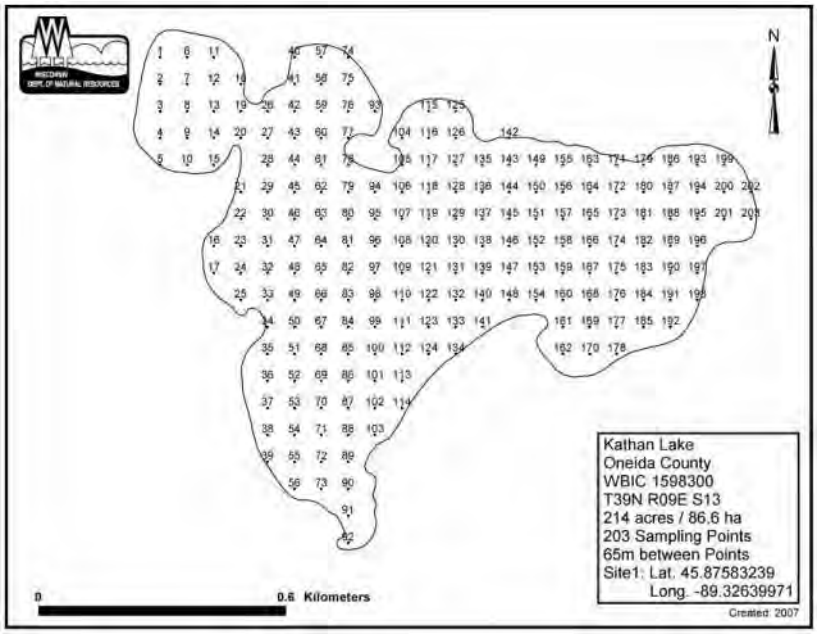


Figure 1: The point-intercept grid for Kathan Lake, Oneida County, WI, with 203 sampling sites.

Timing of Sampling

Surveys should be conducted between early July and mid August. Although certain plant community parameters (such as rake fullness and biomass) can change over the course of the

[4] Aquatic Plant Treatment Evaluation. http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-D.pdf

growing season, presence/absence data is less sensitive to seasonal variation[2]; presence can often be detected throughout the season. For many species, including Eurasian water milfoil (EWM), plant biomass and density may increase as the season progresses, whereas some species like curly-leaf pondweed (CLP), senesce much earlier in the sampling season. Rake fullness data for these species must be interpreted carefully with the sampling date in mind. If early-senescing species such as CLP are targets of management actions, please contact the WDNR Lake Coordinator in your region to coordinate the best possible sampling time.

Time Spent Sampling

Depending on the size of the lake, a survey may be completed in a few hours, or it may take several days. Ideally, a crew spends one-half to three minutes per sample site; however, this may vary depending on the following factors:

- Distance between sample sites
- Weather (i.e. wind, rain, etc.)
- Rake fullness
- Ease of navigation
- Experience; less experienced field workers may take longer to identify unfamiliar plants. However, most field workers have found that the time spent per site drops dramatically with experience. Others have reported their speed increasing greatly with a few hours of training.

PREPARING FOR FIELD WORK

Field Gear

Necessary equipment:

- Appropriate watercraft and all equipment required by state law
- Double-sided sampling rake attached to a 15-ft (4.6m) pole
- Weighted sampling rake attached to a 40-ft (12m) rope
- Handheld GPS receiver with WDNR sample sites loaded
- Print-out of lake map with WDNR sample sites
- Print-out of WDNR field datasheets on waterproof paper
- Pencils
- Sealable storage bags for voucher specimens
- Waterproof voucher sample labels
- Cooler(s) with ice for storing voucher specimens
- Depth finder

Helpful, but not required:

- Trolling motor for reaching shallow sites
- Bathymetric map
- Plant ID references or guides to aid in plant identification
- Hand lens to aid in plant identification
- Digital camera for plant specimens or field pictures
- Underwater video camera for viewing the maximum depth of plant colonization

Loading Sample Site Locations onto the GPS Receiver

Detailed instructions on loading sample site locations onto the GPS receiver depend greatly on the type of GPS receiver as well as the software used to translate site location from the text file to "waypoints" in the receiver. The WDNR commonly utilizes Garmin 76 model GPS receivers and the WDNR Garmin GPS Standalone Tool software. The WDNR Standalone Tool is only available to WDNR employees, and only works with Garmin GPS receivers. The Minnesota Garmin GPS Tool and appropriate guidance documents are available to the public and can be found online at the Minnesota DNR internet site[5]. The two programs are similar; their chief difference is that the Minnesota tool requires the GPS text file to be comma-delimited instead of tab-delimited. Procedures for other GPS models with a Wide Area Augmentation System (WAAS-capability) may be used; please refer to the manufacturer's instructions for details on uploading site locations.

Please note that storage capability varies by GPS model. Some GPS receivers are unable to store the large numbers of data sites required in some surveys. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files of sites as needed or work from multiple receivers in the field.

The instructions below describe how WDNR employees can use the WDNR Garmin Standalone Tool software to load sample site locations, or "waypoints," onto a Garmin 76 model GPS receiver.

To upload waypoints from a GPS text file to the GPS receiver, you will need:

- **PC/laptop with WDNR Garmin GPS Tool.** Your IT administrator can help you obtain and install the software.

- **GPS text file (.txt extension).** A tab-delimited text file containing the sample sites and their geographical information.

- **A Garmin 76 model GPS receiver with external data port.**

[5] Available online at: http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html (accessed September, 2009)

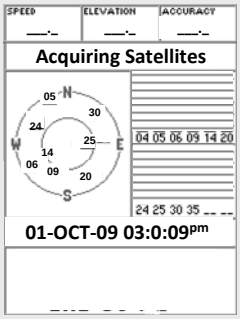
- **PC interface cable (with USB or 9-pin serial connector).** Can be purchased online at http://www.garmin.com

Step 1: Set GPS to the "Simulating GPS" Mode

Operating the receiver in "Simulating GPS" mode prevents the GPS receiver from trying to acquire a satellite signal indoors.

1. Press and hold the red [ON/OFF] button for two seconds to turn the GPS receiver on.

2. Press [PAGE] to navigate through the welcome screens until the "Acquiring Satellites" page is visible.



3. Press the [MENU] button, select "Start Simulator", and press [ENTER]; the screen heading should now read "Simulating GPS."

Step 2: Set Serial Data Format (this setting will **not** have to be re-set upon each use)

Set the serial data format on the Garmin 76 receiver to GARMIN prior to transferring data. Failure to set the serial data format to GARMIN will cause a communication error.

1. Press the [MENU] button twice to reach the main menu, use the rocker key to select "Setup", and then press [ENTER].

2. Use the rocker key to scroll left or right until the "Interface" tab is highlighted. Use the rocker key to scroll down to highlight the drop-down box and press [ENTER].

3. A menu will appear; select "GARMIN" and press [ENTER]. Press [QUIT] twice to exit the menu.

Step 3: Plug in the PC Interface Cable

1. The GPS receiver should be on and in simulation mode.

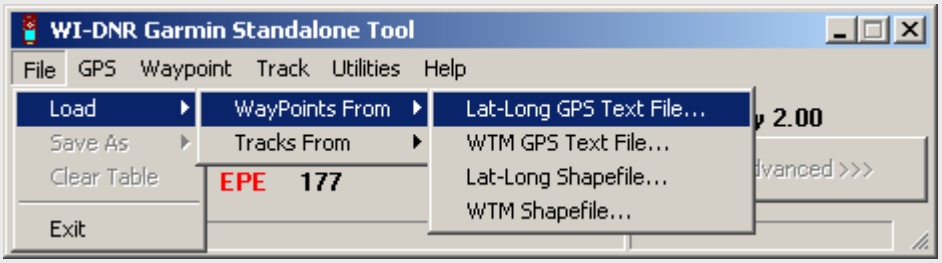
2. Plug the 9-pin serial connector cable into COM port #1 on your PC. If port #1 is in use, plug into the next available port and note the port number. The newest version of the WDNR Garmin GPS Tool (ver. 8.2.8) supports USB connectivity as an alternate to COM port connection.

3. Plug the round end of the PC interface cable into the external data/auxiliary power port under the rubber panel on the back of the GPS receiver.

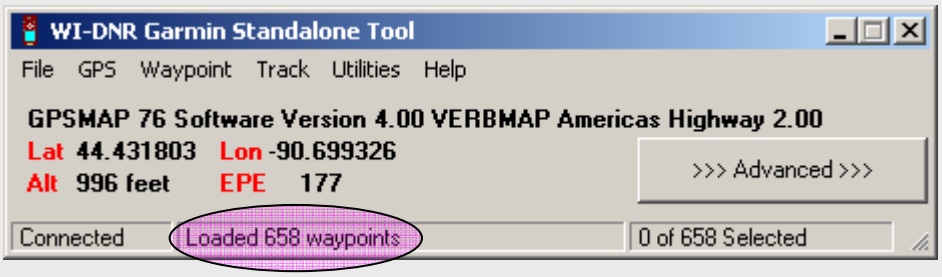
Step 4: Load the GPS text file into the WDNR Garmin Standalone Tool

1. Open the WDNR Garmin GPS Tool file on your computer. Select:

   File > Load > Waypoints From > Lat-Long GPS Text File.



2. Navigate to and select the appropriate GPS text file and select OK. The waypoints will be visible in the Tool's status bar.



3. If necessary, you can view and edit waypoints by clicking the [Advanced] button on the WDNR Garmin GPS Tool.

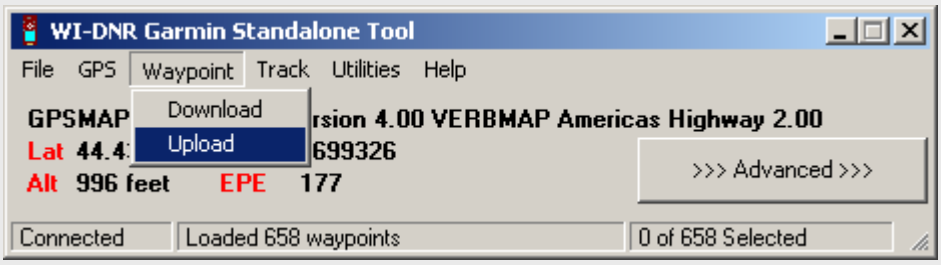
4. Troubleshooting COM-enabled setups
   - **a.** Check that the correct COM port is selected in the WDNR Garmin GPS tool.
     - **i.** GPS > Assign Port > select correct port #
   - **b.** Check that the baud rate matches that of the GPS receiver.
     - **i.** GPS > Assign Port >Baud Rate > 9600
     - **ii.** A Garmin 76 receiver will transfer at 9600 bits per second

c. Check that the serial data format is set to "GARMIN" (see Step 2).

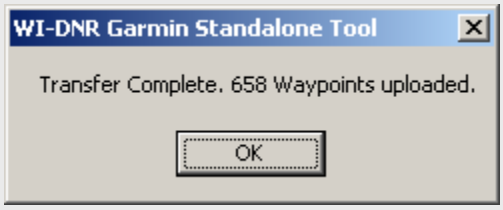
d. If your problem persists, please consult your GPS unit's user's manual.

Step 5: Upload Waypoint Data from the WDNR Garmin GPS Tool to the GPS receiver

1. In the menu bar, select: Waypoint > Upload



2. A pop-up window will indicate the completion of a successful upload. Click OK.



3. Check that the uploaded waypoints are visible on the GPS receiver: press [MENU] twice to get to the main menu, select "Points", press [ENTER], select "Waypoints", and press [ENTER].

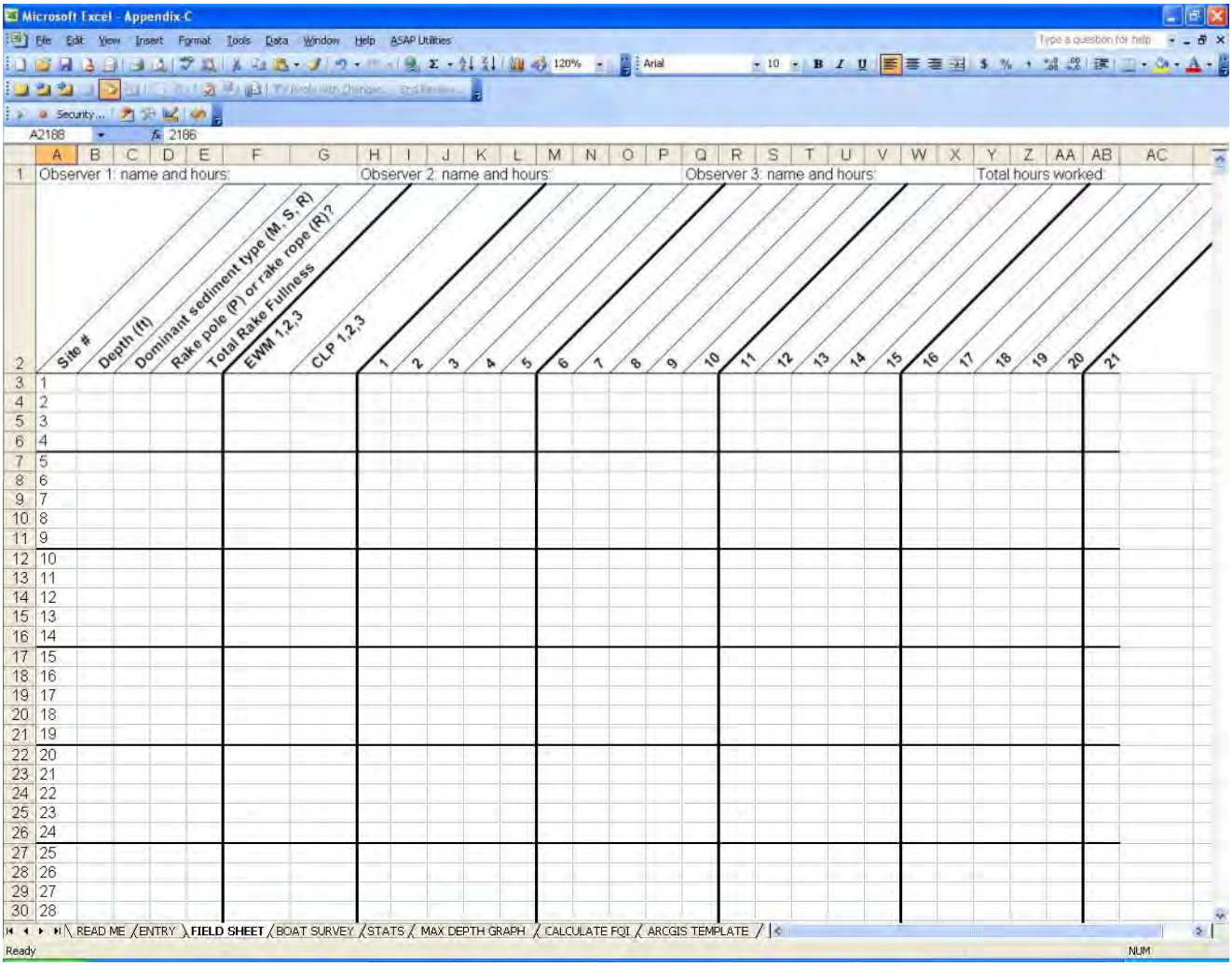
4. Troubleshooting

a. Storage capability varies by GPS model. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files as needed or work from multiple receivers in the field.

b. For more help, please refer to the appropriate online documentation or user's manuals.

Printing Datasheets

The form used for recording data can be found on the tab labeled “FIELD SHEET” in the Aquatic Plant Survey Data Workbook, downloadable from the University of Wisconsin Extension website (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls). Print the field sheet (waterproof paper recommended), using the “Print Area > Set Print Area” function under the “File” menu to set the appropriate number of rows to print. Under Header (View > Header and Footer > Custom Header) record lake name, Waterbody Identification Code (WBIC), county and survey date.



Constructing the Rake Samplers

The rake samplers are each constructed of two rake heads welded together, bar-to-bar, to form a double-sided rake head. The rake head is 13.8 inches (35 centimeters) long, with approximately 14 tines on each side. For use in shallow waters, mount a double-sided rake head to a pole that has the capability to extend to 15 feet (4.6 meters). For use in deeper waters, attach a second double-sided rake head to a rope; this rake head should also be weighted (Figure 2).

Pole Sampler

To make the pole samplers shown in the photographs, we removed the handles from 2 standard bow rakes (available at most hardware stores), and welded the rake heads together bar-to-bar. We mounted the rake head to an 8-foot (telescoping to 15.5 feet) pool skimmer handle purchased from a supply store (left, $50). For an even sturdier sampler we purchased an aluminum Co-Handle from Duraframe Dipnet and designed a rake pole which attaches and detaches into 3 sections (right, $200). For depth recording, mark the rake handle in one-foot increments. Electrical tape marked with permanent marker, then covered with a length of clear packing tape works well and holds up over time.

Rope Sampler

A similar rake head should be constructed and attached to a 40-foot-long rope or anchor line. In order to ensure a quick vertical descent to the lake bottom, attach a light weight (~5 lb) to the rake head, away from the tines. The rope sampler pictured here has a short piece of steel tubing welded to the rake head to serve as a handle through which 45 feet of rope is attached.

Figure 2: Examples of sampling rakes used during surveys.

COLLECTING AND RECORDING FIELD DATA

Using the Rake Samplers

Collect one rake sample per sample site.

In water shallower than 15 feet deep, use the pole sampler. At each sample site, lower the rake straight through the water column to rest lightly on the bottom, twist the rake around twice, and then pull the rake straight out of the water.

In water deeper than 15 feet, drop the rope sampler straight into the water alongside the boat, drag the rake along the sediment surface for approximately one foot (0.3 m), and then pull the rake to the surface.

A large tray or bin may be used to aid in processing the entire sample.

Navigating to Sites

Accuracy

The location reported by the GPS receiver has an element of error that varies under different conditions. The total error from the GPS and your navigational error *combined* should not exceed half of the sampling resolution. Therefore, when sampling with a Garmin 76 receiver, navigate at no greater than an 80-foot zoom level and aim to completely cover the sampling site with the arrow. At 80-foot zoom, the locator arrow shown on the screen represents approximately 25 feet in length. In order to sample with acceptable accuracy, the arrow must completely cover the sample site on screen. At coarser zoom levels, because the size of the arrow remains constant, the boat may be more distant from the site even though the arrow completely covers the site. You can use a lower zoom level (120-feet is appropriate) in order to travel from site to site, but as you approach the target site, you must confirm your location at using at least the 80-ft zoom resolution to ensure you are sampling with acceptable accuracy.

Determining Maximum Depth of Plant Colonization

When sampling, you will have to determine the maximum depth at which the plants are rooted. The maximum depth of colonization (MDC) can vary greatly among lakes, from just a few feet to as deep as the physiological requirements of a species will allow. When sampling a line of sites heading from shore out to deep water, take samples until plants are no longer found on the

rake. Continue sampling at least two sites deeper to ensure you sampled well over the maximum depth of colonization. If no plants are found at these sites, simply record the depth, sampling tool used, and dominant sediment type. Leave the rake fullness and species information blank. Depending on the lake bathymetry, you may choose to continue down the same row to the other side of the lake. Use a depth finder and begin sampling again when the depth reaches that of the last (no plant) site sampled. Alternatively, if the rows are very long, you may choose to move over to the next row and sample sites back into shore, working back and forth along the shoreline and around the lake. However, if the second row is shallower than the first, be sure to start sampling sufficiently far from shore so that the depth is similar to that at which you stopped sampling in the first row. By sampling in this way, over time you will begin to hone in on the maximum depth of plant colonization.

After working several rows crossing the edge of the littoral zone, estimate the maximum depth of colonization (e.g. 20 feet) and only continue to sample deeper sites within 6 feet of this estimation (all sites ≤ 26 feet). As you complete more rows and gain confidence in your estimation, you can then begin to gradually omit sampling depths that are too deep for plants to grow. Once you have sampled the deep end of your estimated maximum depth of colonization (i.e. 26 feet) at least three times and have not found any plants, then you can discontinue sampling at anything deeper, but continue to sample any sites shallower (≤ 25 feet). If you then sample a shallower depth three times (i.e. 25 feet) and find no plants at any of those sites, you may now discontinue sampling at these deeper sites and only sample sites shallower than this new sampling depth (≤ 24 feet). Continue to successively eliminate shallower depths in sequence until you establish the maximum depth of colonization. To account for patchiness and other sources of variation, never narrow the sampling window to less than 1.5 feet of the estimated maximum depth of colonization. Use your best judgment when eliminating depths, and remember that plant distribution may be uneven and that different areas of a single lake may have plants growing relatively deeper or shallower. It is good practice to err on the side of oversampling.

Recording Data

Completing the Field Sheet

1. General site information
   Complete the top portion of the "Field Sheet" with the lake name, county, WBIC, date, names of observers, and how many hours each person worked during the survey.

2. Site number

   Each site location is numbered sequentially. Each site number will have one row of data on the "Field Sheet."

3. Depth

   Measure and record the depth to the nearest half-foot increment at each site sampled, regardless of whether vegetation is present. The pole mounted rake and rope sampler should be marked to measure the depth of water at a sample site. However, a variety of options exist for taking depth measurements, including sonar handheld depth finders (trigger models) and boat-mounted depth finders. If you are using a depth finder, it is useful to know that the accuracy may decrease greatly in densely vegetated areas. Depth finders sometimes report the depth to the top of the vegetation instead of to the sediment surface. In most cases, it is best to use depth markings on a pole-mounted rake for shallow sites.

4. Dominant sediment type

   At each sample site, record the dominant sediment type based on how the rake feels when in contact with the sediment surface as: mucky (M), sandy (S), or rocky (R).

5. Pole vs. Rope

   Record whether the pole (P) mounted rake or the rake-on-a-rope (R) was used to take the sample.

6. Rake fullness

   At each site, after pulling the rake from the water record the overall rake fullness rating that best estimates the total coverage of plants on the rake (1 - few, 2 - moderate, 3 - abundant; see Figure 3). Also identify the different species present on the rake and record a separate rake fullness rating for each. Account for plant parts that dangle or trail from the rake tines as if they were fully wrapped around the rake head. The rake may dislodge plants that will float to the surface, especially short rosette species not easily caught in the tines. Include the rake fullness rating for plants dislodged and floating but not collected on the rake. Record rake fullness ratings for filamentous algae, aquatic moss, freshwater sponges, and liverworts, but do not include these ratings when determining the overall rake fullness rating. While at a site, perform a brief visual scan. If you observe any species within 6 feet (2m) of the sample site, but not collected with the rake, record these species as observed visually ("V") on the field sheet. These species will be included in total number of species observed.

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

Figure 3: Illustration of rake fullness ratings used during the survey.

7. Species names

Note that the field datasheet does not include any species names, except for EWM (Eurasian water milfoil) and CLP (Curly-leaf pondweed). The sampling crew must write the species name in subsequent columns the first time that species is encountered. Names must be re-written on successive field sheets as they are encountered. You may use common or Latin names, but be sure there is no ambiguity in the name that will present problems during data entry. The use of standard abbreviations can greatly shorten this process. It is generally safe to shorten the names to include the first three letters of the genus name followed by the first three letters of the species name (i.e. *Ceratophyllum demersum* = CerDem).

8. Inaccessible sites

It may be impossible or unsafe to reach some sample sites. Where the water is very shallow, rocks are present, or dense plant growth prevents navigation, field workers should attempt to access the site as long as doing so is safe and relatively practical. It is often possible to reach difficult sites by using oars or poling; however, keep safety in mind and practice good judgment. Do not get out and drag the boat through mucky sediment to reach a site. If the sampling site is shallow but the substrate is firm, you may be able to walk to the site from shore or from the boat. If you cannot access a site, leave the depth blank and record the appropriate comment on the field datasheet from the list below. Remember to also transfer these to the "Comments" column of the ENTRY sheet (see data entry section):

a. NONNAVIGABLE (PLANTS)

1. Sample site cannot be accessed due to thick plant growth.
2. Aquatic plants that are visible within 6 feet of a non-navigable sample site (e.g. water lilies, cattails, bulrushes, etc.) should be recorded as visuals (V) on the datasheet.

b. TERRESTRIAL

1. Sample site occurs on land (including islands).
2. Aquatic plants visible within 6 feet of a terrestrial sample site (e.g. water lilies, cattails, bulrushes, etc.) may be included in the general boat survey list, but should not be marked as visuals (V) on the datasheet.
3. Only species rooted in water should be recorded as present or as part of the boat survey.

c. SHALLOW

1. Sample site is in water that is too shallow to allow access.
2. Aquatic plants that are visible within 6 feet of a shallow sample site should be recorded as visuals (V) on the datasheet.

d. ROCKS

1. Sample site is inaccessible due to the presence of rocks.

e. DOCK

1. Sample site is inaccessible due to the presence of a dock or pier.

f. SWIM AREA

1. Sample site is inaccessible due to the presence of a designated swimming area.

g. TEMPORARY OBSTACLE

1. Sample site is inaccessible due to the presence of a temporary obstacle such as a boater, swimmer, raft, loon, etc.
2. If possible, try to revisit this site later on during the survey once the temporary obstacle has moved.

h. NO INFORMATION

1. No information is available about the sample site because it was not traveled to (inaccessible channel, accidently omitted during survey, skipped due to time constraints, etc.).

i. OTHER

1. Site was not sampled for another reason; please provide a brief description.

9. Filling Out the Boat Survey Datasheet

Often there will be localized occurrences of certain species (e.g., floating-leaf or emergent species) that are missed by the point-intercept grid. For areas that are outside the grid or in between sampling sites, record the name of the plant and the closest site to the plant. This information will be entered into the "BOAT SURVEY" section of the data entry file. Emergent near-shore vegetation should only be recorded if it's rooted in water.

Collecting and Identifying Voucher Samples

Voucher each plant species for verification and identification. You can often use plants collected on the rake as vouchers. However, if the sample is of poor quality or lacks reproductive structures, attempt to collect a better specimen. If a better specimen is unavailable, voucher and press what you are able to collect. Remember that the more material collected, the easier identification will be. Whenever possible, collect at least two specimens, and include reproductive material such as seeds, flowers, fruit, roots, etc. Place the voucher plant into a re-sealable plastic bag with a waterproof voucher label. The voucher label should include the species name, or in the case of unknown species, a unique identifier, the lake name, county, sample site, sediment type, collector's name, and the date. Additional information about habitat or co-occurring species may also be included on the tag. Place all specimens in a cooler for transport to the lab. See below, "Pressing Plants" for instructions once back at the laboratory.

Plant Identification and Troublesome Taxa

1. Plants should be identified to species whenever possible. Certain genera, including *Carex*, *Sparganium*, and *Sagittaria* must be flowering and/or fruiting to confirm identification and may not be identifiable to species without these parts.

2. Non-angiosperms such as *Chara* or *Nitella* are identified to genus only. Often, *Isoetes* can be identified to species by looking at spores, if present. Filamentous algae, aquatic moss, and freshwater sponge can be referred to simply as algae, moss, and sponge.

3. If a plant cannot be identified in the field, place the two voucher specimens in a re-sealable bag with a separate voucher label. Take these specimens back to the lab to verify the identity. The label should include a unique identifier, lake, county, the sample site number, and sediment type. The presence and fullness of the species should be recorded on the field datasheet under the same unique identifier name listed on the voucher label.

4. In the lab, try to identify the plant using plant identification keys and a stereo microscope. If you are still uncertain of the identity of the plant, contact a DNR biologist in your region to help with identification. Do not send specimens to an expert until you notify them of your intended shipment and they have instructed you to do so. Once the plant is identified, record this information so that the correct identification is used during data entry.

ENTERING DATA ELECTRONICALLY

Worksheet Descriptions and Instructions

The Aquatic Plant Survey Data Workbook
(http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls) contains eight worksheets:

1. READ ME

   Provide a brief description of the six other worksheets included in the workbook.

2. FIELD SHEET

   The FIELD SHEET should be printed on waterproof paper for recording the field data.

3. ENTRY

   a. There are many formulas embedded in the ENTRY sheet that allow for the statistical calculations on the STATS sheet. Thus, **DO NOT add or delete columns or rows on the ENTRY or STATS sheets**.

   b. Data collected in the field is recorded on the FIELD SHEET and afterwards transferred to the electronic ENTRY sheet.

   c. Copy latitude and longitude information for the sample sites from the GPS text file and paste into the appropriate columns of the ENTRY sheet.

   d. Record the lake and county name, WBIC, survey date, and the names of the field workers.

   e. There is a column for comments on the ENTRY sheet. Please use the standardized comments discussed on page 18 of this protocol.

   f. Species' Latin names appear alphabetically in the first row of the spreadsheet. Species such as aquatic moss, freshwater sponge, filamentous algae, and liverworts are listed separately at the end of the alphabetical list.

   g. Additional species not already listed should be added in the columns at the end of the alphabetical list (sp1, sp2, etc.). Any vouchered specimens that are awaiting ID confirmation should be entered here as well. You should use the same unique voucher identifier established in the field to for ease of updating the information.

h. We strongly recommend double-checking the electronically entered data against the original field datasheets to ensure that no errors or omissions occurred during the entry process.

4. BOAT SURVEY

a. Enter information on plants observed during the survey that were observed more than 6 feet away from a sample site.

b. Additional comments about field conditions, known management activities, or other observations can also be recorded in this worksheet.

5. STATS

The STATS worksheet automatically calculates summary statistics using the data entered into the ENTRY worksheet (see Appendix 2, Table 1). There are several summary calculations including:

a. Individual Species Statistics:

- **i. Frequency of occurrence within vegetated areas (%)**: Number of sites at which a species was observed divided by the total number of vegetated sites. Frequency of occurrence is sensitive to the number of sample sites included. Including non-vegetated sites will lower the frequency of occurrence.
- **ii. Frequency of occurrence at sites shallower than maximum depth of plants**: Number of sites a species was observed at divided by the total number of sites shallower than maximum depth of plants.
- **iii. Relative frequency (%)**: This is a proportional value that reflects the degree to which an individual species contributes to the sum total of all species observations. The sum of the relative frequencies of all species is 100%. Relative frequency is not sensitive to whether all sampled sites, including non-vegetated sites, are included. Relative frequency does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts.
- **iv. Relative frequency (squared)**: This value is only part of a calculation and is not used directly.
- **v. Number of sites where a species was found**: This is the sum of the number of sites at which a species was recorded on the rake.
- **vi. Average rake fullness**: Mean rake fullness rating, ranges from 1-3.
- **vii. Number of visual sightings**: This is the total number of times a plant was seen within 6 feet of the boat, but not collected on the rake.
- **viii. Present (visual or collected)**: Automatically fills in “present” if the species was observed at a sample site.

b. Summary Statistics:

i. **Total number of sites visited**: Total number of sites where depth was recorded, even if a rake sample was not taken.

ii. **Total number of sites with vegetation**: Total number of sites where at least one plant was found on the rake.

iii. **Total number of sites shallower than maximum depth of plants**: Total number of sites where the depth was less than or equal to the maximum depth at which plants were found. This value is used for frequency of occurrence at sites shallower than maximum depth of plants.

iv. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of times plants were recorded at a site divided by the total number of sites sampled that were shallower than the maximum depth of plants.

v. **Simpson's Diversity Index**: A nonparametric estimator of community heterogeneity. It is based on relative frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.

vi. **The maximum depth of plants**: This is the depth of the deepest site sampled at which vegetation was present. Please note that this value does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts. See "MAX DEPTH GRAPH" below for more information.

vii. **Number of sites sampled using rake on rope (R)**

viii. **Number of sites sampled using rake on pole (P)**

ix. **Average number of all species per site (shallower than max depth)**: Mean number of species found at sample sites which were less than or equal to the maximum depth of plant colonization.

x. **Average number of species per site (vegetated sites only)**: Mean number of species found at sample sites were vegetation was present.

xi. **Average number of native species per site (shallower than maximum depth)**: This does not include Eurasian water milfoil, Curly-leaf pondweed, Purple loosestrife, Spiny naiad, or Reed canary grass.

xii. **Average number of native species per site (vegetated sites only)**

xiii. **Species richness**: Total number of species observed not including visual sightings. Please note that this value does not include aquatic moss, freshwater sponges, filamentous algae, or liverworts.

xiv. **Species richness (including visuals)**: Total number of species observed including visual sightings recorded within 6 feet of the sample site (but does not include additional species found during the boat survey).

6. MAX DEPTH GRAPH

The maximum depth of colonization is an important metric to characterize accurately, as it can indicate changes in water clarity and water quality over time. This worksheet automatically displays a histogram of plant occurrences by water depth. Occasionally, unrooted plants floating in the water column are snagged by the rake, which can sometimes result in an inaccurate estimation of the maximum depth of colonization. It is

important to examine the reported maximum depth of plant colonization in order to detect potential outliers. As a general rule, a single plant occurrence reported at a site which is 2 or more feet deeper than the next shallowest site with plants is considered an outlier, and should be excluded when determining the maximum depth of plant colonization (see Figure 4).

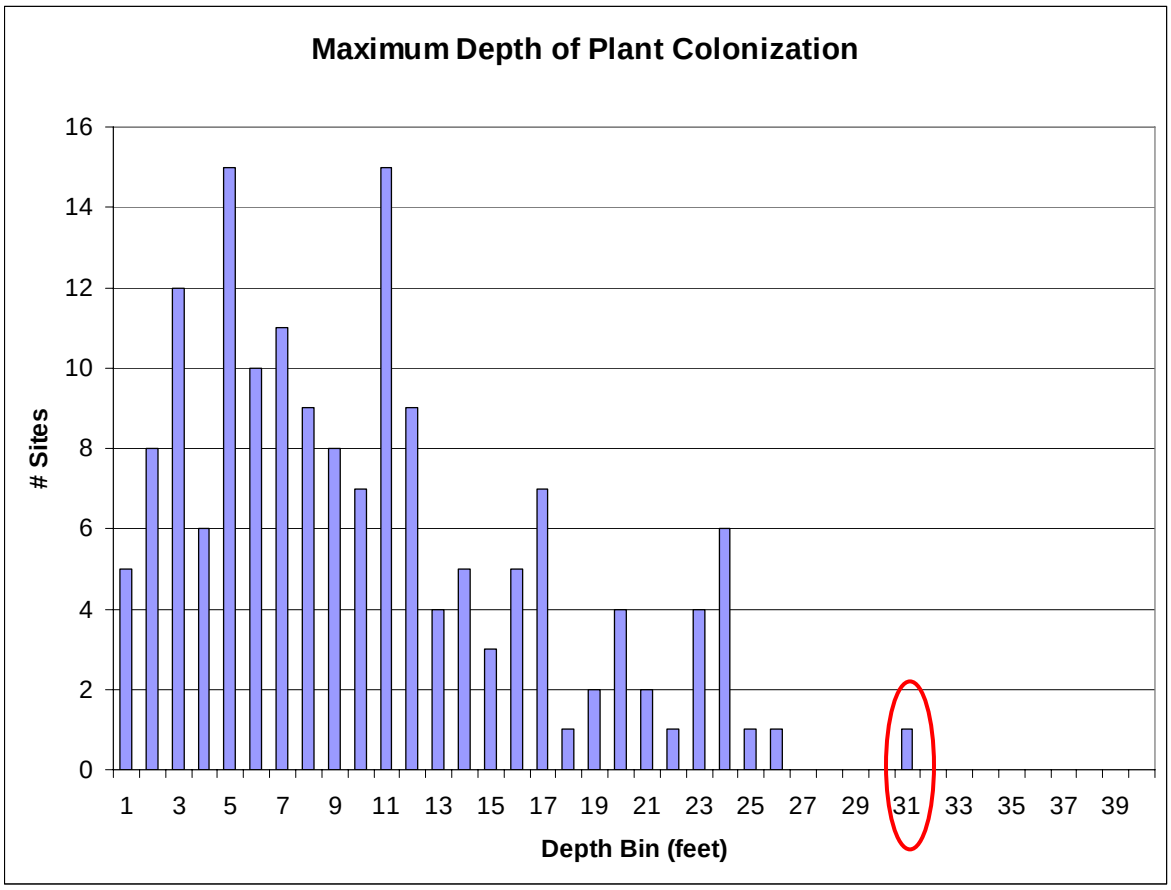


Figure 4: Distribution of plant occurrences versus water column depth. The value circled in red is more than 2 feet deeper than all other plants found during the survey, and is considered an outlier. Outliers should be omitted when determining the maximum depth of plant colonization.

It is necessary to delete the occurrence of this outlier from the ENTRY spreadsheet so that the automatically-calculated statistics will reflect the revised maximum depth of colonization. To do this, locate the sampling point number on the ENTRY worksheet where the outlier was found. Scroll across the row until you find the outlier to omit. Once you've located the cell with the outlier, press delete to clear the cell. Right click on the cell and select "Insert Comment". Briefly describe the occurrence of the outlier and the reason for omitting it. Follow the same steps with the overall rake fullness column, deleting out the contents of the cell and including a brief comment. Please also include information regarding any omissions of outliers and revised MDC directly on the STATS spreadsheet, typing all comments in the space below "See Max Depth Graph Worksheet to Confirm".

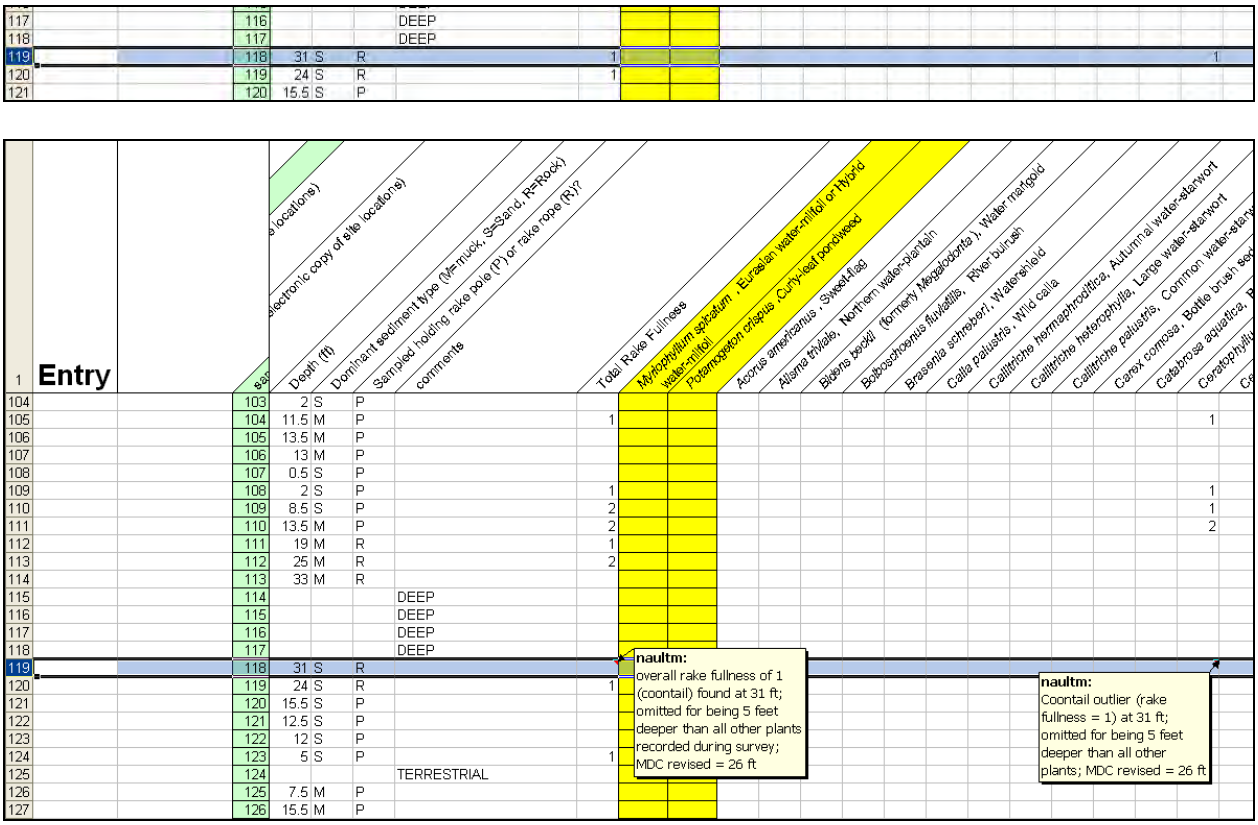


Figure 5: ***Top*** **- Ceratophyllum demersum outlier at 31 feet (sampling point #118).** ***Bottom*** **- C. demersum outlier at 31 feet deleted from both C. demersum and total rake fullness columns. Brief descriptive comments should be inserted in cells where outliers have been deleted.**

7. CALCULATE FQI

This worksheet automatically calculates the Floristic Quality Index (FQI) based upon the data entered into the ENTRY worksheet. The FQI metric is designed to evaluate the closeness of the flora in an area to that of undisturbed conditions[6]. The species list considered in this calculation is that which Nichols[6] originally considered, and the "C values" used in this spreadsheet reflect those currently accepted by the Wisconsin State Herbarium[7]. Species are counted as being present only if they are collected on the rake at some point during the baseline survey.

8. ARCGIS TEMPLATE

This worksheet of truncated species names is used when creating plant distribution maps using ArcGIS 9.3. See Appendix 3 for more information.

[6] Nichols, S.A. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management, 15(2):133-141.

[7] University of Wisconsin-Madison, 2001. Wisconsin Floristic Quality Assessment (WFQA). Retrieved October 27, 2009 from: http://www.botany.wisc.edu/WFQA.asp

Saving the File

Once the data is electronically entered into the Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls), please save the file with a name indicating the lake, county, WBIC, and year sampled. The format we recommend is: Lake_County_WBIC_(year).xls. For example, Lake Mendota sampled in 2009 would be named: Mendota_Dane_805400_(2009).xls

Double-Checking the Data

We strongly recommend double-checking the electronic data against the field sheet to catch any errors made during the entry process.

Sending the Data

Send the final electronic file to the WDNR via email (DNRBaselineAquaticPlants@wisconsin.gov). There should be one file for each completed lake survey.

Creation of Plant Distribution Maps

Aquatic plant distribution maps can be easily created using the point-intercept data collected during the survey. Instructions on how to create these maps can be found in Appendix 3 and 4.

Statistical Analysis of Data

Statistical comparisons of datasets can easily be analyzed between pre- and post-management activities or between two survey years by using a simple chi-square analysis. The chi-square analysis is commonly used to examine whether or not there was a statistically significant change in the occurrence of a plant species between the survey years or after management activities have occurred. The "Compute Pre-Post Data" worksheet (available at: http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Apendix-D1.xls), allows users to enter in the number of sites at which a species was recorded during each survey, and provides an output indicating whether or not differences reflect a statistically significant change in the plant community.

PRESSING PLANTS – PREPARATION OF VOUCHER SPECIMENS

"Floating" Specimens

Because most aquatic plants, especially finely dissected specimens, tend to stick to paper as they dry, it is usually better to "float" the plant directly onto herbarium paper. However, if the plant is large and robust, or not entirely aquatic (such as bulrushes, emergent sedges or pickerelweed) you can press the plant in newsprint.

1. Use a pencil to label the mounting paper with the plant name, geographic location, date collected, and serial code (a unique identifier in a series that identifies all specimens you have pressed; we use the initials of the presser followed by the year and a sequential number; i.e. AM2009-01). Mount only one species per sheet, and do not cut herbarium sheets in half.

2. Carefully rinse the plant so it is free of epiphyton, silt, and other debris.

3. Fill a sink or tray with about one inch of water. Slip the labeled mounting paper into the water.

4. Float the plant in the water and arrange it onto the sheet.

5. If the plant has fine leaflets, such as water milfoil or bladderwort, cut off one leaf and display it floated out onto the paper so that leaflet characteristics can be readily observed.

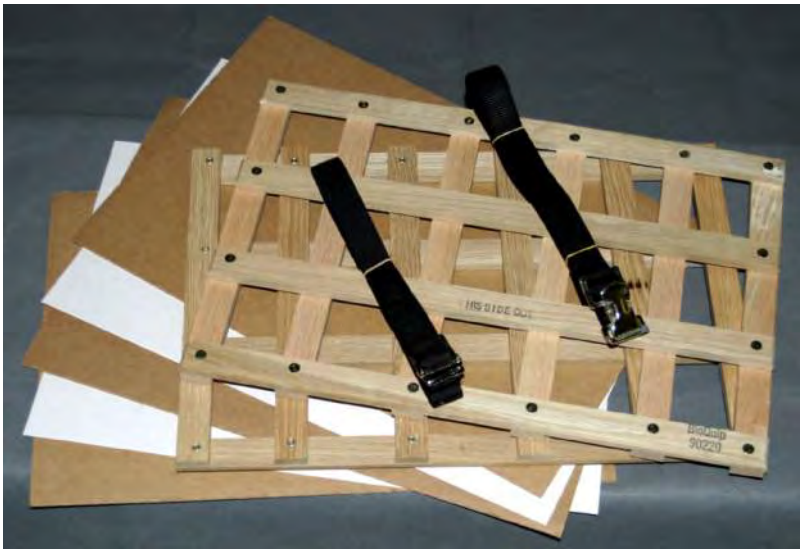
6. The plant may be bent into a "V" or "W" or curled shape to fit on the sheet.

7. Slowly lift the paper out of the water by one end. Keeping the plant in place, let the water slowly drain off.

8. Use a toothpick or probe to spread out plant parts for better display, making sure to expose identifiable characteristics such as stipules, sheaths or seeds.

Pressing Specimens

- Cover the plant with a sheet of waxed paper or plastic wrap if it is especially delicate (we recommend this technique especially for bladderworts and other fine, delicate species).
- Place the specimen sheet inside folds of newspaper.
- Place the newspaper between two sheets of blotting paper, and the blotting paper between two sheets of corrugated cardboard.
- Place multiple specimens in a plant press. Use rope or straps to compress plants to keep specimens flat as they dry.



- Place the press somewhere warm and dry. Placing the press on its long edge on top of a ventilated aluminum or aluminum-lined box containing incandescent light bulbs allows for quick drying. Remove plants after several days when they are thoroughly dry.

Suggested Herbarium Materials

Herbarium and science supply businesses such as the Herbarium Supply Company (www.herbariumsupply.com; 800-348-2338) sell many herbarium products including mounting paper, plant presses, blotting paper, and cardboard spacers. When ordering herbarium mounting paper, look for acid-free, non-glossy, 100% rag, and heavy or standard weights.

Preparing Dried Specimens for Shipment to an Herbarium

1. **Package specimens**. Place each dried specimen with unique identifier clearly marked on the newsprint or mounting paper in the fold of a single sheet of newspaper and place all of the newspaper/specimens between two pieces of cardboard. Tie or rubber band the cardboard bundle together, and put it into a padded envelope or a box. As long as the package is going to or from an educational institution, a special 4th class mailing rate called "Library Rate" can be used.

2. **Label information**. Both of the herbaria utilized by the WDNR label the dried plant specimens themselves. Prepare an electronic spreadsheet with the relevant information for each specimen. Send the file to Mark Wetter (mawetter@wisc.edu) for the Madison herbarium or to Robert Freckmann (rfreckma@uwsp.edu) for the Stevens Point herbarium. Each row (i.e. each specimen) in the file will need a unique identifier such as the collector's initials followed by a specimen number. Use the same identifier on the specimen so the herbaria can match the label to the specimen. Each row of the spreadsheet should include columns for the following (column heading in **bold**, example in plain text):

    a. **Specimen Identifier** CD2009-01
    b. **Collector Name** Isabel Velez
    c. **Preparer's Name** (If different from collector) Chad Douwe
    d. **Lake Name** Little John Jr.
    e. **County** Vilas
    f. **Date collected** 7 July 2009
    g. **Specimen ID** *Potamogeton spirillus*, Spiral-fruited pondweed
    h. **Habitat** muck over sand
    i. **Associated species (if known)** *Najas gracillima*, *Potamogeton friesii*
    j. **TRS** T41N R07E S29
    k. **WBIC** 1861700
    l. **More detailed location** (if known) SW edge of lake, 1 m depth
    m. **GPS lat/long coordinates** (if known) N 46°15.037' W090°01.804'
    n. **Herbarium of deposition** UWSP

3. **Send pressed plants** to Mark Wetter or Ted Cochrane (UW- Madison), or to Dr. Robert Freckmann (UW-Stevens Point). **Please notify the herbarium of your intention and wait for confirmation before sending plants**:

Mark Wetter or Ted Cochrane
University of Wisconsin-Madison Herbarium
Department of Botany, Birge Hall
430 Lincoln Drive
Madison, WI 53706-1381
tel.: (608) 262-2792
FAX: (608) 262-7509
www.botany.wisc.edu/herbarium/

Dr. Robert Freckmann
Robert Freckmann Herbarium
0310 CNR Addition
1900 Franklin Street
Stevens Point, WI 54481
rfreckma@uwsp.edu

4. **Send electronic record to the WDNR.** Please send a copy of the electronic herbarium file along with the plant data to DNRBaselineAquaticPlants@wisconsin.gov.

CONCLUSIONS

There will be four products from each plant survey. First, there will be the raw data from the quantitative survey which provides a lakewide plant species list and distribution and rake fullness data for each species observed. Second, there will be summary statistics useful in characterizing and comparing populations. Third, there will be observations from the general boat survey. Fourth, voucher specimens will provide a catalog of plant species present in the lake and will bolster the state collections. All electronic data should be sent by email to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to the WDNR Lake Coordinators and Aquatic Plant Management staff for recommendations and comments in the design, implementation, and applications of the data and the survey methodology. The many hours the field staff put into testing this methodology was integral to its successful development, and we are very grateful for all of their hard work.

Appendix 1

Current (02/2010) contact information for regional WDNR aquatic plant management (APM) and lake coordinators

Northern Region (NOR)

(Ashland, Barron, Bayfield, Burnett, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Oneida, Polk, Price, Rusk, Sawyer, Taylor, Vilas, & Washburn Co.)

Frank Koshere
APM Coordinator
715-392-0807
frank.koshere@wisconsin.gov

Kevin Gauthier, Sr.
Florence, Forest, Langlade, Lincoln, Oneida, & Vilas Co.
715-365-8937
kevin.gauthiersr@wisconsin.gov

Pamela Toshner
Barron, Bayfield, Burnett, Douglas, Polk, & Washburn Co.
715-635-4073
pamela.toshner@wisconsin.gov

Jim Kreitlow
Ashland, Iron, Price, Rusk, Sawyer, & Taylor Co.
715-365-8947
james.kreitlow@wisconsin.gov

Southeast Region (SER)

(Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, & Waukesha Co.)

Heidi Bunk
: Ozaukee, Sheboygan, Walworth, Washington, & Waukesha Co.
262-574-2130
heidi.bunk@wisconsin.gov

Craig Helker
Kenosha, Milwaukee, & Racine Co.
262-884-2357
craig.helker@wisconsin.gov

South Central Region (SCR)

(Columbia, Dane, Dodge, Green, Grant, Iowa, Jefferson, Lafayette, Richland, Rock, & Sauk Co.)

Susan Graham
Lake & APM Coordinator
608-275-3329
susan.graham@wisconsin.gov

Northeast Region (NER)

(Brown, Calumet, Door, Fond du Lac, Green Lake, Kewaunee, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Shawano, Waupaca, Waushara, & Winnebago Co.)

Mary Gansberg
Kewaunee, Door, Manitowoc, & Menominee Co.
920-662-5489
mary.gansberg@wisconsin.gov

Ted Johnson
Green Lake, Marquette, Waupaca, & Waushara
920-787-4686 ext. 3017
tedm.johnson@wisconsin.gov

Mark Sesing
Fond du Lac, Outagamie, & Winnebago Co.
920-485-3023
mark.sesing@wisconsin.gov

Jim Reyburn
Brown, Oconto, & Shawano Co.
920-662-5465
james.reyburn@wisconsin.gov

Greg Sevener
Marinette Co.
715-582-5013
gregory.sevener@wisconsin.gov

West Central Region (WCR)

(Adams, Buffalo, Chippewa, Clark, Crawford, Dunn, Eau Claire, Jackson, Juneau, La Crosse, Marathon, Monroe, Pepin, Pierce, Polk, Portage, St. Croix, Trempealeau, Vernon, & Wood Co.)

Scott Provost
APM Coordinator
715-421-7881 ext. 3017
scott.provost@wisconsin.gov

Buzz Sorge
Lake Coordinator
715-839-3794
patrick.sorge@wisconsin.gov

Appendix 2

This appendix contains examples of statistical outputs created through the point-intercept sampling method for Kathan Lake, Oneida County. The data was collected during a survey conducted August 21-22, 2007.

Table 1. Summary Statistics

Total number of sites set-up	**203**
Total number of sites visited	**171**
Total number of sites with vegetation	**149**
Total number of sites shallower than maximum depth of plants	**165**
Frequency of occurrence at sites shallower than maximum depth of plants	**90.30**
Simpson Diversity Index	**0.94**
Maximum depth of plants (ft)	**9.50**
Number of sites sampled using rake on Rope (R)	**0**
Number of sites sampled using rake on Pole (P)	**171**
Average number of all species per site (shallower than max depth)	**3.96**
Average number of all species per site (veg. sites only)	**4.39**
Average number of native species per site (shallower than max depth)	**3.56**
Average number of native species per site (veg. sites only)	**3.95**
Species Richness	**37**
Species Richness (including visuals)	**38**
Species Richness (including visuals & boat survey)	**40**

Table 2. Individual species frequency of occurrences

Common Name	Scientific Name	% Frequency (Littoral)	% Frequency (Whole lake)	% Frequency (in vegetated areas)	Relative Frequency (%)
Bushy pondweed	*Najas flexilis*	41.2	39.8	45.6	10.4
Common waterweed	*Elodea canadensis*	40.6	39.2	45.0	10.2
Eurasian water milfoil*	*Myriophyllum spicatum**	40.0	38.6	44.3	10.1
Filamentous algae	*Algae* spp.	26.1	25.1	28.9	6.6
Coontail	*Ceratophyllum demersum*	23.0	22.2	25.5	5.8
Stoneworts	*Nitella* spp.	21.8	21.1	24.2	5.5
Watershield	*Brasenia schreberi*	20.6	19.9	22.8	5.2
Small bladderwort	*Utricularia minor*	17.6	17.0	19.5	4.4
Small pondweed	*Potamogeton pusillus*	17.0	16.4	18.8	4.3
Common bladderwort	*Utricularia vulgaris*	16.4	15.8	18.1	4.1
Wild celery	*Vallisneria americana*	15.2	14.6	16.8	3.8
Flat stem pondweed	*Potamogeton zosteriformis*	13.9	13.5	15.4	3.5
Stiff pondweed	*Potamogeton strictifolius*	11.5	11.1	12.8	2.9
Ribbon leaf pondweed	*Potamogeton epihydrus*	9.1	8.8	10.1	2.3
White water lily	*Nymphaea odorata*	7.9	7.6	8.7	2.0
Muskgrasses	*Chara* spp.	7.3	7.0	8.1	1.8
Freshwater sponge	Sponge spp.	6.1	5.8	6.7	1.5
Moss	Moss spp.	6.1	5.8	6.7	1.5
Large-leaf pondweed	*Potamogeton amplifolius*	5.5	5.3	6.0	1.4
Spiny-spored quillwort	*Isoetes echinospora*	4.9	4.7	5.4	1.2
Waterwort	*Elatine minima*	4.2	4.1	4.7	1.1
Creeping spikerush	*Eleocharis palustris*	4.2	4.1	4.7	1.1
Water horsetail	*Equisetum fluviatile*	4.2	4.1	4.7	1.1
Northern water milfoil	*Myriophyllum sibiricum*	4.2	4.1	4.7	1.1
Thin floating-leaf bur-reed	*Sparganium* sp.	4.2	4.1	4.7	1.1
Spatterdock	*Nuphar variegata*	3.6	3.5	4.0	0.9
Spiral-fruited pondweed	*Potamogeton spirillus*	3.6	3.5	4.0	0.9
American bur-reed	*Sparganium americanum*	3.6	3.5	4.0	0.9
Shoreweed	*Littorella uniflora*	3.0	2.9	3.4	0.8
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	2.4	2.3	2.7	0.6
Variable pondweed	*Potamogeton gramineus*	2.4	2.3	2.7	0.6
Twin-stemmed bladderwort	*Utricularia geminiscapa*	1.8	1.8	2.0	0.5
Pipewort	*Eriocaulon aquaticum*	0.6	0.6	0.7	0.2
Clasping leaf pondweed	*Potamogeton richardsonii*	0.6	0.6	0.7	0.2
Broad-leaved arrowhead	*Sagittaria latifolia*	0.6	0.6	0.7	0.2
Thin-leaved pondweed	*Potamogeton* sp.	0.6	0.6	0.7	0.2
Flat-leaved bladderwort	*Utricularia intermedia*	0.6	0.6	0.7	0.2
Cattail	*Typha* sp.	Visual	Visual	Visual	Visual
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	Boat Survey	Boat Survey
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	Boat Survey	Boat Survey

Table 3. Number of sites where species was found and average rake fullness rating

Common Name	Scientific Name	# sites where species was found	# sites where species was found (including visuals)	Average rake fullness rating
Bushy pondweed	*Najas flexilis*	68	68	1.28
Common waterweed	*Elodea canadensis*	67	67	1.28
Eurasian water milfoil*	*Myriophyllum spicatum**	66	71	1.47
Filamentous algae	*Algae* spp.	43	43	1.00
Coontail	*Ceratophyllum demersum*	38	38	1.37
Stoneworts	*Nitella* spp.	36	36	1.00
Watershield	*Brasenia schreberi*	34	58	1.68
Small bladderwort	*Utricularia minor*	29	29	1.10
Small pondweed	*Potamogeton pusillus*	28	28	1.14
Common bladderwort	*Utricularia vulgaris*	27	27	1.30
Wild celery	*Vallisneria americana*	25	26	1.36
Flat stem pondweed	*Potamogeton zosteriformis*	23	25	1.22
Stiff pondweed	*Potamogeton strictifolius*	19	19	1.16
Ribbon leaf pondweed	*Potamogeton epihydrus*	15	18	1.27
White water lily	*Nymphaea odorata*	13	42	1.69
Muskgrasses	*Chara* spp.	12	12	1.25
Freshwater sponge	Sponge spp.	10	11	1.00
Moss	Moss spp.	10	10	1.20
Large-leaf pondweed	*Potamogeton amplifolius*	9	10	1.33
Spiny-spored quillwort	*Isoetes echinospora*	8	11	1.00
Waterwort	*Elatine minima*	7	8	1.00
Creeping spikerush	*Eleocharis palustris*	7	9	1.14
Water horsetail	*Equisetum fluviatile*	7	15	1.43
Northern water milfoil	*Myriophyllum sibiricum*	7	7	1.00
Thin floating-leaf bur-reed	*Sparganium* sp.	7	7	1.00
Spatterdock	*Nuphar variegata*	6	22	1.17
Spiral-fruited pondweed	*Potamogeton spirillus*	6	6	1.00
American bur-reed	*Sparganium americanum*	6	11	1.50
Shoreweed	*Littorella uniflora*	5	5	1.00
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	4	5	1.25
Variable pondweed	*Potamogeton gramineus*	4	5	1.00
Twin-stemmed bladderwort	*Utricularia geminiscapa*	3	3	1.00
Pipewort	*Eriocaulon aquaticum*	1	2	1.00
Clasping leaf pondweed	*Potamogeton richardsonii*	1	1	2.00
Broad-leaved arrowhead	*Sagittaria latifolia*	1	1	1.00
Thin-leaved pondweed	*Potamogeton* sp.	1	1	1.00
Flat-leaved bladderwort	*Utricularia intermedia*	1	1	1.00
Cattail	*Typha* sp.	Visual	3	n/a
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	n/a
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	n/a

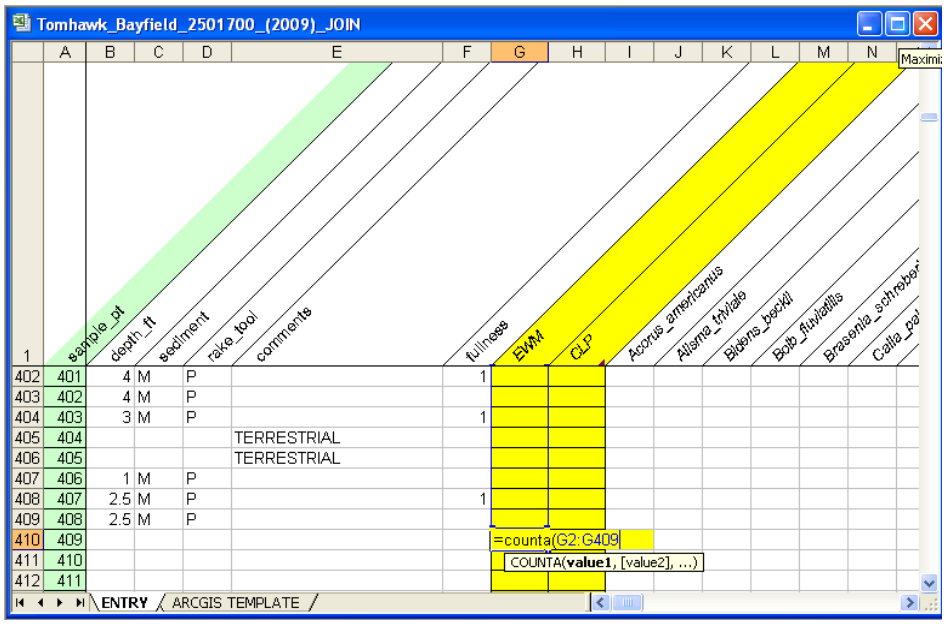
Appendix 3

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 9.3

This is a protocol for making a plant distribution map using ArcGIS 9.3 and the Excel (2003 version) file of data from the point intercept (PI) survey. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

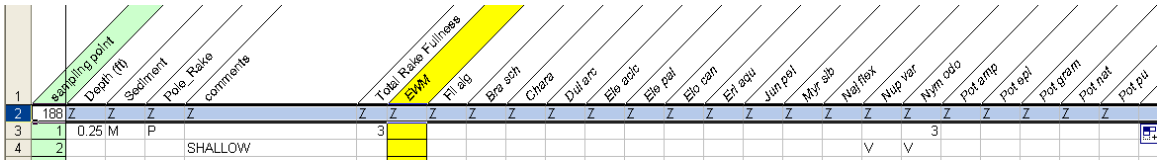
1. After entering the PI survey data into the Aquatic Plant Survey Data Workbook (Appendix-C.xls), save the file using a unique name. We recommend the convention: Lake_County_WBIC_(YYYY).xls

2. Prepare <Lake_County_WBIC_(YYYY).xls> For Join
    a. Open file in Excel
    b. File → Save As → Lake_County_WBIC_(YYYY)_JOIN.xls (DO NOT MODIFY ORIGINAL FILE)
    c. Delete all worksheets except for ENTRY and ARCGIS TEMPLATE (make sure to scroll left and delete the README sheet)
        i. Click on worksheet tab; Edit → Delete Sheet → Delete
    d. Delete the following columns
        i. Entry columns (A & I) and calculated columns (B-H)
            1. Columns B-H are normally hidden. To "unhide" them, cursor over the column heading (A) at the top of the sheet and click/drag to highlight it and the adjacent column (I). Right click the highlighted region, then select unhide. Columns B-H are colored blue. Now delete all columns A-I.
        ii. Latitude, Longitude columns (possibly hidden, located between sampling point and depth columns)
        iii. Replace first row of ENTRY with ARCGIS TEMPLATE
            1. Copy the entire first row of truncated species names from the ARCGIS TEMPLATE worksheet
            2. Highlight the first row on the ENTRY worksheet and replace with the template (Edit → Paste)
        iv. Species columns with no data
            1. Add a count row to identify empty columns to delete
                a. Select all cells and remove any validation
                    i. Select All (Ctrl-A)
                    ii. Data → Validation → OK → Allow Any Value → OK
                b. In the row below the last sampled point, and in the first column under a plant species, enter the formula =counta(
                c. Then highlight the column up to the first sampling point. The beginning of this procedure is depicted below.



d. Finally, add a closing) and hit enter. The final formula will be similar to this: =counta(G2:G500)
e. Point the cursor over the bottom right corner of the cell until cursor turns into a "+". Click/Drag this formula all the way across to the end of the species list.
f. Delete any columns where the sum row is equal to 0
g. Then delete the sum row

e. Delete any rows after the last applicable sample point
   i. The "sample_pt" column is usually populated up to 4000 points; delete any rows where the sampling point column is numbered, but these sample points are greater than the number of points set-up in the lakewide grid, and therefore the row doesn't contain any information.
f. Add a "dummy" row so all data imports into ArcGIS as "text"
   i. Add a row directly above the first sampled point
   ii. In this newly created row, under the Sampling Point column, enter the number equal to the total number of sample points plus 1 (i.e. total sampling points in example image is 187. The number 188 would be entered into the "dummy" row under the sampling point)
g. Enter "Z" in all other cells in all columns that contain any information



h. Save the file and close Excel

3. Save the lake specific polygon and point shapefiles to a folder on a local drive
   a. We'll refer to this folder as "MapFolder"

4. Open ArcMap
   a. Select to Start using ArcMap with "a new empty map" and click "OK"

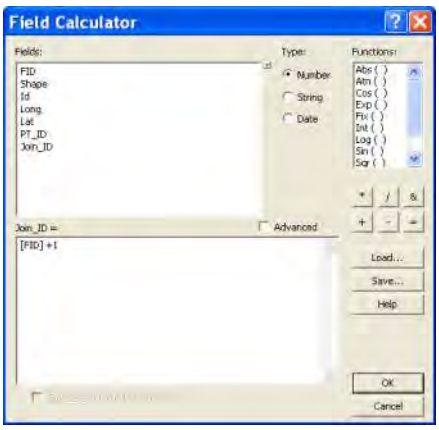
5. Add Data (either method “a” or “b”)
    a. Using Add Data Button
        i. Select the “Add Data” button; or File → Add Data 
        ii. Navigate to MapFolder
        iii. Highlight both the lake polygon (lake_country_WBIC_poly.shp) and point (lake_county_WBIC_XXmpts.shp) shapefiles
        iv. Click on ‘Add’
    b. Directly from ArcCatalog
        i. Situate ArcMap and ArcCatalog windows so that you can see both
        ii. Navigate to MapFolder in ArcCatalog
        iii. Highlight both the lake polygon (lake_county_WBIC_poly) and point (lake_county_WBIC_XXmpts) shapefiles
        iv. Drag and drop these shapefiles into ArcMap
        v. Note: Shapefiles should only be saved, deleted, moved, etc. in ArcCatalog. Using Windows Explorer with shapefiles can result in accidental deletion of individual shapefile files (i.e. *.shp, *.dbf, *.sbn, *.shx, *.sbx, and *.sbn files must all be stored together. ArcCatalog packages these files together so nothing gets lost)

6. Defining Shapefile Projections
    a. If after adding in your shapefiles a warning message regarding “Unknown Spatial Reference” appears, the shapefiles coordinate system is not defined
        i. To define and verify projection, please contact DNRBaselineAquaticPlants@wisconsin.gov
        ii. Alternatively, the shapefile projection can be defined manually by using the Define Projection Tool located in ArcToolbox
            1. ArcToolbox → Data Management Tools → Projections and Transformations → Define Projection
            2. Input Dataset or Feature Class
                a. Select the shapefile that needs a defined projection
            3. Click on the browse button (right side of dialog box)
            4. In the Spatial Reference Properties dialog box, click on the “Select” button
            5. Browse for the correct coordinate system
                a. Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj; Click Add.
                    i. Do not use the US Feet system
                    ii. The coordinate system name may also be displayed as NAD 1983 HARN Transverse Mercator
                    iii. Coordinate system parameters:
                        1. Projection → Transverse Mercator
                        False Easting → 520000.00000000
                        False Northing → -4480000.000000
                        Central Meridian → -90.00000000
                        Linear Unit → Meter

6. Select “OK” on Spatial Reference Properties dialog box, and “OK” on define projection tool

7. Edit Attribute Table for point shapefile
    a. Open Attribute Table
        i. Right click on point shapefile in ArcMap table of contents
        ii. Select “Open Attribute Table”
    b. Add a Field
        i. Select the “Options” button → “Add Field”
        ii. Name: Join_ID
        iii. Type: Double
        iv. Precision: 10
        v. Scale: 3

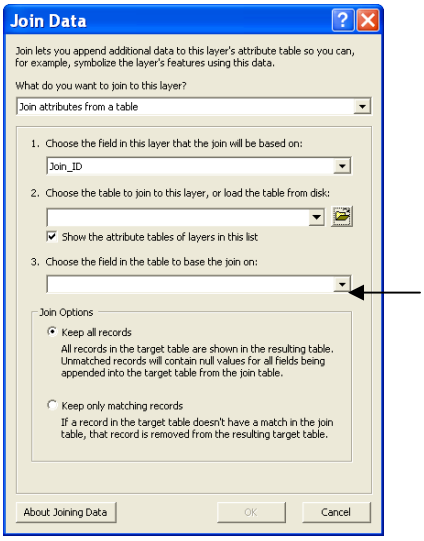
    c. Populate Join_ID Column
        i. Right click on “Join_ID” column heading
        ii. Select “Field Calculator”
        iii. If Field Calculator warning message pops up, click “Yes”
        iv. Set expression by double-clicking FID in the “Fields:” box and typing +1. The white box under “Join_ID =” should now read **[FID] +1**
        v. Click “OK”
        vi. Your Join_ID column should now be populated in sequential order, starting with point #1 at the top
        vii. Close the attribute table
        viii. Note: This expression is assuming that each unique ID was based off of the calculation [FID] +1 when creating the initial point file. If the unique ID’s were not created in sequential order based on the FID field, then calculate Join_ID field accordingly (example: Truncate a unique ID such as ‘Como001’ so that it just reads ‘001’ in the Join_ID field.)



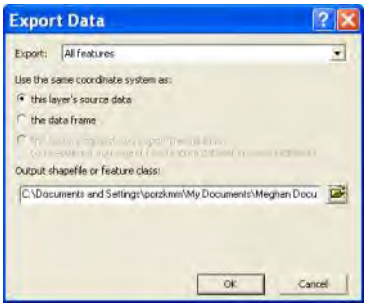
8. Join shapefile to <Lake_County_WBIC_(YYYY)_JOIN.xls>
    a. Right click on point shapefile in ArcMap table of contents
    b. Select Joins and Relates → Join…
    c. Set the following options:
        i. Join Attributes from a table
        ii. Join will be based on “Join_ID”
        iii. Choose the table to join to this layer
            1. Click on Window Folder (See arrow)

2. Navigate to and double-click on the Excel file saved in step 2
3. Double-click on the 'ENTRY $' sheet
4. Click "Add"

iv. Base the join on "sample_pt"
v. Join Options: Keep All Records (If using ArcGIS 9.2, these options can be viewed by clicking the "Advanced" button)
vi. Click "OK"
vii. If prompted to create index, select "Yes"



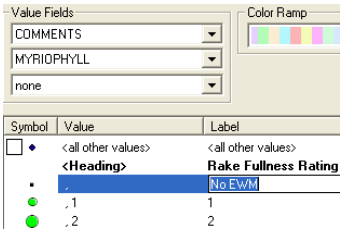
9. Export joined shapefile to make it permanent
    a. Right click on joined point shapefile in ArcMap table of contents
    b. Select Data → Export Data
    c. Set the following options:
        i. Export: All Features
        ii. Use the same coordinate system as: this layer's source data
        iii. Output shapefile or feature class: Save in MapFolder as **Lake_County_WBIC_ XXpts_YEAR_JOIN.shp**



    d. Click "OK"
    e. When asked if you want to add the exported data to the map as a layer, select "Yes"
        i. This final joined shapefile will now be referred to as "Joined Point Shapefile"
    f. Remove the Join from the original point shapefile
        i. Right click on point shapefile in ArcMap table of contents
        ii. Select Joins and Relates → Remove Join(s) → Remove All Joins
    g. In the table of contents, uncheck or remove the original point shapefile that was used to create the Joined Point Shapefile.

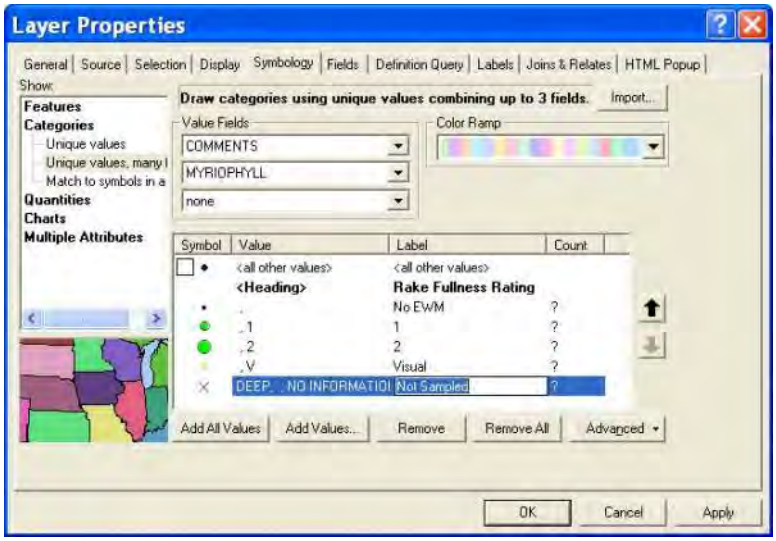
10. Check Join Results
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select "Open Attribute Table"
    c. Verify that Join was successful
        i. All data present in Excel file should now be located in the Joined Point Shapefile attribute table, and the Join_ID and Sample_Pt columns will be identical

11. Display Plant Distribution Data
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select “Properties”
    c. Select “Symbology” tab
    d. On left side of dialog box under “Show:”, select “Categories – Unique Values, Many Fields”
    e. Value Fields should be “Comments”. Be sure to select the appropriate Comments field, as there may be two that appear similar.
    f. You will then choose additional Value Fields to display species information (i.e. If you want to display both EWM and CLP species information, then both EWM and CLP need to be chosen as Value Fields)
    g. Select “Add All Values”
        i. All possible values are now displayed, separated by a comma. Each position indicates the unique values for each Value Field you designated in steps e & f, in the order entered. That is, if you selected ‘comments’, ‘EWM’, and ‘CLP’ as your value fields, the first value might read: ‘ , , ‘ indicating points that were sampled, but had neither a comment, EWM, nor CLP present. The next value might read ‘ , ,1’, which includes points with no comments, no EWM, and fullness rating of 1 for CLP.
        ii. Points with information for the ‘comments’ value field were likely not sampled; the comment listed should clarify how to work with these points.
    h. Un-check <all other values> box
    i. Double-click on symbol next to each value to set symbology
        i. You must now choose appropriate symbols and colors for the different variables being expressed.
        ii. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2, 3), a small light green circle for visuals (V), a small black dot for sites sampled that had no relevant plant data, and a small “x” symbol for all sites not sampled
    j. You can change the label name of the symbol being represented by clicking on the respective space under “Label”. (e.g. change “ , ” to “No EWM”; “ ,1” to “1”; “ ,V” to “Visual”; “Deep, ” to “Not Sampled”)



    k. You can also group values together (e.g. No Information, Deep, Shallow, etc)
        i. Hold down the Shift key and highlight all rows that should be grouped

ii. Right click on highlighted rows and select “Group Values”
iii. The final Layer Properties dialog box should look similar to this: Note: If you want to change the order that these will appear in the legend, highlight a row and use the arrows on the right side to move.
iv. Click “Apply” then “OK” to update symbols on map



v. The polygon shapefile fill color and outline may also be modified similarly under the “Symbology” tab

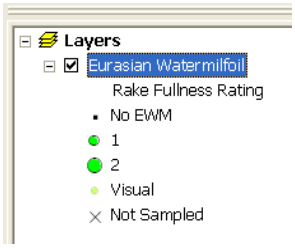
12. Map Page Layout
    a. Verify that the coordinate system is defined correctly for the Data Frame
        i. Select View → Data Frame Properties → Coordinate System Tab
        ii. If the coordinate system is incorrectly defined, browse for the correct coordinate system
            1. Predefined → Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj
    b. View → Layout View
    c. File → Page and Print Setup → Select Landscape or Portrait
    d. Modify size/shape of data frame to fit on entire page and serve as map border
        i. Right click data frame, select Properties, under the ‘Frame’ tab, change border to a thickness of 2 and select OK.
    e. Insert → North Arrow
        i. Size and position appropriately
    f. Insert → Scale Bar
        i. Select “Alternating Scale Bar 1” and click “OK”
        ii. Double-click on Scale Bar in Layout view to edit properties
        iii. Set the following properties:
            1. Number of divisions: 2
            2. Number of subdivisions: 1
            3. Set units to kilometers

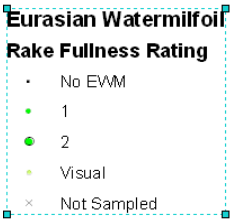
4. Click “OK”

g. Insert → Text
   i. Double-click on Text Box to edit information
      1. Create text box with the following information:
         a. Lake Name, County, Date Sampled, etc.
      2. Format text as appropriate using “Change Symbol…” button

h. Insert → Picture → Navigate to WDNR Logo (Black & White)
   i. Size and position appropriately

i. Legend
   i. In the table of contents, modify the displayed name of your shapefile as you would like it to appear in your legend by single clicking on the text
   ii. Insert → Legend
   iii. Choose which layers you want to include in your legend
      1. Include the layer that has the plant distribution symbology information
      2. You may have to remove the polygon layer by highlighting it under “Legend Items” and clicking the single left angle bracket (<), then select “Next”
   iv. Remove the word “Legend” from the Legend Title and select “Next”
   v. Continue selecting “Next” and then “Finish”
   vi. Format legend text
      1. Right click on Legend and select “Properties”
   vii. Size and position legend as appropriate





j. If you’re going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as an ArcMap Template so you can use the same one each time
   i. File → Save As → Save As Type: ArcMap Template

k. Check printed map for color accuracy before you export (Step 13). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

13. Saving Map as JPEG
   a. File → Export Map
      i. Save as type: JPEG
      ii. Set Resolution: 300 dpi
      iii. Navigate to appropriate folder and Save

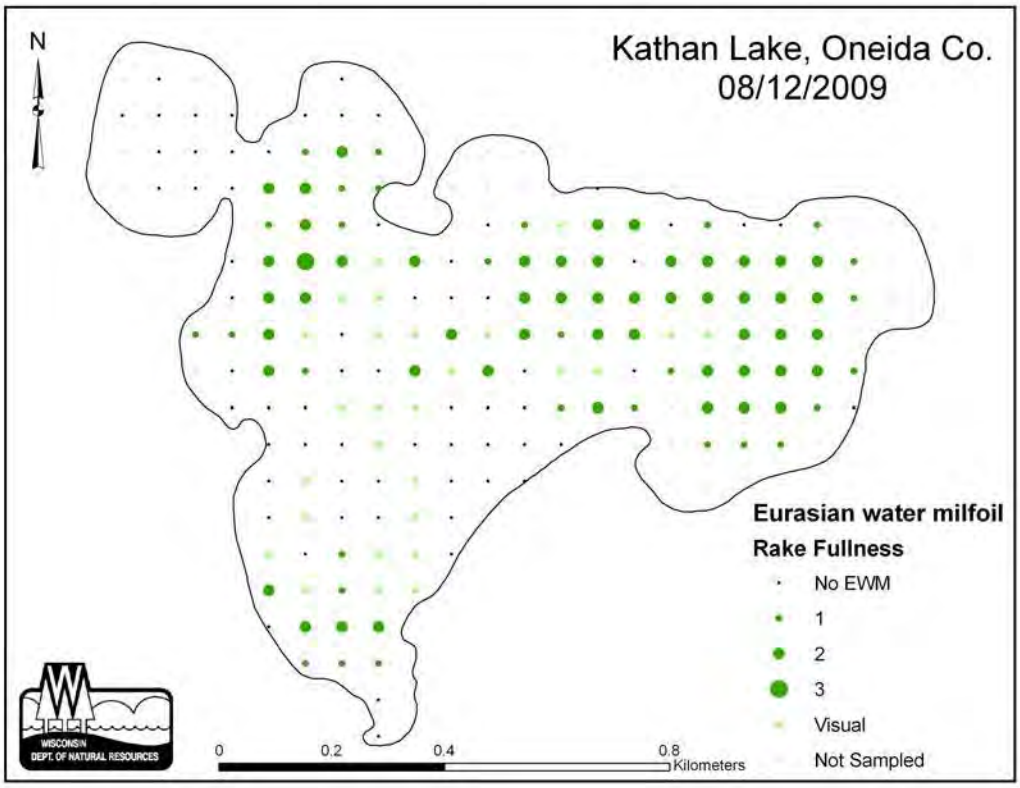


Figure 6: Example plant distribution map created using point-intercept data and ArcGIS 9.3 software for Kathan Lake, Oneida County.

Appendix 4

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 3.3

This is a protocol for making plant maps using ArcView GIS 3.3 and the Aquatic Plant Survey Data Workbook Excel file <Appendix-C.xls.>. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. Save the ArcView shapefiles (*.shp, *.dbf, *.sbn, *.shx, *.sbx, *.sbn) to a folder on a local drive.
    a. We'll refer to this folder as "MapFolder"

2. Open ArcView and create a new project with a new view.
    a. Click "yes" to add data

3. Add shapefiles from MapFolder
    a. You can add multiple files at once by holding down "shift" while you click the individual files

4. View window: select the point file
    a. Make sure both themes have the box checked in order to view them
    b. Click once on the point layer to activate that theme (raised box around that item)
    c. If necessary, drag the activated point layer above the polygon layer in order to see the sample points

5. Open theme table
    a. Theme > Table or
    b. The open theme table shortcut button

6. Start editing, add variable column
    a. Table > Start Editing
    b. Edit > Add Field
        i. Enter the name of the field (e.g. EWM_2009)
        ii. Specifications 'type', 'width', and 'decimal places' do not need to be changed
        iii. Click "OK"

7. Stop editing, save edits
    a. Table > Stop Editing, 'Yes' to save edits

8. Export point file

a. File > Export
b. Select ‘dBASE’
c. Select MapFolder to save file
d. Default will be named <table1.dbf>
e. Close table

9. Set-working directory
    i. File > Set Working Directory
    ii. Change working directory to MapFolder

10. Save project, exit ArcView
    a. File > Save Project As > save in MapFolder (for ease of reference, lets call the file EWM_Map.apr)
    b. Exit ArcView

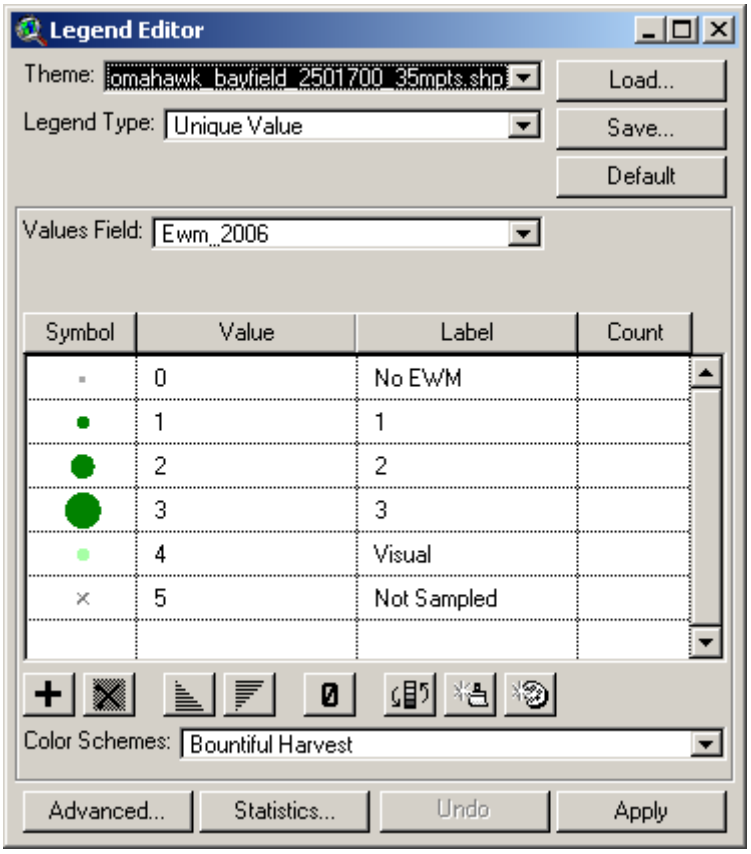
11. Open file saved in step 8 with Excel
    a. Open excel; Open a file, when prompted to find the file, navigate to MapFolder
    b. In “Files of type” option bar select “All files”
    c. Open <table1.dbf>

12. List information under data field created (EWM_2009)
    a. Open PI data entry excel file (WiAPMS.xls)
    b. Copy columns “Sample point, Depth, Comments, & EWM”
    c. Paste special “values” into new excel workbook
        i. Edit > Paste Special > Values
    d. Highlight all data, sort by comments
        i. Data > Sort > Comments
    e. Enter the number 5 into EWM column for all unsampled sites (deep, terrestrial, non-navigable, etc) (this is so the legend can code these sites)
    f. Highlight EWM data column and replace all blanks with 0 (zero), and V (visuals) with 4
        i. Edit > Replace, replace all
    g. Highlight all data, re-sort by sampling site
        i. Data > Sort > Sampling Point
    h. Copy EWM column, excluding header, paste into the .dbf file (already open, originally created in step 8)
    i. “Save as” this file as the **original dbf** file’s name (the copy you placed in MapFolder, not the original file, obviously)
        i. i.e. overwrite the ISS original (e.g. Kathan_Oneida_1598300_65mpts.dbf) with the new file you just modified in excel. The name must be EXACTLY the same!!
        ii. Close excel

13. Reopen project in ArcView
    a. Open existing project

b. Open MapFolder and click on EWM_Map.apr (or whatever you chose to name it in step 9)

14. Create legend
    a. Double-click point symbol in the View frame to open the legend window
    b. In "Legend Type" option bar, choose "Unique Value"
    c. In "Values Field" option bar select "EWM_2009" column (or whatever column you want this map to show)
    d. Apply
    e. You must now choose appropriate symbols and colors for the different variables being expressed by the legend. You can change the symbol by double clicking on it
    f. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2 , 3), a small light green circle for visuals (value: 4), a small black dot for sites sampled, but without EWM, (value: 0), and a small "x" symbol for sites not sampled (value: 5).



    g. You can change the label name of the symbol being represented by clicking on the respective cell under "Label". (e.g. change "5" to "Not Sampled", change "4" to Visual)
    h. The color or shading of the polygon can also be changed by double clicking on the theme

15. Set units
    a. View > Properties
    b. Change map units to "meters" and distance units to "kilometers"

16. Layout
    a. View > Layout
    b. Select Landscape or Portrait
    c. Double-click 'View1' to change map title
    d. Double-click scale bar to adjust range or units
    e. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as a Template (Layout > Store as Template) so you can use the same one each time.

f. Check printed map for color accuracy before you export (step 17). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

17. Save as JPEG
    a. Have the final layout window active
    b. Select File > Export
    c. In "List Files of Type" option bar, select JPEG
    d. Click 'Options' button
        i. Set resolution to highest number
        ii. Likely 144 DPI and Quality = 100
    e. Type file name, choose location in which to save the JPEG
    f. Click OK

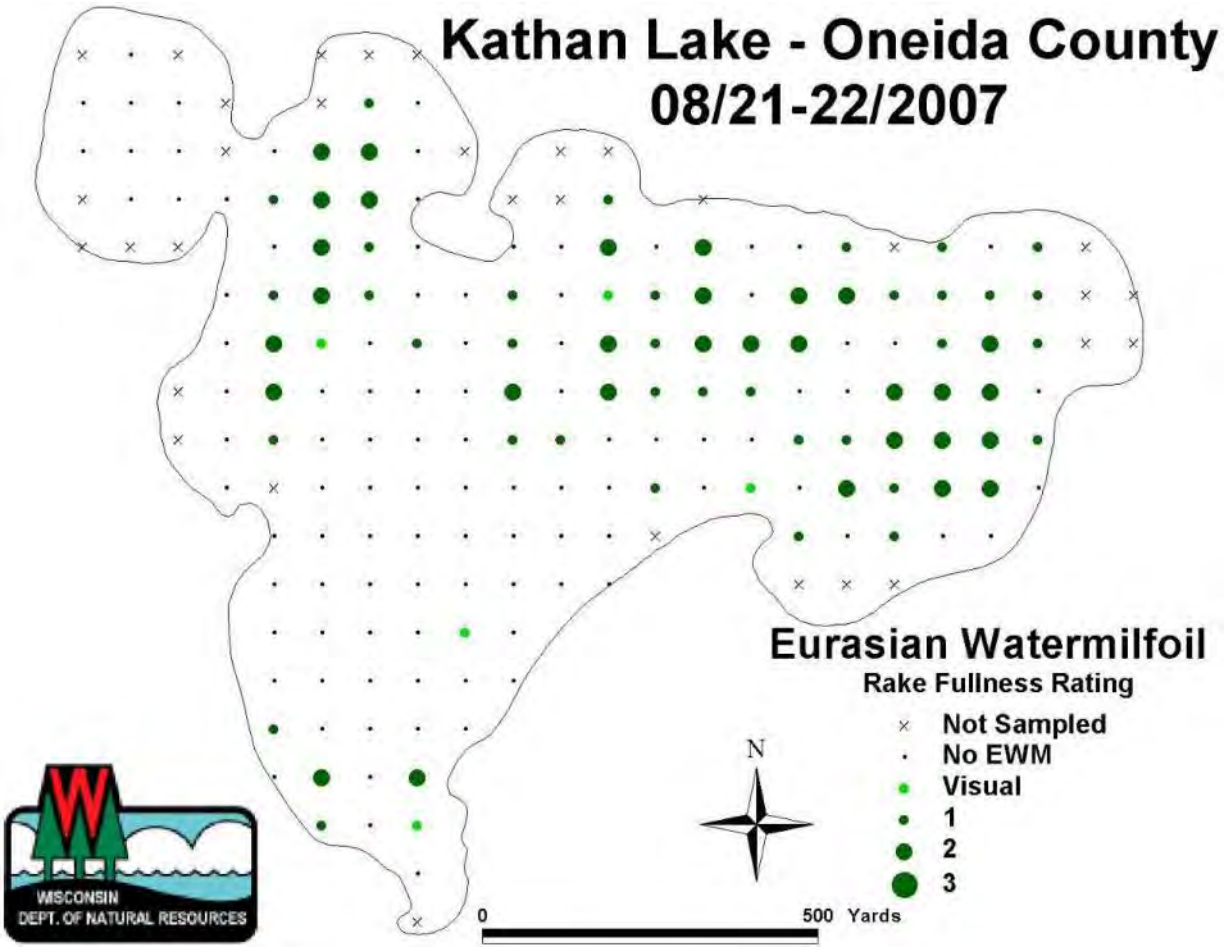


Figure 7: Example plant distribution map created using point-intercept data and ArcGIS 3.3 software for Kathan Lake, Oneida County.

Document citation:

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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- analyzing new information and emerging technologies.
- synthesizing information for policy and management decisions.
- applying the scientific method to the solution of environmental and natural resources problems.
- providing science-based support services for department initiatives.
- collaborating with local, state, regional, and federal agencies and academic institutions in Wisconsin and around the world.

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Appendix 3 – Aquatic Invasive Species Early Detector Handbook

WISCONSIN AQUATIC INVASIVE SPECIES EARLY DETECTOR HANDBOOK

NOTES

TABLE OF CONTENTS

EARLY DETECTOR BASICS

4 How to prepare
5 Example map
6 Assembling a monitoring kit
8 How to sample AIS from shore
10 How to sample AIS from a boat
12 Photographing Aquatic Invasive Species

PLANT ID

14 Brazilian waterweed & Hydrilla
16 Brittle naiad
17 Carolina fanwort
18 Curly-leaf pondweed
19 Eurasian watermilfoil
21 European frog bit
22 Flowering rush
23 Narrow-leaf cattail / hybrid cattail
24 Parrot feather
25 Phragmites
26 Purple loosestrife
27 Starry stonewort
28 Water chestnut
29 Water hyacinth
30 Water lettuce
31 Yellow floating heart
32 Yellow Iris

ANIMAL ID

34 Asian clam (*Corbicula*)
35 Banded & Chinese mystery snails
36 Faucet snail
37 New Zealand mudsnail
38 Round goby
39 Rusty crayfish
40 Spiny waterflea
41 Zebra & quagga mussels

AIS EARLY DETECTORS

Early detection of aquatic invasive species (AIS) can be the difference between long-term management and potential eradication--the difference between $$$ and $. Once they become well-established, invasive species can be very difficult to control, and may be impossible to eradicate. Early detection and rapid response to new AIS populations in Wisconsin has resulted in some populations being eradicated from entire lakes, including notable invaders like Eurasian watermilfoil, flowering rush, and yellow floating heart (cover photo). The best possible option for a lake is to have trained eyes on the water often, so that a suspicious plant or animal can be detected early and quickly responded to.

Your Citizen Lake Monitoring Network staff and local Aquatic Invasive Species Coordinators are ready to help you! They can provide hands-on training workshops, assist with identification, suggest the best locations to monitor on your lake, and more. This is a team effort to stop invasive species from spreading to our favorite fishing spots, our cherished swimming holes, and the peaceful places where we love to observe native plants and animals. We can all do our part. Thank you for being a partner to protect the amazing lakes of Wisconsin.

This booklet is adapted from *Aquatic Invasive Species Early Detectors: A How-to Guide*, produced by the Minnehaha Creek Watershed District, Minnetonka, Minnesota, used with permission.

Produced by the Wisconsin Citizen Lake Monitoring Network, UW-Extension Lakes Program.
Photos by Paul Skawinski except the following:
Jeff Gunderson, Minnesota Sea Grant (top photo, p. 38);
Jeffrey Thompson, Minnesota Public Radio; (page 3)
Minnehaha Creek Watershed District; (pages 6, 10)
Tina Wolbers, Minnesota Department of Natural Resources (top photo, page 32)

WISCONSIN DEPT. OF NATURAL RESOURCES

Wisconsin Lakes Partnership

UW Extension
University of Wisconsin-Extension

HOW TO PREPARE

1. Know which invasive species are already present in the lake or stream you are monitoring. Lists of invasive species in each water body can be found on the Wisconsin Department of Natural Resources website: dnr.wi.gov/lakes/invasives/AISbywaterbody.aspx

2. Determine several locations to sample. Be sure to target boat landings, inlets/outlets, public parks, developed shorelines, and a variety of sediment types (mucky, sandy, etc.). Your own shoreline is also a great place to keep an eye on. Mark these sampling locations on a map so that you can show others where you sampled or found a suspicious species.

3. Refer to the *Assembling a Monitoring Kit* section on page 6 to prepare for monitoring. If any of your gear has been used in another waterbody, be sure that it doesn't contain any plants, animals, or debris that could be holding invasive species.

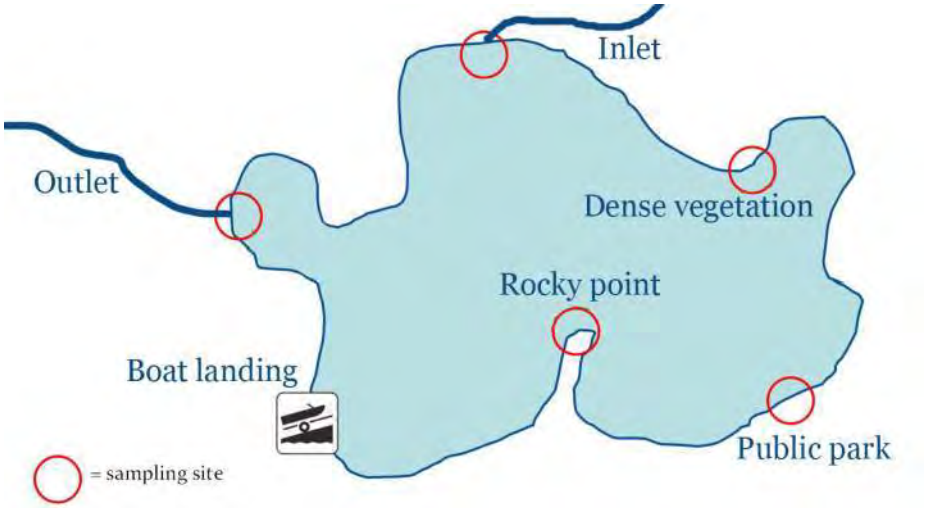
Inspect your equipment for any attached plants, animals, or mud

Remove all attached debris

Drain water from your boat, motor, live wells, bait buckets, and any other location that holds water

EXAMPLE MAP

Great maps can be found for public lakes across the state by searching dnr.wi.gov for “lake maps”.

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ASSEMBLING A MONITORING KIT

Use the checklist below to assemble an AIS monitoring kit. Items marked with an asterisk (*) can be provided by your Regional Citizen Lake Monitoring Network Coordinator or local Aquatic Invasive Species Coordinator.

1) Aquatic plant sampling rake*
2) Waterproof labels*
3) Ziploc bags*
4) Hand lens*
5) Pencil*
6) AIS monitoring forms*
7) Polarized sunglasses
8) Towel to dry your hands and equipment
9) Underwater viewing scope (optional)

Waders (10) and snorkeling gear (11) can also be very useful tools for AIS monitoring, but are not required. Volunteers wishing to do a very thorough check of an area may choose to use these items.

10

11

A steel rake head (usually with at least 30 feet of rope attached to it) is a very effective aquatic plant sampling tool. You can buy a rake head by itself, or simply cut the handle off of a rake and tie the rope to the head. If desired, a double-sided rake can be made by attaching two rake heads together with cable ties or welding.

1

7

Polarized sunglasses reduce glare and allow a person to see much more clearly into the water.

8

A towel is useful to wipe your hands and your gear!

HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM SHORE

Identify the public boundaries of the site. Beginning at one of the boundaries, conduct the sampling steps outlined below, and repeat these steps at five points spaced about equally between the site boundaries.

1. Scan the area for at least 30 seconds, examining plants in the water and any plant fragments/shells that are washed up on shore.

2. Toss your sampling rake from shore into the water, aiming for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of your rope!

3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Continue tossing the rake until you feel that you have adequately sampled this location (usually 2-3 rake tosses). Use this handbook to help you identify suspicious plants and animals.

If there is a dock or pier, use it as one of your sampling locations. You can sample off of any side of the dock. If you are able to see or touch the legs of the dock, this is a good way to look for zebra mussels.

Place a sample of any suspected invasive species in a plastic bag with a waterproof label. Bags, labels, and pencils are included in your monitoring kit. Seal the bag tightly and place it somewhere secure until you can get it into a refrigerator or deliver it to an expert.

4. Report what you found. If you did not find any suspected invasive species, that's great! We want to know the good news! Please enter this information into the Surface Water Integrated Monitoring System (SWIMS) database, or email the *Aquatic Invasives Surveillance Monitoring* form to your local Aquatic Invasive Species Coordinator. This form can be used to record results from one day or from an entire season of monitoring, whichever is most convenient for you. Please enter or mail your results by November 1st so we can compile information from across the state.

If you found a suspected invasive species, please record that on the form. Then take digital photographs of the invasive species (please include the waterproof label in the photos) and email the photos to your local AIS Coordinator (DNR or county). Please save all suspicious plants and animals in the refrigerator or in a cooler until you hear back. Your AIS Coordinator may ask to see the actual specimen to confirm its identification.

Who is my local AIS Coordinator? Visit the Wisconsin DNR website at dnr.wi.gov and type "AIS Coordinator" into the search box. Then click on your county to find contact information for AIS staff that cover your area.

If you need help finding this information, please contact:

Paul Skawinski
Statewide Citizen Lake Monitoring Network Coordinator
Pskawins@uwsp.edu or 715-346-4853

HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM A BOAT

Identify sites with a high risk of invasive species introductions, such as boat landings, public parks, bridges, and inlets. Conduct the sampling steps outlined below at each site you have identified around the lake. While motoring/paddling between sites, stay shallow enough that you can see aquatic plants, and watch for AIS as you go.

1. Scan the area for suspicious plants and animals, both in the water and along the shoreline. Scan for at least 30 seconds at each site.

2. Toss your sampling rake into the water, once from each side of the boat. Aim for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of the rope!

3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Continue tossing the rake until you feel that you have adequately sampled this location (usually 2-3 rake tosses). Use the identification resources provided to help you identify suspicious plants and animals.

Place a sample of any suspected invasive species in a plastic bag with a waterproof label. Bags, labels, and pencils are included in your monitoring kit. Seal the bag tightly and place it somewhere secure until you can get it into a refrigerator or deliver it to an expert.

4. Report what you found. If you did not find any suspected invasive species, that's great! We want to know the good news! Please enter this information into the Surface Water Integrated Monitoring System (SWIMS) database, or email the *Aquatic Invasives Surveillance Monitoring* form to your local Aquatic Invasive Species Coordinator. This form can be used to record results from one day or from an entire season of monitoring, whichever is most convenient for you. Please enter or mail your results by November 1st so we can compile information from across the state.

If you found a suspected invasive species, please record that on the form. Then take digital photographs of the invasive species (please include the waterproof label in the photos) and email the photos to your local AIS Coordinator (DNR or county). Please save all suspicious plants and animals in the refrigerator or in a cooler until you hear back. Your AIS Coordinator may ask to see the actual specimen to confirm its identification.

Who is my local AIS Coordinator? Visit the Wisconsin DNR website at dnr.wi.gov and type "AIS Coordinator" into the search box. Then click on your county to find contact information for AIS staff that cover your area.

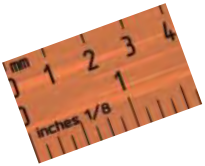
If you need help finding this information, please contact:

Paul Skawinski
Statewide Citizen Lake Monitoring Network Coordinator
Pskawins@uwsp.edu or 715-346-4853

PHOTOGRAPHING AQUATIC INVASIVE SPECIES

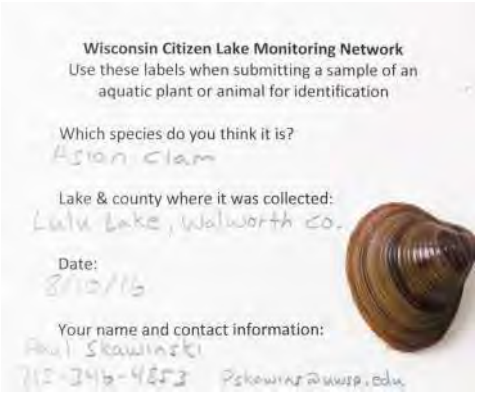
Most aquatic invasive species can be readily identified from a good photograph. Here are some tips to make your specimen easy for your local AIS Coordinator to identify.

Light it up! Have the sun or other light source behind you, not behind the object. Shadows make it difficult to see colors and patterns.



Show scale. Some species can be differentiated based on size. Use a coin, hand, key, or the ruler at the front of this handbook to demonstrate size.

Have a contrasting background. Small features of plants and animals are tough to see against backgrounds that are busy or contain similar colors/textures.



PLANT ID

BRAZILIAN WATERWEED AND HYDRILLA

Plant type: Submergent
Status: Prohibited
Native look-alike: Common waterweed

INVASIVE

Brazilian waterweed
(*Egeria densa*)

- Rings (whorls) of 4-8 leaves around the stem
- Fine teeth on leaf edges. This usually requires a hand lens to see
- No teeth underneath the leaves

NATIVE

Common waterweed
(*Elodea canadensis*)

- Rings (whorls) of 3 leaves around the stem
- Smooth leaf edges
- No teeth underneath the leaves

INVASIVE

Hydrilla
(*Hydrilla verticillata*)

- Rings (whorls) of 4-8 leaves around the stem
- Fine teeth on leaf edges
- Teeth are also produced underneath the leaf, along the centerline

BRITTLE NAIAD

Plant type: Submergent
Status: Prohibited
Native look-alike: Slender naiad

INVASIVE

Brittle naiad
(*Najas minor*)

- Noticeably toothed
- Readily breaks into small fragments
- Leaves curve strongly downward

NATIVE

Slender naiad
(*Najas flexilis*)

- Teeth on edge of leaf require magnification to view
- Flexible
- Leaves straight or slightly curving

CAROLINA FANWORT

Plant type: Submergent
Status: Prohibited
Native look-alike: Water marigold

INVASIVE

Carolina fanwort
(*Cabomba caroliniana*)

- Leaves on short stalks, attaching on opposite sides of the stem
- Flower white with a yellow center
- May have tiny, floating leaves

NATIVE

Water marigold
(*Bidens beckii*)

- Ring/whorl of leaves around the stem
- Leaves do not have stalks
- Yellow, daisy-like flower

CURLY-LEAF PONDWEED

Plant type: Submergent
Status: Restricted
Native look-alike: Clasping-leaf pondweed

INVASIVE

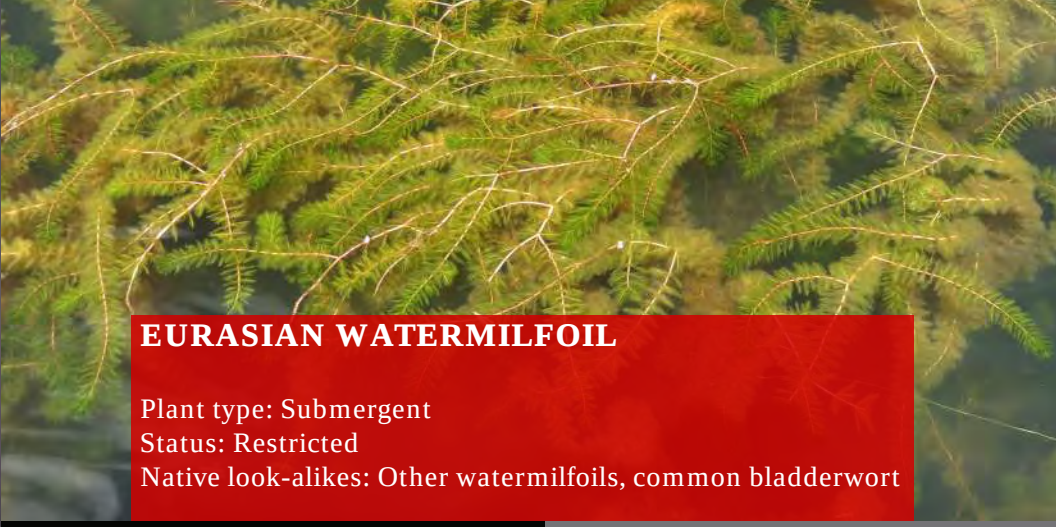
Curly-leaf pondweed
(*Potamogeton crispus*)

- Leaves are usually very wavy
- Finely toothed leaf edges
- Leaf tips are blunt
- Leaf base not wrapped around stem

NATIVE

Clasping-leaf pondweed
(*Potamogeton richardsonii*)

- Leaves are gently wavy
- Leaf edges smooth, no teeth
- Leaf tips are pointed
- Leaf base wraps around stem



EURASIAN WATERMILFOIL

Plant type: Submergent
Status: Restricted
Native look-alikes: Other watermilfoils, common bladderwort

INVASIVE	NATIVE
Eurasian watermilfoil (*Myriophyllum spicatum*)	Northern watermilfoil (*Myriophyllum sibiricum*)
• 12+ pairs of leaflets per leaf • Stems usually weak and limp, reddish-brown to pink • Leaves at tip of branches often red	• 5-10 pairs of leaflets per leaf • Stems tan to green, usually stiff, holding shape out of water • Leaves at tips of branches usually green

NATIVE

Whorled watermilfoil
(*Myriophyllum verticillatum*)

- 8-17 pairs of leaflets per leaf
- Stems brown or dark green
- Rings (whorls) of leaves packed closely together on the stem

NATIVE

Common bladderwort
(*Utricularia macrorhiza*)

- Leaves contain many small sacs (bladders) that trap invertebrates
- Stems are unrooted, usually tangled on other vegetation

EUROPEAN FROG-BIT

Plant type: Floating
Status: Prohibited
Native look-alike: White water lily

INVASIVE

European frog-bit
(*Hydrocharis morsus-ranae*)

- Free-floating, roots hang below
- Small, heart-shaped leaves (2-3”)
- Small, white flower, 3 petals

NATIVE

White water lily
(*Nymphaea odorata*)

- Rooted to the bottom
- Round leaves with a slit/notch
- Large leaves up to 12” diameter
- Large, white flower, many petals

FLOWERING RUSH

Plant type: Emergent/submergent
Status: Restricted
Native look-alike: Bur-reeds

INVASIVE

Flowering rush
(*Butomus umbellatus*)

- Cluster of pink/red flowers held above the plant
- Can be emergent or submergent
- Tall, dark green leaves are triangular in cross-section and often twisted near the top
- Produces small, onion-like growths on the roots called bulbils
- Usually 3-6 feet tall

NARROW-LEAF CATTAIL

Plant type: Emergent
Status: Restricted

INVASIVE

Narrow-leaf cattail
(*Typha angustifolia*)

- Leaves 4-10mm wide
- Male and female flowerheads separated by 1” or more
- Pollen is shed as single grains

NATIVE

Broad-leaf cattail
(*Typha latifolia*)

- Leaves >12mm (1/2”) wide
- Male and female flowerheads touching, or nearly touching
- Pollen is shed in clusters of four grains

Note: Narrow-leaf and broad-leaf cattails can hybridize. Hybrid cattail (*Typha* x *glauca*) typically has a gap of 1/4” to 1” between the male and female flowerheads, sheds pollen mostly in single grains but also as clusters of two, three, and four, and grows in very dense stands.

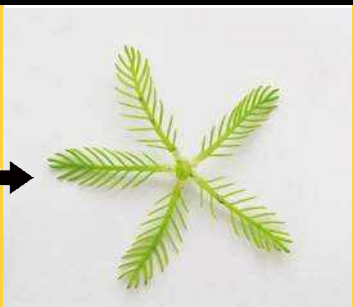
PARROT FEATHER

Plant type: Emergent/submergent
Status: Prohibited

INVASIVE

Parrot feather
(*Myriophyllum aquaticum*)

- 6-30 pairs of short leaflets
- Rings/whorls of 4-6 widely spaced leaves
- Can emerge up to 8” from the water



PHRAGMITES

Plant type: Shoreline or emergent
Status: Prohibited/restricted (split-listed)
Native look-alike: Native Phragmites

INVASIVE

Non-native Phragmites (*Phragmites australis* ssp. *australis*)

- Often more than 10 feet tall
- Large, feathery seedheads
- Dark green leaves
- Dull, ridged stem

NATIVE

Native Phragmites (*Phragmites australis* ssp. *americanus*)

- Usually less than 8 feet tall
- Sparse seedheads
- Bright green leaves
- Smooth, glossy stem, often reddish

PURPLE LOOSESTRIFE

Plant type: Emergent/shoreline
Status: Restricted
Native look-alike: Blue vervain

INVASIVE

Purple loosestrife
(*Lythrum salicaria*)

- Flowers pink-purple, with 6 petals, blooming in a tall spike
- Leaves have smooth edges and are opposite or in rings/whorls of 3,
- Square or 6-sided stem

NATIVE

Blue vervain
(*Verbena hastata*)

- Flowers blue, with 5 petals, blooming one ring/whorl at a time
- Leaves opposite with toothed edges
- Square stem

STARRY STONEWORT

Plant type: Submergent
Status: Prohibited
Native look-alike: Native stoneworts

INVASIVE

Starry stonewort
(*Nitellopsis obtusa*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Uneven forking near end of branchlets
- Produces star-shaped bulbils in sediments
- Stiff; holds shape out of water

NATIVE

Slender stonewort
(*Nitella flexilis*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Symmetrical forking near end of branchlets
- Does not produce bulbils in sediments
- Delicate; collapses out of water

WATER CHESTNUT

Plant type: Floating
Status: Prohibited

INVASIVE

Water chestnut
(*Trapa natans*)

- Triangular, toothed leaves
- Leaf bases are inflated
- Mostly free-floating
- Fruits with sharp spines formed underneath the leaves
- Entire plant may be over 1 foot in diameter

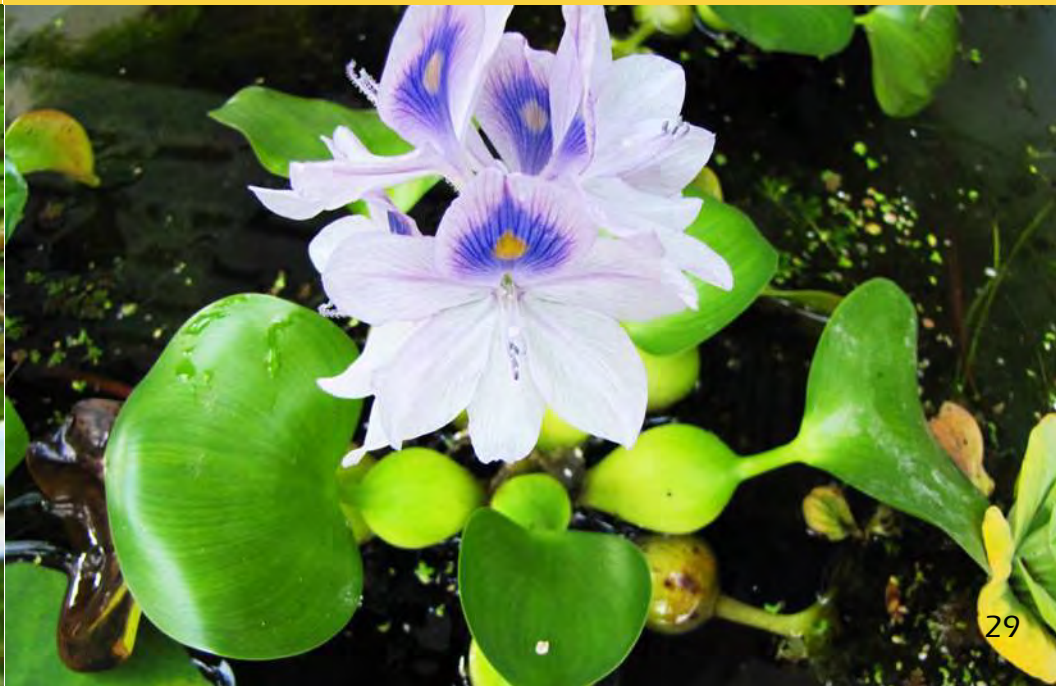
WATER HYACINTH

Plant type: Floating
Status: Prohibited

INVASIVE

Water hyacinth
(*Eichhornia crassipes*)

- Leaves are waxy and very shiny
- Leaf base is inflated
- Lavender flower with a purple/yellow spot
- Roots hang below the plant
- Forms interconnected colonies



WATER LETTUCE

Plant type: Floating
Status: Prohibited

INVASIVE

Water lettuce
(*Pistia stratiotes*)

- Free-floating
- Roots hang below the plant
- Leaves are thick, ridged, fuzzy, and light green
- Forms dense, interconnected colonies
- Resembles a floating head of lettuce

YELLOW FLOATING HEART

Plant type: Floating
Status: Prohibited
Native look-alike: Bullhead pond lily

INVASIVE

Yellow floating heart
(*Nymphoides peltata*)

- Heart-shaped leaves up to 4 inches long
- Leaves have wavy edges
- Yellow flowers have five fringed petals
- Plant is rooted to the bottom

NATIVE

Bullhead pond lily
(*Nuphar variegata*)

- Heart-shaped leaves up to 15 inches long
- Leaves do not have wavy edges
- Yellow flower is cup-shaped
- Plant is rooted to the bottom

YELLOW IRIS

Plant type: Emergent
Status: Restricted
Native look-alike: Blue-flag Iris

INVASIVE

Yellow Iris
(*Iris pseudacorus*)

- 3-5 feet tall
- Leaves are dark green or blue-green
- Flower is yellow
- Center of leaf is sharply thickened

NATIVE

Blue-flag Iris
(*Iris versicolor & Iris virginica*)

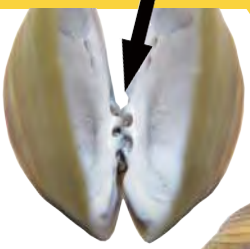
- 2-4 feet tall
- Leaves light green
- Flower is blue
- Center of leaf gradually thickened

ANIMAL ID

ASIAN CLAM

Status: Prohibited
Native look-alike: Fingernail clams

INVASIVE	NATIVE
Asian clam (*Corbicula fluminea*)	Fingernail clams (many species)
• Distinctly raised rings on shell • Up to 2 inches across • Shell yellow-brown, often blue inside, solid and opaque • Three large hinge teeth on each shell	• Rings of shell not distinctly raised • Under 1 inch across • Shell light to dark brown and white inside • Shell translucent and fragile • 1 or 2 teeth at the hinge



BANDED & CHINESE MYSTERY SNAILS

Status: Restricted

INVASIVE

Banded mystery snail
(*Viviparus georgianus*)

- 1-1.5 inches tall
- Horizontal brown bands on shell
- Bands may be hidden by algae or sediment

INVASIVE

Chinese mystery snail
(*Cipangopaludina chinensis*)

- Up to 3 inches tall
- Dark brown shell, often with short ridges near the shell opening

FAUCET SNAIL

Status: Prohibited
Native look-alike: Several other small snails. Consult an expert for verification.

INVASIVE

Faucet snail
(*Bithynia tentaculata*)

- Small, 12-15mm long (1/2 inch)
- Light brown to black
- 5-6 spirals
- Shell opening is on right side and teardrop-shaped

NEW ZEALAND MUDSNAIL

Status: Prohibited
Native look-alike: Several other small snails. Consult an expert for verification.

INVASIVE

New Zealand mudsnail
(*Potamopyrgus antipodarum*)

- Very small, 4-6mm long (1/8-1/4 inch)
- 7-8 spirals separated by deep grooves
- Gray to brown
- Shell opening is on right side
- Typically found in cold streams

ROUND GOBY

Status: Restricted
Native look-alike: Sculpins

INVASIVE

Round goby
(*Neogobius melanostomus*)

- Commonly 3-6 inches long
- Round head with bulging eyes
- Pelvic fins on underside are fused into one circular fin
- Dark spot on back of dorsal fin

RUSTY CRAYFISH

Status: Restricted
Native look-alike: Several native crayfishes

INVASIVE

Rusty crayfish
(*Orconectes rusticus*)

- Rusty brown spot on each side
- Body is mostly light brown
- Up to 5 inches long
- Claws have black and orange bands

SPINY WATER FLEA

Status: Prohibited

INVASIVE

Spiny waterflea
(*Bythotrephes longimanus*)

- About 1cm (3/8”) in length
- Very long tail spine
- Often seen as clumps on fishing line, anchor lines. downriggers

ZEBRA AND QUAGGA MUSSEL

Status: Restricted (Zebra), Prohibited (Quagga)

INVASIVE

Zebra mussel
(*Dreissena polymorpha*)

- D-shaped shell
- Sits flat on its side
- Color varies but is usually light brown to white with brown-black stripes
- Up to 1.25” in length
- Usually attached to hard surfaces

INVASIVE

Quagga mussel
(*Dreissena bugensis*)

- Teardrop-shaped shell
- Does not sit flat on its side
- Color varies but is usually light brown to white with brown stripes
- Can grow up to 1.5” in length
- Usually attached to hard surfaces

Wisconsin's Citizen Lake Monitoring Network supports nearly a thousand volunteers like you as they monitor the health of Wisconsin's lakes. This information is used to assess the health of our lakes, develop lake management plans and invasive species management strategies, identify long-term trends, evaluate effects of land use practices, and more.

Visit our website to learn more!

uwsp.edu/uwexlakes

Appendix 4 – Terrestrial Invasive Species Monitoring Form

Terrestrial Invasive Species Monitoring Form

		Site #	Latitude Coordinates	Longitude Coordinates		Japanese honeysuckle	Multiflora rose	Purple loosestrife	Common buckthorn	Glossy buckthorn	Saw-toothed buckthorn	Dahurian buckthorn	Japanese buckthorn	Chinese buckthorn	Dahrian buckthorn	Kudzu-vine	Exotic bush honeysuckles	Exotic olives	Salt cedars	Poison hemlock	Giant hogweed	Oriental bittersweet	Lesser celandine	Teasel	Japanese knotweed	Giant knotweed	Bohemian knotweed	
Project		1			Relative Abundance																							
County					Length of Shoreline																							
Date		2			Relative Abundance																							
					Length of Shoreline																							
Field Crew		3			Relative Abundance																							
					Length of Shoreline																							
		4			Relative Abundance																							
					Length of Shoreline																							
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					Length of Shoreline																							

Appendix 5 – Documentation of Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Friday, January 14, 2022 8:11 AM
To: Joan Harn
Cc: Shawn Puzen
Subject: FW: Hayward and Trego Invasive Species DRAFT Monitoring Plan
Attachments: Appendix 3 Reduced.pdf; Appendix 2 Invasive Study Point Intercept Protocol.pdf; Appendix 4 Wisconsin Point Intercept Worksheet with addtl substrate info.xls; 20220113 Hayward Trego Draft ATIS Study Plan.pdf

Categories: Filed by Newforma

Hi Joan,

This email was returned to me yesterday.

Sorry for the inconvenience.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Thursday, January 13, 2022 4:52 PM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; jharn@nps.gov; cjpetersen@msn.com
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; brey.j.maurer@xcelenergy.com; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: Hayward and Trego Invasive Species DRAFT Monitoring Plan

Good Afternoon,

Attached is a draft Hayward and Trego Invasive Species Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete an invasive species survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than February 11, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

February 8, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Aquatic and Terrestrial Invasive Species Study Plan, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) appreciates the opportunity to provide comments on the *Hayward and Trego Hydroelectric Projects Draft Aquatic and Terrestrial Invasive Species Study Plan.* This study plan was prepared by Mead & Hunt for Xcel Energy for the Hayward and Trego hydroelectric projects on the Namekagon River, within the St. Croix National Scenic Riverway (Riverway) administered by the NPS. The NPS is interested in the protection of native species and limiting the spread of invasive species throughout the Riverway. The NPS requested to review this study plan in our initial comments because Xcel/NSPW is using this study to fulfill some of the information the NPS recommended for inclusion in other study plans and because of our interest in wild rice, which Xcel/NSPW also proposed to include in this study.

We received this proposed study plan by email dated January 13, 2022. We understand you intend to complete field work by the end of August 2022 and the draft study report will be available by October 31, 2022.

1. Introduction
We concur and are pleased that this study plan responds to the request from the Wisconsin Department of Natural Resources (WDNR), using WDNR protocols. We note that some elements of this study relate to components that NPS recommended for inclusion in other studies. We offer the following comments.

2.1 Study Goals and Objectives
Although the objective of the Aquatic and Terrestrial Invasives Species (ATIS) study is to provide baseline data, the NPS encourages including analysis and description of changes that have occurred under the existing license, when information is available. The NPS 08/31/2021 comment letter highlighted the need to include analysis of change from previous surveys associated with sediment deposition, aquatic plant growth, and recreation access (including flooding) as part of the ATIS and Recreation studies. This will help inform the development of protection, mitigation, and enhancement measures in the subsequent license.

2.2 Background and Existing Information
The NPS requests analysis of change from annual purple loosestrife surveys conducted under the existing license.

2.3 Nexus between Project Operations and Effects on Resources
Please describe conditions, including sediment and substrate conditions, under which invasive species become established after introduction to better understand how inundation and sedimentation capture due to the dam contribute to establishment.

2.4 Study Area
The NPS concurs with the proposed study area.

2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas
The plan notes that water depth information collected for all survey points will be used to develop a bathymetric map for each reservoir. The NPS raised concerns about this method in our comments on 08/31/2021.

The NPS continues to remain concerned about whether the new bathymetric map will be of sufficient detail to detect changes from the previous map as well as evaluate changes over time through the license period. The NPS requests that additional points be included in the survey, particularly in the area recommended for removal from the boundary at the upper end of the Trego reservoir. Please consider adding detailed information as requested in the WDNR sediment study. In addition, the NPS recommends that the study report include a description of changes that have been seen in the bathymetry and aquatic vegetation since the last map cited in the Preliminary Application Document (PAD).

The initial study plan summary indicated that information about aquatic vegetation, including wild rice, would be part of the ATIS study. There is no specific mention of wild rice in this study plan, however. Section 4.10.3.6 of the PAD acknowledges the relationship of Ojibwe Tribes and the wild rice beds of Northern Wisconsin. The same section acknowledges that Ojibwe Tribes retained the right to hunt, fish, and gather in ceded lands in the Treaty of 1837 and that the Hayward and Trego Projects are both located within the 1837 Ceded Territory.

In an 08/11/20 email, WDNR expressed to the Licensee that Trego Lake enjoys ASNRI Outstanding and Exceptional Status due, in part, to the presence of wild rice. In a 04/27/21 letter, our agency requested a study documenting the presence/extent/type of aquatic vegetation, including "highly valued wild rice." The NPS has responsibility to review water resources projects under Section 7 of the Wild and Scenic Rivers Act to ensure the project will not have a direct and adverse effect on the values for which the river was designated. The Hayward and Trego Projects are in segments of the Riverway that possess outstandingly remarkable cultural values based on the presence of resources related to American Indian heritage. Wild rice is a resource of particular importance, given its cultural significance to Ojibwe Tribes.

For these reasons, NPS suggests the special importance of wild rice be reflected in the study plan and that the presence and extent of wild rice be mapped within the Study Area.

Also of note, the scientific name for zebra mussel is misspelled in the second to last paragraph on page 3.

2.5.2 Upland Shorelines Not Owned by the Licensee and 2.5.3 Upland Shorelines Owned by the Licensee and Recreation Sites

The plan notes that observed locations of terrestrial invasive plants listed in NR40 will be recorded via Global Positioning System (GPS), with provisions for future mapping. To ensure that this information is useful for NPS management, please provide shapefiles and metadata.

Please cite the source of the protocol to be used for the meander terrestrial surveys included in section 2.5.3.

What source(s) will be used to identify early detection terrestrial species?

2.5.4 Personnel Qualifications

The NPS appreciates recognition of the need for obtaining all necessary local, state, and federal permits required for completing the work.

The NPS requests that Xcel (or contractors working on Xcel's behalf) apply for and receive a NPS scientific research and collecting permit to conduct the work outlined in this proposal. Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov for next steps regarding this permit requirement.

2.7 Project Schedule and Deliverables

The NPS requests that the Analysis and Discussion report include a description of how ATIS have changed over the life of the current license. Special attention should be given to the years of data collected under existing license articles for surveys of purple loosestrife and any other aquatic vegetation that has been monitored during the license. Special attention should also be given to bathymetric changes.

The NPS requests that the following additional individual maps be developed and presented:

1. For the reasons included in our agency's comments on Section 2.5.1, a map documenting the presence and extent of wild rice should be included as a deliverable of the study.

2. A map series showing how the presence of purple loosestrife has changed over the life of the current license, given that this has been the subject of monitoring under the current Hayward license.

The NPS also requests a copy of the GIS shapefiles with Metadata for all maps.

Conclusion

Thank you for your consideration of these additional comments as you develop your final study plan. The NPS looks forward to the results of this study as well as the opportunity to continue to collaborate with you throughout the licensing process. Please include the following contacts in all future communication and distribution of study plans and reports:

- Lisa Yager, NPS, St. Croix National Scenic Riverway – lisa_yager@nps.gov
- Jonathan Moore, NPS, St. Croix National Scenic Riverway – jonathan_moore@nps.gov
- Susan Rosebrough-Jones, NPS Hydropower Program – susan_rosebrough@nps.gov
- Joan Harn, consultant working with NPS – jharn.nps@gmail.com
- Angie Tornes, consultant working with NPS – angietornes@gmail.com

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

THERESA HOGAN Digitally signed by THERESA HOGAN
Date: 2022.02.08 08:22:49 -06'00'

Theresa Hogan
Acting Superintendent

WDNR and TLD Did Not Provide Comments on ATIS Study Plan

Mussel Study Plan Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Wednesday, February 2, 2022 2:55 PM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject: Hayward and Trego Mussel DRAFT Monitoring Plan
Attachments: 20220202 Hayward-Trego Mussel Study Plan sent to Agencies.pdf

Good Afternoon,

Attached is a draft Hayward and Trego Mussel Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete a mussel survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 4, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Draft Mussel Study Plan

Prepared for

Xcel Energy®

Prepared by

Mead & Hunt

meadhunt.com

February 2022

1. Introduction

Northern States Power Company – Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 and 2711 respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a final license application to FERC no later than November 30, 2023. The final license application, in part, must include a review of freshwater mussel data in the vicinity of the Projects.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. Wisconsin Department of Natural Resources (WDNR) requested that mussel surveys be completed.

The WDNR recommended that the Licensee conduct a mussel study using the WDNR Guidelines for Sampling Freshwater Mussels in Wadable Streams and the WDNR Quantitative Habitat Assessment Methodology. This study plan is consistent with the WDNR request.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this mussel study is to provide baseline data determine freshwater mussel regarding the general density and diversity of freshwater mussels, including characterizing mussel habitat within the Project area. The study will provide a better understanding of baseline conditions for the Project area.

2.2 Background and Existing Information

No federally or state threatened/endangered or special concern mussel species are known to occur in the impounded sections of the reservoirs; however, listed species may occur downstream from the dams or further upstream from the impounded reaches of the reservoirs (WDNR, 2021).

2.3 Nexus between project operations and effects on resources

The operations of the Projects could influence the freshwater mussel populations located within the Project boundary.

2.4 Study Area

The mussel study will include the sampling of two riverine reaches in each Project vicinity, one upstream of the dam in a riverine area of the impoundment and one downstream of the Project powerhouse outside of the mixing zone. The study areas are depicted in Appendix 1.

2.5 Methodology

2.5.1 Mussel Survey

The 2015 Wisconsin Department of Natural Resources Guidelines for Sampling Freshwater Mussels in Wadable Streams (Guidelines) and other standard survey methodologies were used to develop the mussel survey parameters (Piette, 2015). The Guidelines provide information on minimum survey efforts for wadable conditions and have been modified for non-wadable conditions. The objective of this mussel study is to provide baseline data regarding mussel diversity within the vicinity of the Projects including a general characterization of mussel habitat within the Project boundary.

Two river reaches will be surveyed at each Project. At the Hayward Project, Reach 1 will begin approximately 430 meters above the Highway 77 Bridge and extend 1,000 meters upstream. Reach 2 will begin at the canoe portage put-in and extend 1,000 meters downstream. At the Trego Project, Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 meters downstream. Reach 2 will begin 45 meters below the Trego Dam and extend 1,000 meters downstream.

Surveys will consist of sampling transects extending bank to bank that will be spaced every 100 meters in each reach creating a series of 10 transects per reach. Transects will be numbered 1-10 from downstream to upstream, and a random number selector will be utilized to select five transects for survey in each reach.

Searches along each transect will be conducted in 10-meter-long segments and will extend 0.5 meters on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within the segment. The rapid visual search entails an initial search of 0.2 minutes per square meter along each 10-meter segment to determine if mussels are present. If mussels are present within a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 minute per square meter. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.

General stream conditions and morphology within the study area will be recorded, including bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only when visibility at depth is at least 20 inches.

In addition to the mussel sampling within the transects, a general description of mussel habitat within the Project boundary will be provided.

2.5.2 Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead

(dead < 1 year; lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded. A station location data sheet will also be populated per the Guidelines. Data will be recorded using the forms in Appendix 2 to allow distinction between searches. Mussel taxonomy will follow the names presented by Williams et al., 2017.

If any federally or state-listed species is observed, dead or alive, the Licensee will be notified immediately. WDNR and U.S. Fish and Wildlife Service (USFWS) will be notified per surveyor collection permit requirements. No live mussels will be harmed or taken during the study. Any federally or state-listed species that are encountered will be individually hand placed into their places of origin.

2.5.3 Personnel Qualifications

All surveys will be conducted by individuals with prior mussel identification training and experience with aquatic and mussel surveys.[1]

2.5.4 Survey Report

A draft report will be developed within 30 days of completion of field work for agency review and comment. A final report will be completed within two weeks of receiving agency comments. The report shall include a description of mussel survey activities and provide summary tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. The report shall also describe general mussel density and diversity within the vicinity of the two Projects.

A general description of mussel habitat within the Project boundaries, including the reservoirs, bypass reaches and tailwater areas, will also be provided. GIS-based mapping will provide a visual representation of the findings. The report, including completed survey sheets, will be summarized and appended to the DLA.

2.6 Consistency with generally accepted scientific practice

The Mussel Study follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been used in other FERC relicensing studies.

2.7 Project Schedule and Deliverables

The study will be completed in 2022. Scientific collector's permits will be obtained, as appropriate, from the WDNR and National Park Service (NPS) prior to the field work commencing. To minimize thermal stress to the mussel specimens, field work will generally be completed between June and mid-September when water temperatures exceed 50 degrees Fahrenheit. Normal to low water conditions

[1] Consultant(s) selected to complete the work will be responsible for obtaining any NPS or WDNR scientific collectors permits required.

and good underwater visibility must be present to effectively conduct field work; therefore, project activities will be planned accordingly.

NSPW anticipates that all field work will be completed by mid-September with a draft report available by October 1, 2022.

3. Consultation

The mussel study was requested by WDNR. The Licensee consulted with WDNR and NPS as follows.

3.1 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Mussel Study plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 3.

3.2 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Mussel Study plan to the NPS for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 3.

4. References

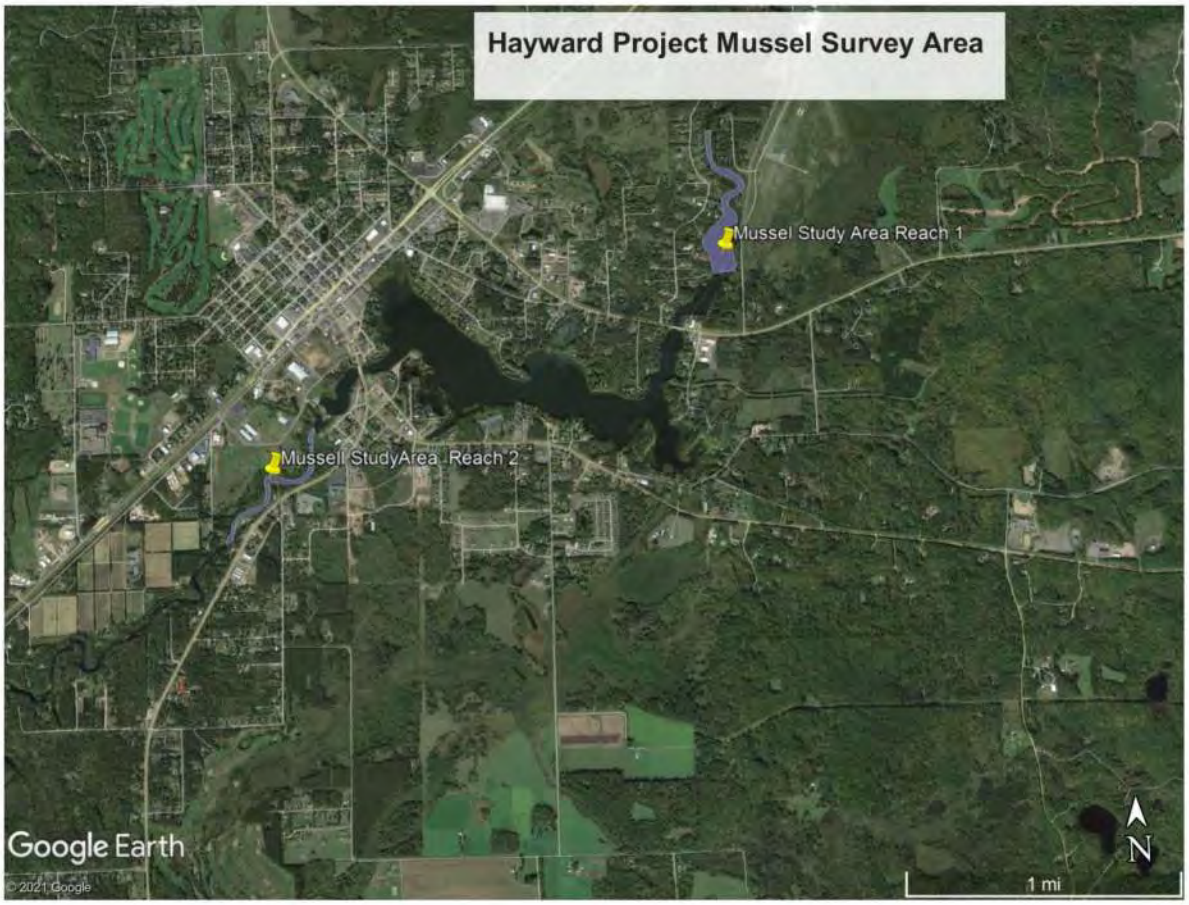
Piette, R.R. 2015. Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50 pp.

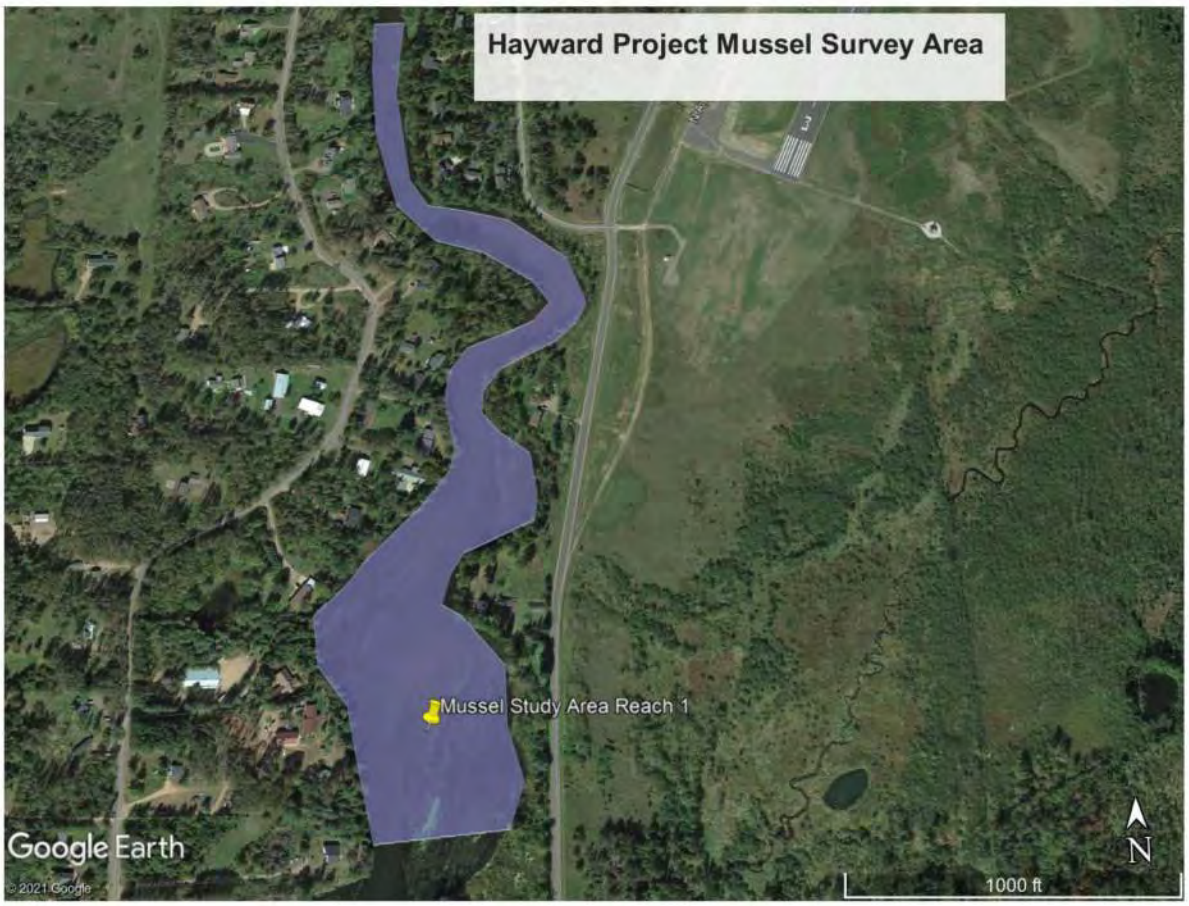
Smith, D.R. 2006. Survey design for detecting rare freshwater mussel species. Journal of the North American Benthological Society 25:701-711.

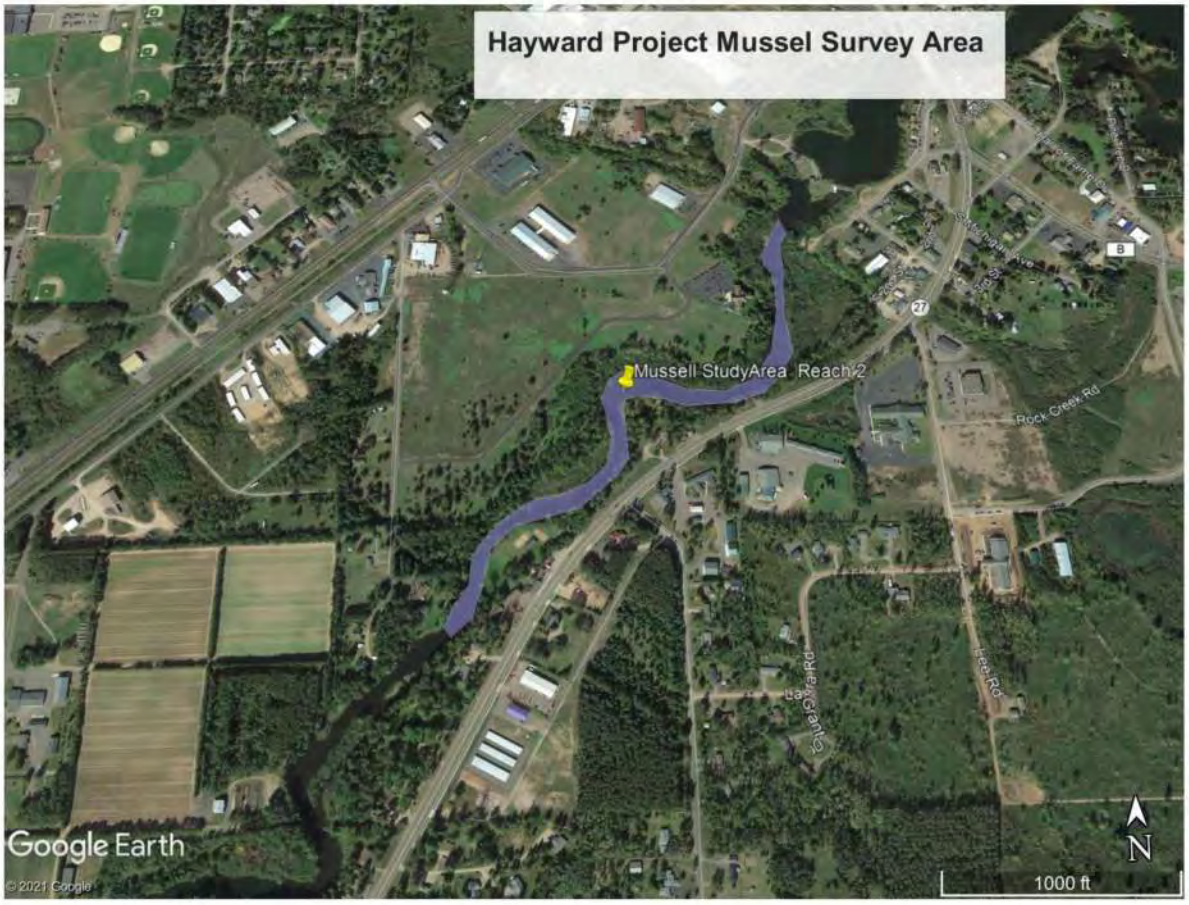
Williams, J.D et. al. 2017. A revised list of the freshwater mussels (Mullusca: Bibalvia Unionida) of the United States and Canada. Freshwater Mollusk Biology and Conservation, 20(2), 33-58.

Wisconsin Department of Natural Resources. 2020. Study Requests Relicensing of Hayward (P-2417) and Trego (P-2711) Projects. May 7, 2021.

Appendix 1 – Mussel Survey Locations


Hayward Project Mussel Survey Area
Mussel Study Area Reach 1
Mussel StudyArea Reach 2
Google Earth
© 2021 Google
N
1 mi


Hayward Project Mussel Survey Area
Mussel Study Area Reach 1
Google Earth
© 2021 Google
N
1000 ft


Hayward Project Mussel Survey Area
Mussell StudyArea Reach 2
Rock Creek Rd
Google Earth
© 2021 Google
N
1000 ft


Trego Project Mussel Survey Area
Mussel Survey Area Reach 2
Mussel Survey Area Reach 1
63
Google Earth
© 2021 Google
N
1 mi


Trego Project Mussel Survey Area
Mussel Survey Area Reach 1
Trego Park Rd
Lesch Rd
53
Hwy 63
N
1000 ft
Google Earth
© 2021 Google


Trego Project Mussel Survey Area
Bull Creek Rd
Mussel Survey Area Reach 2
River Rd
Google Earth
© 2021 Google
N
1000 ft

Appendix 2 – Mussel Survey Data Forms

Substrate and Water Depth Per Segment											
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)							
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 1	T1	10								
	T1	20								
	T1	30								
	T1	40								
	T1	50								
	T1	60								
	T1	70								
	T1	80								
	T1	90								
	T1	100								
	T1	110								
	T1	120								
	T1	130								
	T1	140								
	T1	150								
	T1	160								
	T1	170								
	T1	180								
Reach 1	T2	10								
	T2	20								
	T2	30								
	T2	40								
	T2	50								
	T2	60								
	T2	70								
	T2	80								
	T2	90								
	T2	100								
	T2	110								
	T2	120								
	T2	130								
	T2	140								
	T2	150								
	T2	160								
	T2	170								
	T2	180								
Reach 1	T3	10								
	T3	20								
	T3	30								
	T3	40								
	T3	50								
	T3	60								
	T3	70								
	T3	80								
	T3	90								
	T3	100								
	T3	110								
	T3	120								
	T3	130								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
	T3	140								
	T3	150								
	T3	160								
	T3	170								
	T3	180								
Reach 1	T4	10								
	T4	20								
	T4	30								
	T4	40								
	T4	50								
	T4	60								
	T4	70								
	T4	80								
	T4	90								
	T4	100								
	T4	110								
	T4	120								
	T4	130								
	T4	140								
	T4	150								
	T4	160								
	T4	170								
	T4	180								
Reach 1	T5	10								
	T5	20								
	T5	30								
	T5	40								
	T5	50								
	T5	60								
	T5	70								
	T5	80								
	T5	90								
	T5	100								
	T5	110								
	T5	120								
	T5	130								
	T5	140								
	T5	150								
	T5	160								
	T5	170								
	T5	180								
	T1	10								
	T1	20								
	T1	30								
	T1	40								
	T1	50								
	T1	60								
	T1	70								
	T1	80								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 2	T1	90								
	T1	100								
	T1	110								
	T1	120								
	T1	130								
	T1	140								
	T1	150								
	T1	160								
	T1	170								
	T1	180								
Reach 2	T2	10								
	T2	20								
	T2	30								
	T2	40								
	T2	50								
	T2	60								
	T2	70								
	T2	80								
	T2	90								
	T2	100								
	T2	110								
	T2	120								
	T2	130								
	T2	140								
	T2	150								
	T2	160								
	T2	170								
	T2	180								
Reach 2	T3	10								
	T3	20								
	T3	30								
	T3	40								
	T3	50								
	T3	60								
	T3	70								
	T3	80								
	T3	90								
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	T3	110								
	T3	120								
	T3	130								
	T3	140								
	T3	150								
	T3	160								
	T3	170								
	T3	180								
	T4	10								
	T4	20								
	T4	30								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 2	T4	40								
	T4	50								
	T4	60								
	T4	70								
	T4	80								
	T4	90								
	T4	100								
	T4	110								
	T4	120								
	T4	130								
	T4	140								
	T4	150								
	T4	160								
	T4	170								
	T4	180								
Reach 2	T5	10								
	T5	20								
	T5	30								
	T5	40								
	T5	50								
	T5	60								
	T5	70								
	T5	80								
	T5	90								
	T5	100								
	T5	110								
	T5	120								
	T5	130								
	T5	140								
	T5	150								
	T5	160								
	T5	170								
	T5	180								

PROJECT:																								
Mussels Observed within [illegible] River, 2022																								
Species		Reach 1							Reach 2							Reach 3 (if applicable)							Overall (All Reaches Together)	
Common Name	Scientific Name	T1	T2	T3	T4	T5	Total Number Reach 1	Relative Abundance (% of total Reach 1)	T1	T2	T3	T4	T5	Total Number Reach 2	Relative Abundance (% of total Reach 2)	T1	T2	T3	T4	T5	Total Number Reach 3	Relative Abundance (% of total Reach 3)	Total Number	Relative Abundance (% of total)
Abundance (total number of mussels)																								
Number of Species (live)																								
Effort (size of transect, m^2)																								
Surface Density (# per m^2)																								

Appendix 3 – Documentation of Consultation

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

March 4, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Study Plans for Mussels, Water Quality, and Wood and Blanding's Turtle Nesting Habitat, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) is consolidating our comments for the three aforementioned studies received by email dated February 2 and 3, 2022.

The NPS reiterates our request for information reflected in our original study requests on April 27, 2021 for shoreline surveys and hydraulics, sedimentation, and channel change, and our August 31, 2021 comments on your draft Study Summary and Responses. The study plans reviewed here have components that would contribute important information relating to our original study requests.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System, as established by Congress in 1968 (Public Law 90-542). Under this law, the NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and its tributary, the Namekagon River, in a natural condition; to protect and enhance the exceptional natural, scenic, and cultural resources of the Riverway; and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic, cultural, recreation, and scenic/aesthetic resources. The Namekagon River is managed as part of the St. Croix National Scenic Riverway and is protected under the Organic Act.

Prior to the FERC issuing a new license, the NPS will need to evaluate the proposed license under Section 7(a) of the Wild and Scenic Rivers Act and to determine whether it will have direct and adverse effects on the values for which the river was designated. If the NPS identifies direct and adverse effects, the license/project will need to be modified to ensure that park resources are protected. The NPS study requests are needed to provide information to enable timely completion of this NPS review as well as the FERC NEPA analysis. Continuing impacts on resource values must be identified so that protection and enhancement measures can be incorporated into a new license.

Comments on Draft Study Plans

Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov to obtain all required NPS scientific research and collecting permits prior to implementing the study plans.

1. **Mussels**
   - Mussels are a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. It is our agency's understanding that drawdowns may be necessary during the proposed forty-year license period for maintenance and other purposes. Drawdowns have the potential to affect mussels that are present in the portion of riverbed that emerges during the drawdown. To better understand potential effects to mussels, additional reaches will need to be included within the impoundments, especially in the areas near the shoreline that would become exposed during a drawdown event. The study area as currently proposed includes only two riverine reaches at either end of the Project boundaries, which is inadequate to understand the presence, species, and density of mussels in the areas of the impoundments that would be most affected by a drawdown. Please add additional reaches within each impoundment to the study area. The NPS is available to consult further on identifying and prioritizing additional reaches for the purposes of this study.
   - The NPS concurs with the use of WDNR guidelines.
   - On page 3, include the NPS in the notification list, along with WDNR and USFWS, if any federally or state-listed species is observed, dead or alive. This will also be specified within the required NPS research and collecting permits.
   - When assessing and characterizing mussel habitat, researchers should reference *Aquatic Habitat Classification on the St. Croix National Scenic Riverway* by Haibo Wan et al.

2. **Water Quality Study**
   - Water quality is a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. The Wild and Scenic Rivers Act directs the NPS to protect water quality of the Namekagon (Sec. 1(b)) and work with the Environmental Protection Agency and the WDNR to eliminate or diminish water pollution of the river (Sec. 12(c)).
   - The NPS concurs with the use of WDNR protocols and the rationale for not monitoring cyanobacteria.
   - The NPS requests that sediment accumulation also be monitored. Results would provide needful baseline information and facilitate better understanding of sedimentation within the project boundaries.

3. **Wood and Blanding's Turtle Nesting Habitat Study**
   - This is another example, like the Aquatic and Terrestrial Invasive Plant study, where the effort that goes into the study could provide shoreline survey information outlined in the NPS study request; however, the draft plan does not provide enough detail on shoreline survey methods to determine if NPS needs would be met through this work.
   - The NPS-requested shoreline study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license. The NPS has responsibility to review shoreline alteration activities such as bank stabilization and small boat docks as water resources projects under Section 7 of the Wild and Scenic Rivers Act.
   - The NPS Shoreline Survey request Method 1[1] recommended a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still) and cited the High-

[1] NPS comments on the Pre-Application Document and Study Requests, dated 4/28/21, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CF9CB-66E2-5005-8110-C31FAFC91712

Definition Stream Survey (HDSS) method (Trutta, 2019)[2] used in recent FERC hydropower licensing proceedings, which enables mapping, a visual record of stream and shoreline characteristics, and data collection from multiple sensors. For any planned boat surveys of the shoreline (e.g., turtle, cultural resources, vegetation), please reconsider adopting study Method 1 proposed in the NPS shoreline survey study request to systematically evaluate, quantify, and photograph shoreline conditions including streambank conditions, bank stabilization types and conditions, docks/piers, and public access locations.

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27,2021 letter, including the shoreline survey and hydraulics, sedimentation, and channel change. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Conclusion

Thank you for your consideration of our agency's comments as you develop your final study plan. The NPS looks forward to the results of the three studies reviewed in this letter, as well as the opportunity to continue to collaborate with you throughout the licensing process. Please distribute future communications through Lisa Yager, chief of resource stewardship and education at the St. Croix National Scenic Riverway. Information will be distributed to the NPS team as appropriate through Lisa.

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

CRAIG HANSEN Digitally signed by CRAIG HANSEN Date: 2022.03.04 13:13:56 -06'00'

Craig Hansen
Superintendent

[2] Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021:
https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850582&accessionnumber=20200410-5091

Document Accession #: 20220304-5265 Filed Date: 03/04/2022

Document Content(s)

NPSCommentsProposedMusselsWQTurtles03042022.pdf.....1

Darrin Johnson

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, February 16, 2022 12:16 PM
To: Darrin Johnson; Shawn Puzen
Cc: Miller, Matthew J
Subject: FW: Hayward and Trego Mussel DRAFT Monitoring Plan

See comments below. I confirmed to Jesse that all study reports will be provided to the DNR.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Sent: Wednesday, February 16, 2022 12:10 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>
Subject: RE: Hayward and Trego Mussel DRAFT Monitoring Plan

Overall, I fully support the study plan and have two comments:

1. Can the author briefly describe what happens at individual 10-meter segments where no evidence of mussels occur. Are segments omitted from semi-quantitative searches?
2. We'd like to obtain a copy of the completed datasheets for use in comparing the current mussel bed to an historical dataset (Heath & Rasmussen 1990). Author mentions, *"The report, including completed survey sheets, will be summarized and appended to the DLA."* So I just want to clarify these datasheets will be available.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Jesse Weinzinger
Conservation Biologist - NHC
Wisconsin Mussel Monitoring Program
Wisconsin Department of Natural Resources
Phone: (608) 576-8631 **(New)**
Jesse.Weinzinger@Wisconsin.gov

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, February 02, 2022 2:58 PM
To: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>

Subject: FW: Hayward and Trego Mussel DRAFT Monitoring Plan
Importance: High

Please review and let me know if you have comments or we need to set up a conf call.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov


dnr.wi.gov

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Wednesday, February 2, 2022 2:55 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn <jharn.nps@gmail.com>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; brey.j.maurer@xcelenergy.com; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: Hayward and Trego Mussel DRAFT Monitoring Plan

Good Afternoon,

Attached is a draft Hayward and Trego Mussel Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete a mussel survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 4, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN

FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Turtle Study Plan Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Thursday, February 3, 2022 10:45 AM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject: Hayward and Trego DRAFT Wood and Blanding's Turtle Nesting Habitat Study Plan
Attachments: 20220203 Hayward-Trego Wood-Blandings Nesting Habitat DRAFT sent to Agencies.pdf

Good Morning,

Attached is a draft Hayward and Trego Wood and Blanding's Turtle Nesting Habitat Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete Wood and Blanding's Turtle Nesting Habitat monitoring.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 7, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Study Plan

Wood and Blanding's Turtle Nesting Habitat Study

Prepared for

Northern States Power Company, a Wisconsin corporation

Prepared by

Mead & Hunt

meadhunt.com

February 2022

1. Introduction

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the existing Hayward and Trego Hydroelectric Projects (Project or Projects). The current licenses, which designate the Projects as FERC Nos. P-2417 and P-2711, respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a final license application to FERC no later than November 30, 2025. The final license application, in part, must include an evaluation of rare species within the Project vicinity.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that the Licensee conduct wood turtle and Blanding's turtle studies as part of the relicensing process.

The WDNR requested that a wood turtle study be conducted to "determine whether any wood turtle nest sites occur within the Project boundary at either Hayward or Trego (WDNR, 2021)". The WDNR requested that a Blanding's turtle study be conducted to "…determine whether any Blanding's turtle nest sites occur within the Project boundaries (WNDR, 2021)".

Licensee is proposing to conduct a Wood and Blanding's Turtle Nesting Habitat Study to identify areas with suitable wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries for both Projects.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to identify areas with suitable wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries.

2.2 Resource Management Goals

The resource management goal is to ensure compliance with Wisconsin Endangered Species Act of 1972 and the federal Endangered Species Act of 1973.

2.3 Public Interest

WDNR expressed interest in this study.

2.4 Background and Existing Information

WDNR indicated in their wood turtle study request that wood turtles are "known to be present within this Project boundary, however survey data is limited". WDNR indicated in their Blanding's turtle study request that Blanding's turtles were "known to be present near these Project boundaries but that survey data is limited (WDNR, 2021)".

The WDNR issued ER Review Log # 20-683 (ER Review) for the Hayward Project vicinity on September 10, 2020. The ER Review indicated that there was suitable habitat for state-threatened wood turtle and state special concerned Blanding's turtle in the Project vicinity (WDNR, 2020a).

The WDNR issued ER Review Log # 20-684 for the Trego Project vicinity on September 10, 2020. The ER Review indicated that there was suitable habitat for the wood turtle and Blanding's turtle in the Project vicinity (WDNR 2020b).

2.5 Project Nexus

The operations of the Hayward and Trego Dams may affect nesting wood and Blanding's turtles in areas with suitable habitat. Identifying areas with suitable wood and Blanding's turtle nesting habitat will help determine whether mitigation measures are necessary as part of relicensing.

2.6 Study Area

The study area will include all shorelines upstream and downstream of the Hayward and Trego Dams within both the existing and proposed Project boundaries as shown in Appendix 1.

Study results will be filed as privileged information as requested by WDNR to avoid disclosing specific threatened or endangered species location information.

2.7 Methodology

2.7.1 Nesting Habitat Survey, Nesting Survey & Presence/Absence Surveys

NSPW will survey all shorelines for the presence of wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries as shown in Appendix 1. The reservoir shoreline will be surveyed by boat. The bypassed reach (at Hayward) and Namekagon River downstream of both dams will be surveyed by boat, or on foot for those areas not accessible by boat. The surveys will take place during the month of June (preferably on a sunny day) when the air temperature is between 50-80 degrees Fahrenheit.

The surveyors will identify all areas with suitable nesting habitat. Suitable nesting habitat for both turtle species includes areas with a sand or gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring or summer, and is within 200 feet of the river's edge. Note that this can include gravel parking areas, roads, or shoulders of paved roads. GIS locations of all suitable nesting habitat identified will be collected to develop a map of suitable nesting sites within the study area.

In addition to identifying areas with suitable nesting habitat, the surveyors will conduct visual searches for the presence of any basking wood or Blanding's turtles or evidence of wood or Blanding's turtle nesting activity within the survey area. GIS locations of any basking or nesting wood or Blanding's turtles or evidence of wood or Blanding's turtle nesting sites identified will also be recorded.

Since the wood and Blanding's turtles are known to be present within the vicinity of both Projects, it is assumed that the species are also present within the Project boundaries. Therefore, the presence/absence surveys (identifying individual turtles) and nesting surveys (identifying evidence of turtle nesting) will only be conducted once, concurrent with the nesting habitat surveys

The information provided by the study will help inform FERC in identifying any enhancement and mitigation measures necessary to minimize or avoid impacts to the species. The study also meets the WDNR's goals of determining whether there are suitable wood and Blanding's turtle nesting sites within the Project boundaries.

2.7.2 Personnel Qualifications

All surveys will be conducted by individuals qualified and approved by WDNR to identify wood and Blanding's turtles and their nesting habitat. The survey may require special permits from the WDNR and the National Park Service (NPS).

2.8 Consistency with Generally Accepted Scientific Practice

This Wood and Blanding's Turtle Nesting Habitat Study follows generally accepted scientific practice regarding field data collection and reporting.

2.9 Project Schedule and Deliverables

Results of this study will be summarized in a study report. The report will include the following elements:

- Project Information and Background
- Study Area
- Methodology
- Study Results
- Mapping
- Analysis and Discussion
- Agency Correspondence and/or Consultation
- Literature Cited

NSPW anticipates that field work will be completed in June 2022. The draft study report will be completed by August 30, 2022. Any information identifying the specific locations of wood and Blanding's turtles will be filed as privileged, non-public information per WDNR guidelines.

3. Consultation

Wood and Blanding's turtle studies were requested by the WDNR. As a result, the Licensee consulted with the WDNR and the NPS as discussed below.

3.1 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Wood and Blanding's Turtle Study plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 2.

3.1 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Wood and Blanding's Turtle Study plan to the NPS for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 2.

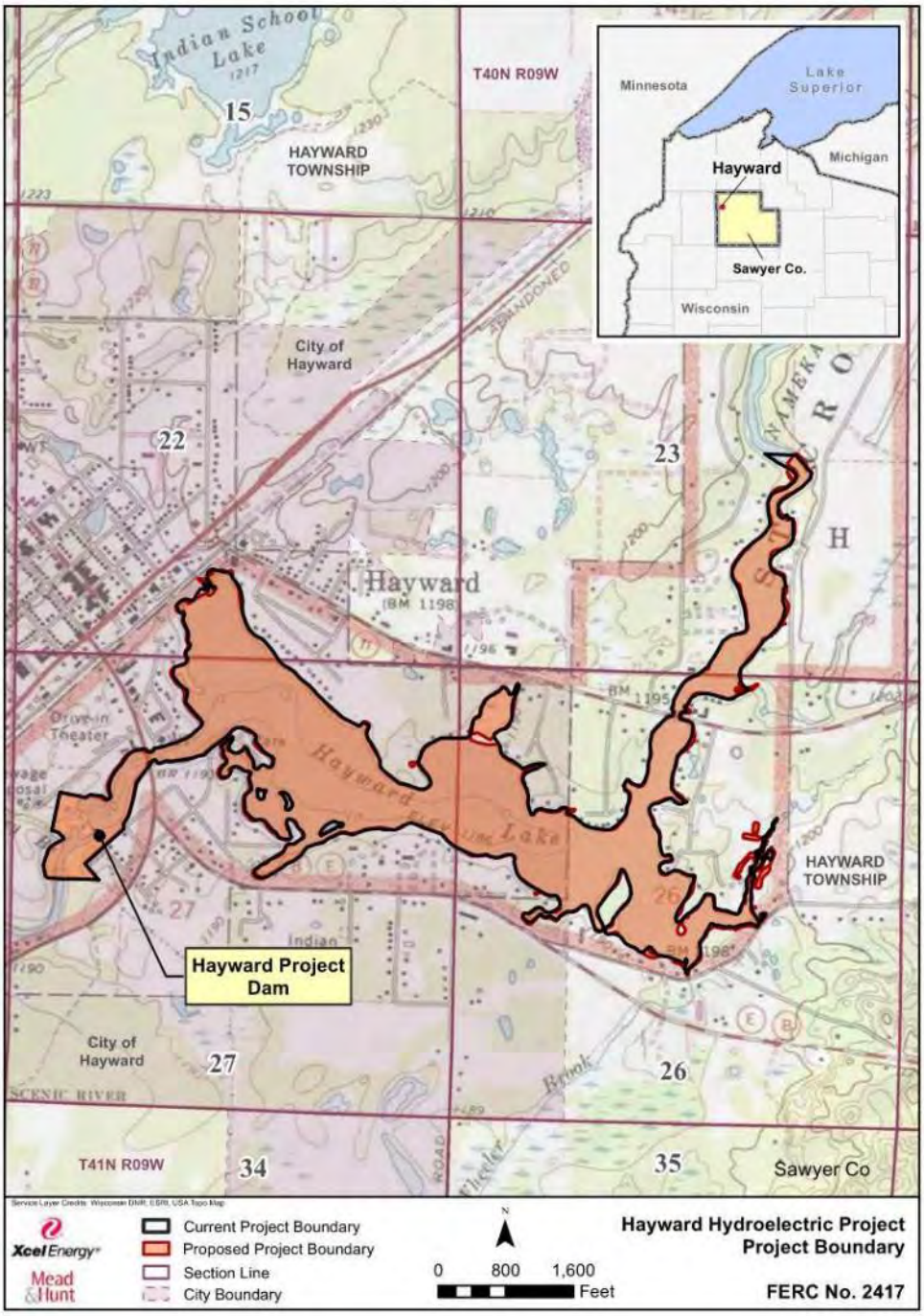
4. References

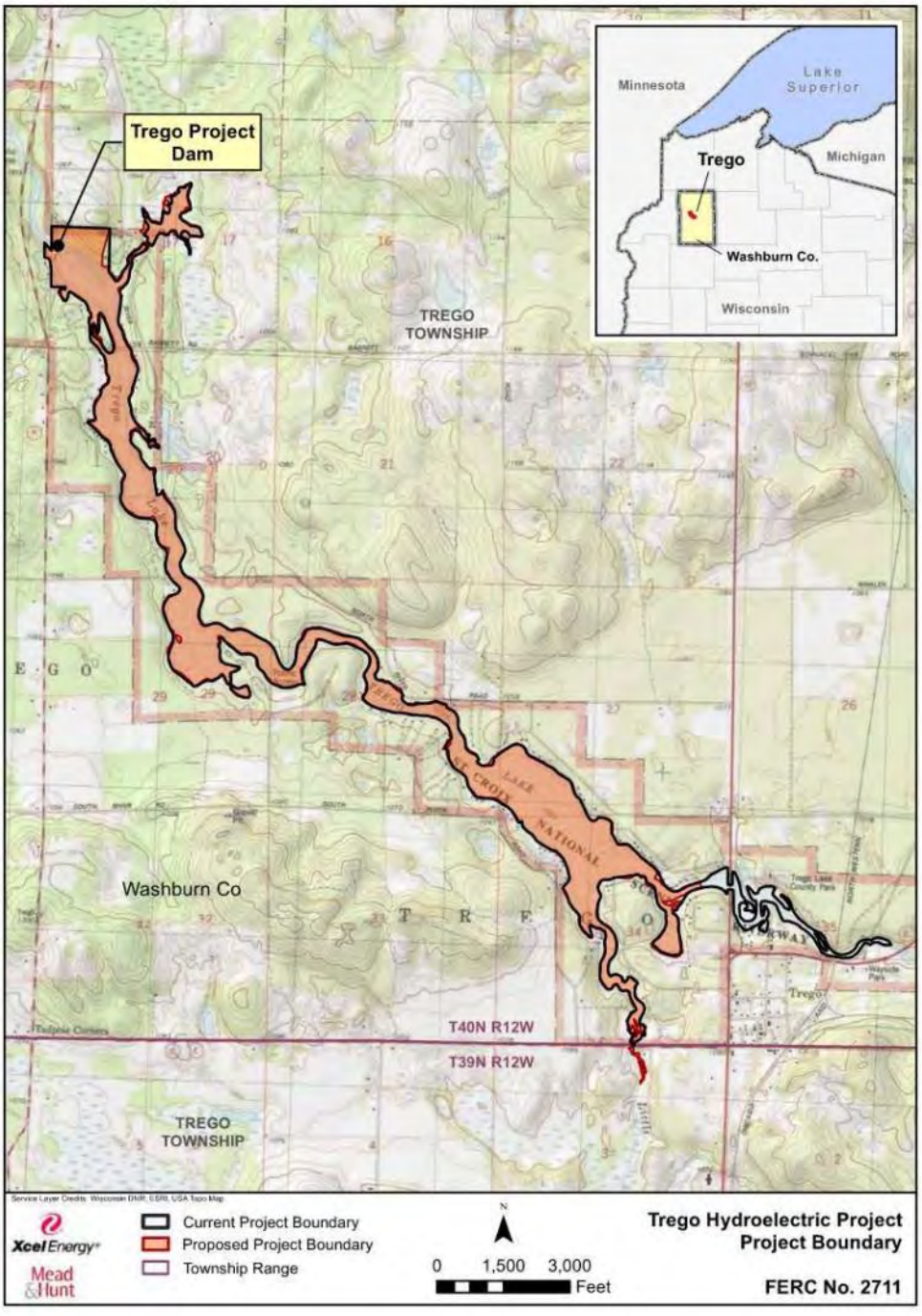
Endangered Resources Review (ERR Log # 20-683). 2020a. Proposed Hayward Hydroelectric Project Relicensing, Sawyer County, WI (ER Log # 20-683). September 10, 2020.

Endangered Resources Review (ERR Log # 20-684). 2020b. Proposed Trego Hydroelectric Project Relicensing, Washburn County, WI (ER Log # 20-683). September 10, 2020.

Wisconsin Department of Natural Resources. 2021. Study Requests- Relicensing of Hayward (P-2417) and Trego (P-2711) Projects. May 7, 2021

Appendix 1 – Wood Turtle Survey Area


Indian School Lake
T40N R09W
15
HAYWARD TOWNSHIP
Minnesota
Lake Superior
Michigan
Hayward
Sawyer Co.
Wisconsin
City of Hayward
22
23
Hayward
BM 1198
BM 1195
Drive-In Theater
Hayward Project Dam
HAYWARD TOWNSHIP
City of Hayward
27
26
SCENIC RIVER
T41N R09W
34
35
Sawyer Co
Current Project Boundary
Proposed Project Boundary
Section Line
City Boundary
N
0 800 1,600
Feet
Hayward Hydroelectric Project
Project Boundary
FERC No. 2417


Trego Project Dam
Minnesota
Lake Superior
Michigan
Trego
Washburn Co.
Wisconsin
TREGO TOWNSHIP
Washburn Co
T40N R12W
T39N R12W
TREGO TOWNSHIP
Current Project Boundary
Proposed Project Boundary
Township Range
N
0 1,500 3,000
Feet
Xcel Energy
Mead & Hunt
Trego Hydroelectric Project
Project Boundary
FERC No. 2711

Appendix 2 – Documentation of Consultation

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

March 4, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Study Plans for Mussels, Water Quality, and Wood and Blanding's Turtle Nesting Habitat, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) is consolidating our comments for the three aforementioned studies received by email dated February 2 and 3, 2022.

The NPS reiterates our request for information reflected in our original study requests on April 27, 2021 for shoreline surveys and hydraulics, sedimentation, and channel change, and our August 31, 2021 comments on your draft Study Summary and Responses. The study plans reviewed here have components that would contribute important information relating to our original study requests.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System, as established by Congress in 1968 (Public Law 90-542). Under this law, the NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and its tributary, the Namekagon River, in a natural condition; to protect and enhance the exceptional natural, scenic, and cultural resources of the Riverway; and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic, cultural, recreation, and scenic/aesthetic resources. The Namekagon River is managed as part of the St. Croix National Scenic Riverway and is protected under the Organic Act.

Prior to the FERC issuing a new license, the NPS will need to evaluate the proposed license under Section 7(a) of the Wild and Scenic Rivers Act and to determine whether it will have direct and adverse effects on the values for which the river was designated. If the NPS identifies direct and adverse effects, the license/project will need to be modified to ensure that park resources are protected. The NPS study requests are needed to provide information to enable timely completion of this NPS review as well as the FERC NEPA analysis. Continuing impacts on resource values must be identified so that protection and enhancement measures can be incorporated into a new license.

Comments on Draft Study Plans

Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov to obtain all required NPS scientific research and collecting permits prior to implementing the study plans.

1. **Mussels**
   - Mussels are a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. It is our agency's understanding that drawdowns may be necessary during the proposed forty-year license period for maintenance and other purposes. Drawdowns have the potential to affect mussels that are present in the portion of riverbed that emerges during the drawdown. To better understand potential effects to mussels, additional reaches will need to be included within the impoundments, especially in the areas near the shoreline that would become exposed during a drawdown event. The study area as currently proposed includes only two riverine reaches at either end of the Project boundaries, which is inadequate to understand the presence, species, and density of mussels in the areas of the impoundments that would be most affected by a drawdown. Please add additional reaches within each impoundment to the study area. The NPS is available to consult further on identifying and prioritizing additional reaches for the purposes of this study.
   - The NPS concurs with the use of WDNR guidelines.
   - On page 3, include the NPS in the notification list, along with WDNR and USFWS, if any federally or state-listed species is observed, dead or alive. This will also be specified within the required NPS research and collecting permits.
   - When assessing and characterizing mussel habitat, researchers should reference *Aquatic Habitat Classification on the St. Croix National Scenic Riverway* by Haibo Wan et al.

2. **Water Quality Study**
   - Water quality is a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. The Wild and Scenic Rivers Act directs the NPS to protect water quality of the Namekagon (Sec. 1(b)) and work with the Environmental Protection Agency and the WDNR to eliminate or diminish water pollution of the river (Sec. 12(c)).
   - The NPS concurs with the use of WDNR protocols and the rationale for not monitoring cyanobacteria.
   - The NPS requests that sediment accumulation also be monitored. Results would provide needful baseline information and facilitate better understanding of sedimentation within the project boundaries.

3. **Wood and Blanding's Turtle Nesting Habitat Study**
   - This is another example, like the Aquatic and Terrestrial Invasive Plant study, where the effort that goes into the study could provide shoreline survey information outlined in the NPS study request; however, the draft plan does not provide enough detail on shoreline survey methods to determine if NPS needs would be met through this work.
   - The NPS-requested shoreline study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license. The NPS has responsibility to review shoreline alteration activities such as bank stabilization and small boat docks as water resources projects under Section 7 of the Wild and Scenic Rivers Act.
   - The NPS Shoreline Survey request Method 1[1] recommended a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still) and cited the High-

[1] NPS comments on the Pre-Application Document and Study Requests, dated 4/28/21, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CF9CB-66E2-5005-8110-C31FAFC91712

Definition Stream Survey (HDSS) method (Trutta, 2019)[2] used in recent FERC hydropower licensing proceedings, which enables mapping, a visual record of stream and shoreline characteristics, and data collection from multiple sensors. For any planned boat surveys of the shoreline (e.g., turtle, cultural resources, vegetation), please reconsider adopting study Method 1 proposed in the NPS shoreline survey study request to systematically evaluate, quantify, and photograph shoreline conditions including streambank conditions, bank stabilization types and conditions, docks/piers, and public access locations.

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27,2021 letter, including the shoreline survey and hydraulics, sedimentation, and channel change. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Conclusion

Thank you for your consideration of our agency's comments as you develop your final study plan. The NPS looks forward to the results of the three studies reviewed in this letter, as well as the opportunity to continue to collaborate with you throughout the licensing process. Please distribute future communications through Lisa Yager, chief of resource stewardship and education at the St. Croix National Scenic Riverway. Information will be distributed to the NPS team as appropriate through Lisa.

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

CRAIG HANSEN Digitally signed by CRAIG HANSEN Date: 2022.03.04 13:13:56 -06'00'

Craig Hansen
Superintendent

[2] Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021:
https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850582&accessionnumber=20200410-5091

Document Accession #: 20220304-5265 Filed Date: 03/04/2022

Document Content(s)

NPSCommentsProposedMusselsWQTurtles03042022.pdf.....1

WDNR provided verbal comments on 2/21/2022

Water Quality Study Plan Consultation

Darrin Johnson

From: Shawn Puzen
Sent: Thursday, February 3, 2022 9:52 AM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject: Hayward and Trego WQ DRAFT Monitoring Plan
Attachments: 20220203 Hayward-Trego WQ DRAFT Study Sent to Agencies.pdf

Good Morning,

Attached is a draft Hayward and Trego WQ Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete WQ monitoring.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 7, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Draft Study Plan

Water Quality Monitoring Study

Prepared for

Northern States Power Company, a Wisconsin Corporation

Prepared by

Mead & Hunt

meadhunt.com

February 2022

1. Introduction

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 and 2711 respectively, expire on November 30, 2025. To obtain new licenses, the Licensee must submit a final license application to FERC no later than November 30, 2023. The final license application, in part, must include an evaluation of the existing water quality associated with the Project.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Project. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that a water quality monitoring study be completed at both projects. More specifically, the WDNR requested that the following water quality parameters be assessed and monitored:

- Ammonia
- Alkalinity
- Bacteria
- Chloride
- Chlorophyll-a
- Color
- Conductivity
- Cyanobacteria
- Dissolved Oxygen (DO)
- Dissolved Phosphorus
- Iron, Manganese, and Sulfide
- Methyl Mercury
- Nitrate (plus nitrite)
- pH
- Secchi Depth
- Sediment Accumulation
- Sulfate
- Temperature
- Total Mercury
- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids

WDNR indicated that the data should be collected and/or analyzed using river monitoring protocols upstream of the impoundments and downstream of the dams. Lake protocols should be applied within the deep hole of the impoundment. The Licensee has developed this study plan to include monitoring for all parameters requested by WDNR with the exception of cyanobacteria, methyl mercury, and sediment accumulation. The study plan is otherwise consistent with the WDNR request.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this water quality monitoring study is to determine if the Project meets current state water quality standards.

2.2 Background and Existing Information

Limited information is available on water quality data within the Project boundaries. Water clarity from satellite imagery has been performed annually from 2010-2017 at Hayward and in 2015 at Trego. Most of the water quality parameters identified in WDNR's study request were also monitored at the Trego Project from 2010-2014 and 2016-2020 (WDNR, 2021).

2.3 Nexus between project operations and effects on resources

The operations of the dam(s) affect the water quality of the impoundment(s) and downstream resources. The overall goal of the request is to further understand the current water quality conditions of the reservoir and river resources which will help inform management decisions in the future (WDNR, 2021).

2.4 Study Area

The study includes water quality monitoring at three locations for each Project. One site will be located downstream of the powerhouse outside of the mixing zone, one will be located in the deep hole within the reservoir, and one will be located upstream of the main impoundment in a riverine area.

At the Hayward Project, site 1 is located approximately 3,600 feet upstream of the Highway 77 bridge, site 2 is located in the deep hole at existing WDNR Monitoring Station 83131, and site 3 is located near the canoe portage put-in at existing WDNR Monitoring Station 583001. At the Trego Project, site 1 is located just upstream of the Highway 53 bridge at existing WDNR Monitoring Station 10022021, site 2 is located in the deep hole at existing WDNR Monitoring Station 663162, and site 3 is located approximately 250 feet downstream of the Trego Dam. Maps showing the location of each monitoring site and their coordinates are included in Appendix 1.

2.5 Methodology

2.5.1 Upstream and Downstream Monitoring

Since Hayward Lake and Trego Lake are classified as impounded flowing waters with a residence time of less than 14 days, river monitoring protocols should be applied at the upstream and downstream monitoring locations (WDNR, 2021).

The parameters to be monitored, type of sampling, and sampling frequency are detailed in Table 2.5.1-1 below. Each sampling event should occur near the middle of the sampling month.

Table 2.5.1-1 Upstream and Downstream Monitoring Parameters and Frequency

Parameter	Samples	Type of Sampling	Sampling Frequency					
			May	June	July	Aug.	Sept.	Oct.
Ammonia	6 total	Lab	X	X	X	X	X	X
Bacteria	6 total	Lab	X	X	X	X	X	X
Chloride	6 total	Lab	X	X	X	X	X	X
Chlorophyll-a	3 total	Lab			X	X	X	
Conductivity	Continuous Jul-Sept	Field Measurement			X	X	X	
DO	Continuous Jul-Sept	Field Measurement			X	X	X	
Dissolved Phosphorus	6 total	Lab	X	X	X	X	X	X
Nitrate (plus nitrite)	6 total	Lab	X	X	X	X	X	X
pH	Continuous Jul-Sept	Field Measurement			X	X	X	
Sulfate	1 total	Lab	X					
Total Mercury	1 total	Lab	X					
Temperature[1]	Continuous May-Oct	Field Measurement	X	X	X	X	X	X
Total Nitrogen	6 total	Lab	X	X	X	X	X	X
Total Phosphorus	6 total	Lab	X	X	X	X	X	X
Total Suspended Solids	6 total	Lab	X	X	X	X	X	X

Data should be collected or analyzed using the *WDNR Wisconsin Consolidated Assessment and Listing Methodology* (*WisCALM Guidance*) located online at the following web address: https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html. A list of standard operating procedures can be found in the Appendix of the *WisCALM Guidance*.

WDNR Nutrient Grab Sample Protocols located online at https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=114118765 should be used for the following parameters:

Ammonia, dissolved phosphorus, sulfate, total mercury, total suspended solids, and nitrate (plus nitrite)

The procedures listed in the *Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)* located online at https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf should be used for the following parameters:

Chlorophyll a, Chloride

[1] WDNR recommended year-round continuous temperature monitoring. It is extremely unlikely that temperature standards will be exceeded between the months of November and April and any data collected during this timeframe would likely not help inform FERC in developing license conditions. NSPW has restricted continuous temperature monitoring to the same timeframe as other monitoring commitments (i.e., May-Oct.).

The procedures identified in the publication *Citizens Monitoring Bacteria: A training manual for monitoring E. coli* located in Appendix 2 should be used for monitoring bacteria.

2.5.2 Deep Hole Monitoring

Since Hayward Lake and Trego Lake are classified as impounded flowing waters with a residence time of less than 14 days, river monitoring protocols should be applied at the upstream and downstream monitoring locations and lake monitoring protocols should be applied within the deep hole of the impounded area (WDNR, 2021).

The deep hole parameters to be monitored, type of sampling, and sampling frequency are detailed in Table 2.5.2-1 below. Each sampling event should occur near the middle of the sampling month.

Table 2.5.2-1 Deep Hole Monitoring Parameters and Frequency

Parameter	Samples	Type of Sampling	Sampling Frequency			
			May	July	Aug.	Sept.
Ammonia	1 total	Lab		X		
Bacteria[2]	4 total	Lab	X	X	X	X
Chloride	4 total	Lab	X	X	X	X
Chlorophyll-a	3 total	Lab		X	X	X
Conductivity	4 total	Field Profile	X	X	X	X
Color	1 total	Lab		X		
DO	4 total	Field Profile	X	X	X	X
Dissolved Phosphorus	4 total	Lab	X	X	X	X
Iron	4 total	Lab	X	X	X	X
Manganese	4 total	Lab	X	X	X	X
Sulfide	4 total	Lab	X	X	X	X
Nitrate (plus nitrite)	1 total	Lab		X		
pH	4 total	Field Profile	X	X	X	X
Secchi depth	4 total	Field	X	X	X	X
Sulfate	1 total	Lab	X			
Total Mercury	1 total	Lab	X			
Temperature	4 total	Field Profile	X	X	X	X
Total Nitrogen	1 total	Field Fixed		X		
Total Phosphorus	4 total	Field Fixed	X	X	X	X
Total Suspended Solids	4 total	Lab	X	X	X	X

The procedures listed in the *Wisconsin Citizen Lake Monitoring Training Manual (Chemistry Procedures)* located online at

[2] The WDNR requested monitoring of cyanobacteria. NSPW is not proposing to monitor for cyanobacteria because other bacteria monitoring will provide similar information and there are no standards for cyanobacteria. The Commission concurred with a similar approach for the Gile Flowage Storage Reservoir P-15055 in their study plan determination dated September 24, 2021.

https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/ChemistryMan.pdf should be used for the following parameters:

Ammonia, chloride, chlorophyll a, chloride, conductivity, color, DO, dissolved phosphorus, iron, manganese, nitrate (plus nitrite), pH, sulfate, sulfide, total mercury, temperature, total nitrogen, total phosphorus, and total suspended solids.

The procedures listed in the *Wisconsin Citizen Lake Monitoring Training Manual (Secchi Disk Procedures)* located online at https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs?CLMN/SecchiMan.pdf should be used for the Secchi depth parameter.

The procedures identified in the publication *Citizen's Monitoring Bacteria: A training manual for monitoring E. coli* located in Appendix 2 should be used for the bacteria parameter.

For parameters that are labeled as field profiles, a hydrographic profile should be conducted with samples beginning at the water surface and sampled at 1-meter intervals until the reservoir bed is reached. These profiles will help evaluate whether the reservoir is stratified.

2.5.3 Personnel Qualifications

All surveys will be conducted by individuals with prior water quality monitoring training and experience.[3]

2.6 Consistency with generally accepted scientific practice

The Water Quality Monitoring Study follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been used in other relicensing studies.

2.7 Project Schedule and Deliverables

Results of the study will be summarized in a final study report. The report will include the following elements:

- Project Information and Background
- Study Area
- Methodology
- Study Results
- Analysis and Discussion
- Agency Correspondence and Consultation
- Literature Cited

NSPW anticipates that field work will be completed between mid-May and mid-October 2022 and the study report is expected to be completed by November 30, 2022.

[3] The Consultant(s) selected to complete the work are responsible to obtain any required scientific collection permits required by NPS, WDNR, or other entities.

3. Consultation

The Water Quality Study was requested by WDNR. As a result, the Licensee consulted with WDNR as discussed below.

3.1 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Water Quality Monitoring Study plan to the National Park Service for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 3.

3.2 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Water Quality Monitoring Study plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 3.

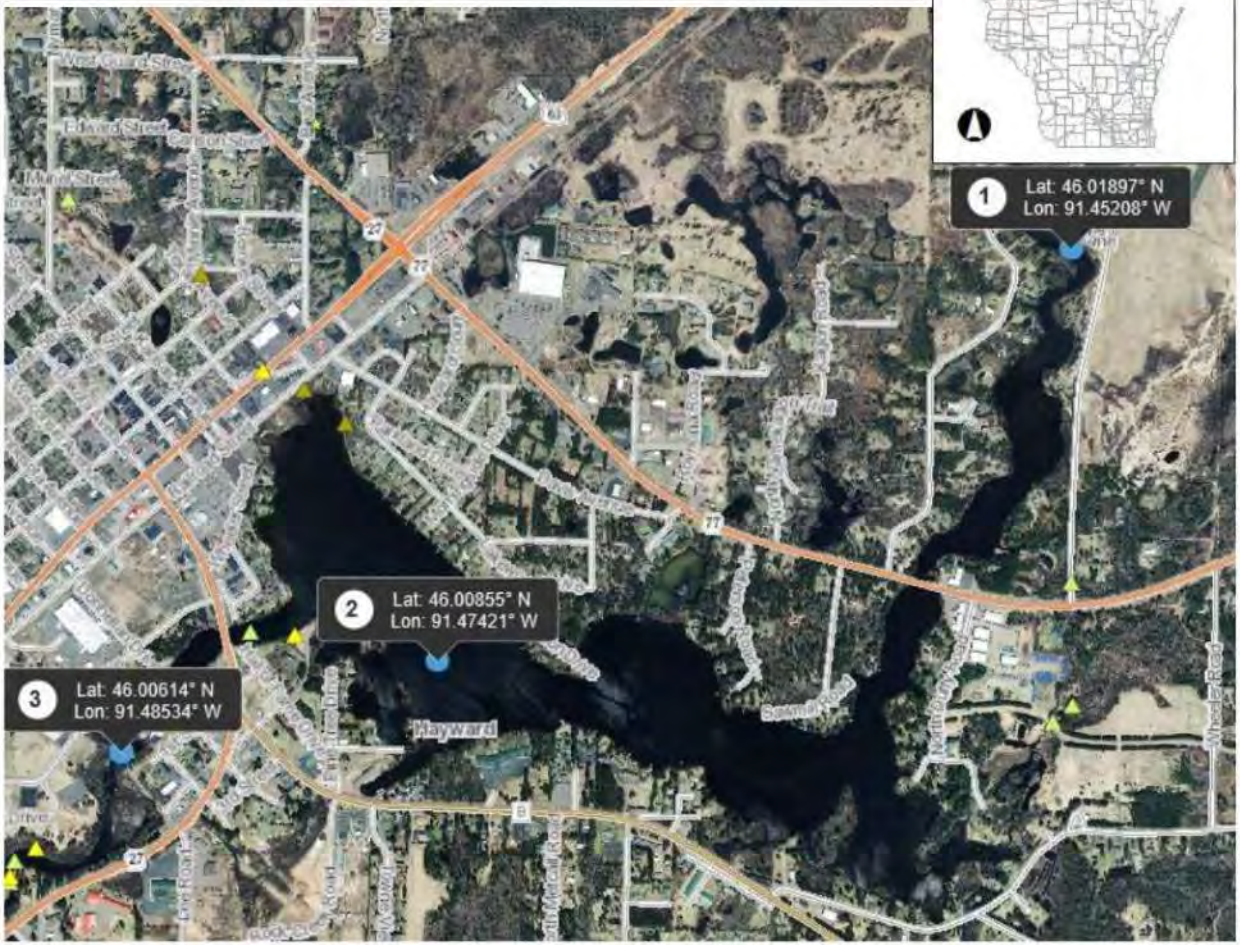
4. References

Bruhm, Laura, and Lois Wolfson. 2007. Citizens Monitoring Bacteria: A training manual for monitoring E. coli. Michigan State University. East Lansing, Michigan. 49pp.

Wisconsin Department of Natural Resources. 2020. Study Requests Relicensing of Hayward (P-2417) and Trego (P-2711) Projects. May 7, 2021.

Appendix 1 – Water Quality Monitoring Study Area

Hayward Water Quality Monitoring Locations



Legend

- Station Points with Historic Data
- Station Points with Recent Data (10 years)
- Station Points without Data (Active, Usable)
- Station Points without Data (New Station, Pending)
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Index to EN_Image_Basemap_Leaf_Off

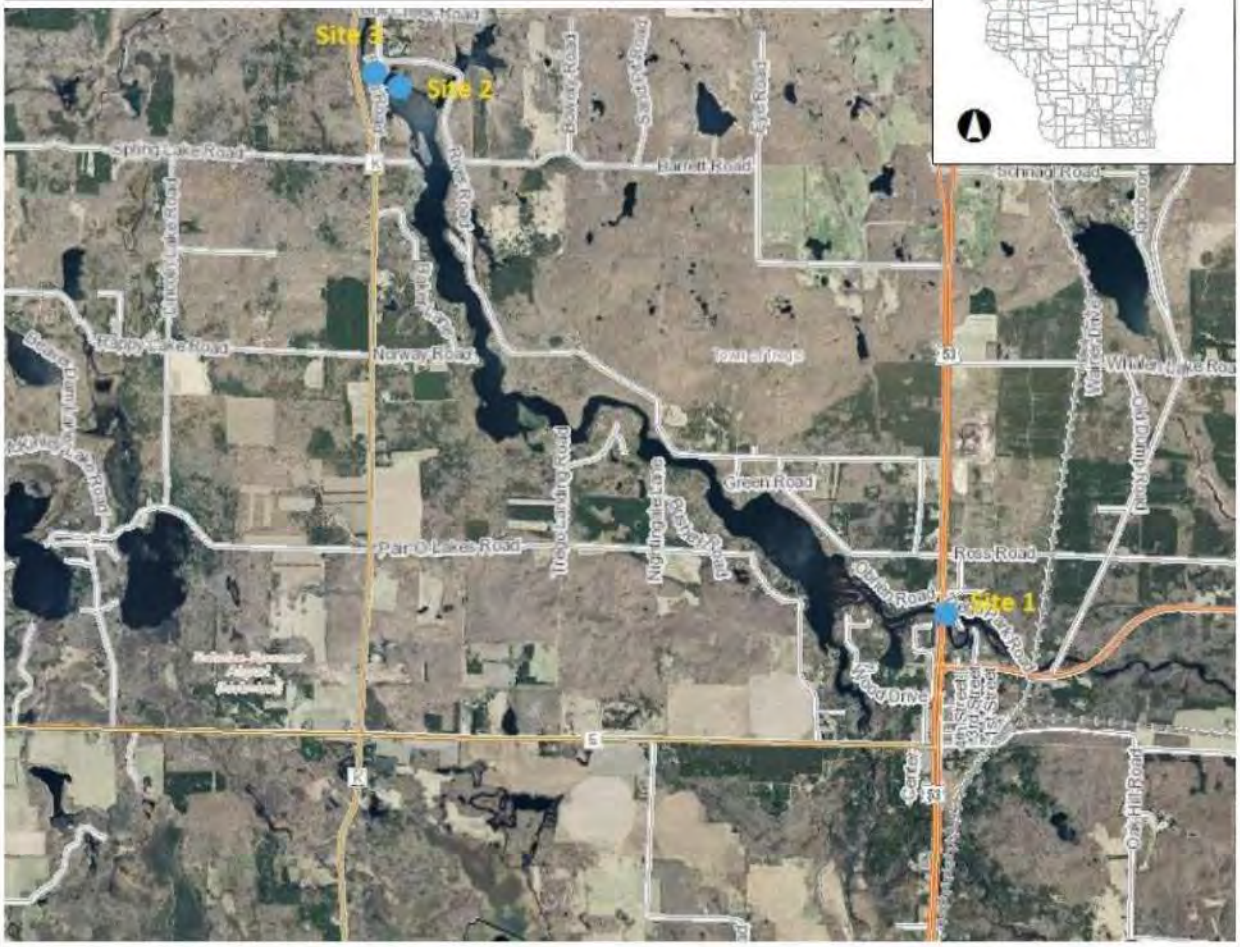
Notes

0.5 0 0.25 0.5 Miles

NAD_1983_HARN_Wisconsin_TM

1: 15,840

Trego Water Quality Monitoring Locations



Legend

- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Index to EN_Image_Basemap_Leaf_Off

Notes

1.5 0 0.75 1.5 Miles

NAD_1983_HARN_Wisconsin_TM

1: 47,520

Trego Water Quality Monitoring Locations

Legend

- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Index to EN_Image_Basemap_Leaf_Off

Notes

0.1 0 0.06 0.1 Miles

NAD_1983_HARN_Wisconsin_TM

1: 3,960

Trego Water Quality Monitoring Locations

Legend

- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Index to EN_Image_Basemap_Leaf_Off

Notes

0.1 0 0.06 0.1 Miles

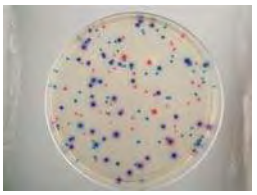
NAD_1983_HARN_Wisconsin_TM

1: 3,960

Appendix 2 – Citizens Monitoring Bacteria: A training manual for monitoring E. coli

Citizens Monitoring Bacteria:

A training manual for monitoring *E. coli*



2nd Edition

A regional partnership between IN, IA, MI, MN, OH and WI

Citizens Monitoring Bacteria:

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http://www.uwex.edu/ces/csreesvolmon/EColi/ProjectVolunteers.htm

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Preface

This manual is a result of a joint project to enhance citizen E. coli monitoring in streams of the upper Midwest. The partners involved in this project include the Iowa Department of Natural Resources IOWATER, Purdue University, the Indiana Department of Natural Resources, Hoosier Riverwatch, Michigan State University, the Ohio State University, the University of Minnesota Extension Service, Minnesota Water Resources Center, the Volunteer Stream Monitoring Partnership, the University of Wisconsin Extension, the Wisconsin Department of Natural Resources, and the Water Action Volunteers Program. Others who have lent support to this manual include local units of government, citizen leaders, and all the volunteers who have helped throughout this project.

Funding for this Citizens Monitoring Bacteria (CMB) project was granted from the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (CSREES) 406 Water Quality program. Additional funding was provided by the CSREES Great Lakes Regional Water Program.

Several excellent training manuals already exist that instruct citizens on monitoring various parameters of water quality in streams, and several are cited at the end of this manual. The content of this training manual will not provide a comprehensive approach to stream monitoring methods but will instead supplement other training manuals by focusing on the single parameter, *E. coli,* and provide detailed information on methods and analyses for *E. coli* stream monitoring.

Chapter 1: Introduction: Stream Monitoring

Why monitor streams?

Streams have been referred to as the arteries of the earth since they carry and transport the water that supports aquatic life. Humans also depend on this water for a multitude of activities including irrigation, drinking supply, energy production, recreation, industry, and aesthetics. Clean water is important to the health and livelihood of all people, and many groups and stakeholders are working together to protect water resources. However, 39% of the rivers and streams assessed in the United States in 2000 were polluted or had degraded habitat. According to the USEPA's 2000 National Water Quality Inventory, polluted water runoff from the land was the leading cause of water quality problems nationwide (USEPA, 2002a). Major pollutant sources were sediment, bacteria, heavy metals and nutrients. Stream monitoring programs can be invaluable in assessing current conditions and tracking changes in water quality over time to determine if remediation or protection actions have been successful.

Volunteer programs

State and regional agency staff as well as funds are often limited, yet stream monitoring needs can be vast. Volunteer monitoring programs can be an extremely valuable asset to states' water quality monitoring programs by expanding data collection efforts and resource assessment opportunities. Volunteer-collected data can provide important baseline information to assist with decision-making and resource assessment.

Volunteer monitoring programs are also a way to tap the expertise of volunteer monitors on local water quality conditions and history. Volunteer monitoring teams are often more "in-touch" with local settings and events and can be available to respond quickly when a pressing need for monitoring arises.

Volunteer monitoring programs are also a great opportunity for citizens of various backgrounds to become more involved in and to gain greater understanding of water quality issues. The training for and involvement in monitoring programs can empower citizens to become involved in informed debate, taking action, and making an impact in their

community. In fact, a study in Wisconsin found that experienced volunteer monitors are more active politically in their communities (Overdevest et al, 2004).

Goals of *E. coli* bacteria monitoring

Many parameters can be monitored to help assess a stream's condition or to follow trends in water quality. One that has received increasing attention as an important water quality indicator is *E. coli* bacteria. While other factors may be just as important to monitor, this training manual focuses on *E. coli* monitoring.

Citizens Monitoring Bacteria Program Goals:

- Build the capacity of volunteer monitoring programs to understand and use the most appropriate *E. coli* testing protocols (test kits, laboratory analysis, etc.) and watershed-based sampling strategies with their volunteers
- Enhance the public's understanding about the role of bacteria in water quality
- Increase awareness and acceptance of the use of volunteer-collected water quality data in various watershed programs, including watershed assessments and TMDL development and implementation
- Share results with other states across the country, primarily via the National Volunteer Monitoring Facilitation Project
- Demonstrate how to set up an appropriate watershed-based *E. coli* sampling strategy utilizing volunteer networks and begin collecting usable data

Setting goals and designing a sampling program

The objectives of this program are to provide citizens involved in *E. coli* monitoring programs with the scientific background, practical applicability, and tools needed to develop an understanding of the role of bacteria in stream water quality.

Before embarking on a bacteria monitoring program, it is suggested that your group first review and determine your own goals in terms of data collection and use. Where, when, and how often you sample will depend on these set goals. A reference you may wish to use is the Volunteer Water Quality Monitoring National Facilitation project website's Guide for Growing Programs. In the "Designing Your Monitoring Strategy," groups are introduced to goal-setting processes, and also referred to a number of valuable resources for working towards step-by-step goal making (www.usawaterquality.org/volunteer/).

The time involved with volunteer monitoring can be demanding, but rewarding. First assess how often your group is prepared to monitor. The amount of time allocated to volunteer monitoring depends on your group's goals. For example, one goal may be to conduct baseline monitoring. This plan would involve monitoring every few weeks over many years. You may also choose to monitor your selected stream to see if it is meeting water quality standards. This plan may call for more frequent monitoring but not necessarily for years and years. A short-term, intensive study, such as monitoring the effects of storm water runoff, is another option which may involve daily sampling. All these monitoring plans are not necessarily mutually exclusive.

If your group has the time and has set goals to monitor more frequently, such a plan will provide you with additional data. For example, many states have an active beach monitoring program because of the high level of full-contact recreational use of beaches. Standards have been developed by state and local agencies that indicate the level of risk to human health by swimming in beach waters. According to USEPA standards, when a one-time high count is reached (235 colony forming units (cfu)/100 milliliters (ml)) or a 30-day geometric mean (with a sample size of at least 5 samples per 30-day period or the total number of samples collected over the specified monitoring period) is exceeded (126 cfu/100 ml), the beach is closed until levels decrease (see Chapter 7 for a description of a geometric mean and how it is calculated). If your group has set a goal to determine a 30-day geometric mean, it is recommended that you monitor at least once a week.

Another group goal may include collecting data to further watershed management plans that will develop from coordination with other water quality monitoring programs. You may also want to work on fostering connections and partnerships with state agencies and other groups that promote sound land and watershed management.

In general, the time involved will include driving to and from the selected sites, taking water samples at these sites, and returning to your home or designated laboratory space to process and incubate the samples. You also must be available 24 to 48 hours later (depending on the test) to read the plates after incubation. Counting the *E. coli* colonies and recording them on a data sheet could take up to an hour.

Finally, remember that good sampling plans are flexible and can be updated and refined according to goals and objectives. You can visit the CSREES Best Education Practices (BEP) website for further information on this process (http://wateroutreach.uwex.edu/).

Other important water quality indicators

Bacteria monitoring, while an important and valuable water quality indicator, is only one part of total stream water quality. A comprehensive assessment program of stream water quality should consider monitoring for other water quality indicators.

Biologically and chemically, water quality is defined by a number of factors, and these parameters can generally indicate if a water body is degraded or polluted. How the water will be used may influence which or how many characteristics are used to determine water quality. In addition to bacteria, other common water quality measurements include clarity, conductivity, dissolved oxygen, hardness, nutrients (particularly nitrogen and phosphorus), pH, temperature, total suspended solids, and biological communities (see box, next page).

Various water quality standards exist based on many of these parameters, however the standards may vary depending on the use of the water. For example, drinking water and irrigation water have different standards for bacteria. Zero levels of *E. coli* are required in drinking water, but the presence of some *E. coli* are a tolerated risk in irrigation or swimming waters.

Other Important Water Quality Parameters

Temperature

Temperature varies depending on time of day, season, and vegetation along the stream. Temperature affects the oxygen content of the water since colder water can hold more dissolved oxygen than warmer water. Temperature also affects the rate of photosynthesis by aquatic plants, metabolic rates of aquatic organisms, and the sensitivity of organisms to toxic wastes and diseases.

Dissolved oxygen (DO)

Dissolved oxygen (DO) is necessary for the maintenance of a healthy aquatic ecosystem. Aquatic organisms differ in the amount of oxygen they require for survival. For example, fish such as trout and pike require higher concentrations of DO for survival, while carp and catfish are able to survive at much lower concentrations (less than 5 mg/L). Dissolved oxygen is supplied to a water body through the atmosphere where oxygen mixes with water through wind and wave action, and through photosynthesis by algae and other aquatic plants. Oxygen is more easily dissolved in cold water than in warm water; therefore, the amount of oxygen that water will hold increases as the temperature decreases. Low DO levels can have negative impacts on biota causing stress and sometimes death if levels fall below tolerance values for organisms.

pH

The pH is a measure of the acidity or the alkaline (basic) nature of the water. Since the scale is logarithmic, a drop in the pH by 1 unit is equivalent to a 10-fold increase in acidity. A pH of 7 is neutral. Thus a pH of 5 is 10 times more acidic than a pH of 6 and 100 times more acidic than a pH of 7. pH affects many chemical and biological processes in the water. Different organisms do well or poorly within different ranges of pH. The majority of aquatic animals prefer a pH range from 6.0-8.0. Outside this range reduces the diversity in the stream because it stresses the physiological systems of most organisms and can reduce reproduction. Low pH can also allow toxic elements and compounds to become mobile and “available” for uptake by aquatic plants and animals. This can produce conditions that are toxic to aquatic life, particularly to sensitive species such as salmon and trout. Changes in acidity can be caused by atmospheric deposition (acid rain), surrounding rock, and certain wastewater discharges.

Nutrients

Excess nutrients such as nitrogen and phosphorus can accelerate eutrophication in surface waters, a condition that often results in excessive plant growth, declining oxygen levels and changes in the aquatic community. Often, phosphorus is the nutrient in the shortest supply relative to the organisms’ needs in fresh water systems, and even a modest increase in phosphorus can set off a chain of undesirable events. This includes accelerated plant growth, algal blooms, low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals. Sources of nutrients can be both natural and human. Natural sources include soil and rocks. Human sources include discharge from wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, animal manure inputs, storm water runoff and disturbed land areas.

Other Important Water Quality Parameters (continued)

Transparency/Water Clarity

Transparency or water clarity is a measure of how well light passes through the water column. Transparency is usually measured with a Secchi disk (for lakes) or transparency tube (for streams), although it can be measured in the field with a light meter. Secchi disk readings are probably the most commonly collected water quality data across the U.S. Transparency measurements are typically made *in situ* (on site) and can be affected by suspended sediment, by algae, and by the color of the water (i.e., humic acids that stain the water red or brownish).

Turbidity

Turbidity is a measure of how much light is scattered by particles in the water. Algal blooms or suspended sediment can increase turbidity because light is scattered by particles in the water, whether those particles are sediment or algae. Other sources contributing to turbidity include soil erosion, runoff from urban and agricultural areas, wastewater and storm water inputs, plant materials and sediment being stirred up by bottom feeders. Materials causing turbidity may also be responsible for clogging fish gills, reducing available habitat, interfering with egg and larvae development, smothering fish eggs and aquatic insect larvae, and suffocating newly-hatched insect larvae. Turbidity is most commonly reported in NTUs (Nephelometric Turbidity Units) and is most accurately measured with a nephelometer which may cost several hundred dollars.

Total Solids

Total solids consist of dissolved and suspended materials in water. Dissolved solids, or those particles that will pass through a filter with pores of around 2 microns (0.002 cm) in size, include calcium, chlorides, nitrate, phosphorus, iron, and sulfur. Total suspended solids (TSS) will not pass through a 2-micron filter and are a direct measurement of the particles suspended in the water - by weight. That means you must collect a sample and take it back to the lab where the water is filtered and dried in an oven, before being weighed. Suspended solids include silt and clay particles, algae, fine organic debris, and other particulate matter. Sediment weighs more than algae, so TSS is a more accurate measurement of how much sediment is in the water, whereas turbidity is affected equally by sediment or algae.

If you collect samples for turbidity or TSS, be sure to shake the container thoroughly before taking a measurement, so whatever has settled out is re-suspended. Neither TSS nor turbidity measurements are affected by colored water.

Biological Communities

Various biological communities can be used to assess stream ecosystem health. Aquatic macroinvertebrates, the animals without a backbone but larger than microscopic organisms, include the aquatic insects, mollusks, crustaceans, and aquatic worms. Macroinvertebrates often are used as indicators of water quality since their tolerance range to pollution varies among species, they are easy and inexpensive to collect, and many are sensitive to both physical and chemical changes in the water. Since they cannot easily escape pollution once it enters, they can be valuable in detecting pollution even after it is no longer detected by chemical methods. Fish may also be used as indicator species. Many fish cannot tolerate low dissolved oxygen concentrations or low pH. Others have narrow temperature tolerances. Some are also sensitive to high turbidity levels, which can clog their gills or interfere with their ability to see their prey.

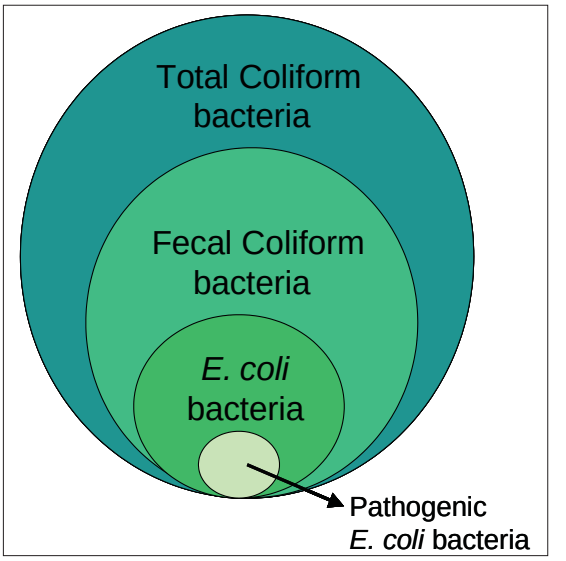
Chapter 2: Bacteria and Water Quality

What are bacteria?

Bacteria are microscopic, single-celled organisms that are the most numerous organisms on earth. They are so small that over five million could be placed on the head of a pin. Bacteria can live in numerous environments and perform many complex actions, some of which are beneficial and some harmful. Most bacteria, however, are not harmful and do not cause human health problems. Those that are disease producing are referred to as pathogenic. Viruses and some protozoans can also be pathogenic.

Coliform bacteria are part of the Enterobacteriaceae family and individual cells cannot be seen with the naked eye due to their small size (but colonies can be seen.) While some coliform bacteria can be naturally found in soil, the type of coliform bacteria that lives in the intestinal tract of warm-blooded animals and originates from animal and human waste is called fecal coliform bacteria.

Escherichia coli (*E. coli*) is one subgroup of fecal coliform bacteria. Even within this species, there are numerous different strains, some of which can be harmful. However, the release of these naturally-occurring organisms into the environment is generally not a cause for alarm. But, other disease causing bacteria, which can include some pathogenic strains of *E. coli*, or viruses may also be present in these wastes and pose a health threat.



Fecal coliform bacteria which include E. coli are part of a larger group of colifom bacteria.

What are indicator bacteria?

The use of an organism that can serve as a surrogate for another is called an indicator organism. Trying to detect disease-causing bacteria and other pathogens in water is expensive and may pose potential health hazards. Further, testing for pathogens requires large volumes of water, and the pathogens can often be difficult to grow in the laboratory and isolate. *E. coli* bacteria are good indicator organisms of fecal contamination because they generally live longer than pathogens, are found in greater numbers, and are less risky to collect or culture

in a laboratory than pathogens. However, their presence does not necessarily mean that pathogens are present, but rather indicates a potential health hazard.

The EPA has determined that *E. coli* are one of the best indicators for the presence of potentially pathogenic bacteria (EPA, 2002b). Because *E. coli* monitoring does not measure the actual pathogens, the assessment is not foolproof, however, it is a good approach for assessing the likelihood of risks to human health. Monitoring for these indicator organisms is an easy and economical method for citizens or professionals to assess health risks due to bacterial contamination of surface waters.

Common sources of *E. coli*

Bacteria in water can originate from the intestinal tracts of both humans and other warm-blooded animals, such as pets, livestock and wildlife. Human sources include failing septic tanks, leaking sewer lines, wastewater treatment plants, combined sewer overflow (CSOs), boat discharges, swimming "accidents" and urban storm water runoff. In urban watersheds, fecal indicator bacteria are significantly correlated with human density (Frenzel and Couvillion, 2002).

Animal sources of fecal coliform bacteria include manure spread on land, livestock in runoff or in streams, improperly disposed farm animal wastes, pet wastes (dogs, cats), wildlife (deer, elk, raccoons, etc.), and birds (geese, pigeons, ducks, gulls, etc.). If you are sampling in a watershed area without significant human impact and are finding *E. coli*, the source may be birds or wildlife. In a study comparing *E. coli* concentrations in waters from agricultural and "pristine" sites, contamination was found in both settings. The researchers deduced that the levels of *E. coli* at the pristine site likely came from wildlife, such as deer and elk, living the area (Niemi and Niemi, 1991).

Common routes of bacteria to streams

How does *E. coli* bacteria get into streams and rivers? Polluted water runoff from the land is the leading cause of water quality problems nationwide (USEPA, 2002a). Fecal material as well as other pollutants can be transported to waterways through runoff. How quickly they are transported partially depends on the type of land use. Non-developed lands including grasses and other vegetation tend to soak up rainfall, thereby increasing infiltration into the ground and reducing runoff to waterways. Developed lands such as streets, rooftops, sidewalks, parking lots, driveways, and other hard surfaces tend to create more impervious surfaces, and runoff increases. Lands that support domesticated animals, such as cattle, hogs, or horses, can also be a source of bacteria, particularly if animals enter the water for drinking or if heavy rains wash manure from the land into receiving waters.

Top: Cattle crossing on a stream in northeast Iowa. Bottom: The crossing keeps the cattle out of the stream. (Photos courtesy USDA NRCS)

Another source of bacteria pollution to stream waters comes from Combined Sewer Overflows (CSOs). Some sewer and storm water pipes are not separated. When a large storm event occurs, the wastewater treatment plants cannot handle the excess volume of water being pumped to them. As a result, untreated sewage along with storm water is dumped directly into rivers and streams.

The presence and levels of *E. coli* in a stream do not give an indication of the source of the contamination. However, it can be a good first step in investigating the watershed for potential sources.

Risks to human health

Most people are concerned about the risk that bacteria may pose to human health. When numbers are above health standards, people exposed to water that contain bacteria may exhibit fever, diarrhea and abdominal cramps, chest pain, or hepatitis. While *E. coli* by itself is not generally a cause for alarm, other pathogens of fecal origin that are health threats include *Salmonella*, *Shigella*, and *Psuedomonas aeruginosa.* Non-bacterial pathogens that may be present with fecal material include protozoans, such as *Cryptosporidium* and *Giardia*, and viruses.

There are some strains of *E. coli* that are pathogenic themselves. One that has received much attention is the *E. coli* strain named 0157:H7 that lives in the intestinal tract of cattle. This strain is primarily spread to people by eating contaminated, undercooked beef or drinking unpasteurized milk and is not generally found in surface waters.

Examples of at-risk concentration levels

Criteria for concentrations of indicator bacteria in recreational waters (USEPA 1986) have been developed by the USEPA. Initially, total coliform bacteria were used as the benchmark. However, because it was shown that *E. coli* were more closely correlated with swimming-related illnesses, the USEPA later recommended that *E. coli* be used as the indicator in freshwater recreational areas (USEPA 2002b).

Many states have since adopted this recommendation, however, some still use total fecal coliform bacteria when determining concentrations. The acceptable risk level for total body contact recreation, which involves activities such as swimming or water skiing, is 126 colonies of organisms (referred to as colony forming units or cfu) per 100 milliliters (ml) of water or less based on a geometric mean (calculated over 30 days with at least 5 samples) or a one-time concentration of 235 cfu/100 ml. The risk of getting sick increases as total numbers of colonies are exceeded.

The number of colony forming units of *E. coli* organisms per 100 ml of water and the method of determination may vary slightly by state based on State Public Health Codes and Water Quality Standards (See Chapter 7). The USEPA recommends a set of standards for *E. coli* in fresh water bodies as a single maximum allowable count. These rates correspond to an acceptable risk level of 8 people out of 1000 getting sick.

	Designated swimming	Moderate swimming area	Light swimming area	Infrequent swimming area
E. coli (colony forming units/100 ml of water)	235	298	410	576

(from USEPA 1986, 2002b)

Even with good watershed management measures, there will always be fecal material in the environment. If you repeatedly find unusually high levels of *E. coli* on a long-term, regular basis in your stream samples, you should alert and work with your local health agency.

Weather and seasonal influences

The number of bacteria colonies can be influenced by weather and seasonal effects. This variability makes the bacterial concentrations in natural water difficult to predict at any one time. Bacteria numbers often increase following a heavy storm, snow melt or other excessive runoff. *E. coli* bacteria are often more prevalent in turbid waters because they live in soil and can attach to sediment particles. Bacteria can also remain in streambed sediments for long periods of time. If the streambed has been stirred up by increased flow or rainfall, your sample could have elevated bacteria levels. This is why you should avoid disturbing the streambed as you wade out into the stream. You should also collect the water sample upstream from you. If you are collecting at several sites within the stream, collect the furthest downstream sample first and proceed upstream.

A number of other weather influences may affect bacteria levels in the stream. Higher *E. coli* counts may be found in warmer waters because they survive more easily in these waters. (*E. coli* are used to living in the warm environment of the intestines of warm-blooded animals). Ultraviolet rays of sunlight, however, can also kill bacteria, so a warm sunny day may produce numbers lower than expected.

Chapter 3: Preparation for Sampling

Selecting your equipment and supplies

There are several containers that can be used to collect your water sample. One recommended type is the pre-sterilized and disposable Whirl-pak® bags. These plastic self-seal bags are easy to use, carry, and transport. Because they are used only once, they are not re-sterilized. However, sterilized plastic bottles are also acceptable. They can be reused, and they're much sturdier than the bags. However, if bottles are re-used, then both the bottles and lids must be sterilized and sealed before collection. The sterilization procedure calls for the use of an autoclave for 15 minutes at 121°C (USEPA, 1997), which may require assistance from a professional laboratory.

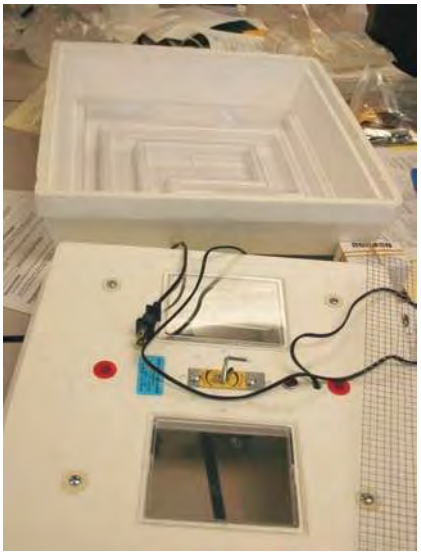
Equipment and supplies checklist

Before going out to a stream, refer to the check-list of the items needed, and make sure you bring them with you.

- ✓ Waders and/or rubber boots (depending on water depth)
- ✓ Bucket with rope or grab sample pole (if sampling from a bridge or water is too deep to enter)
- ✓ Sealed, sterilized, wide mouth bottles (plastic or glass) or Whirl-pak® bags
- ✓ Labels & clear tape to cover them
- ✓ Long rubber/latex gloves—elbow length if possible
- ✓ Clipboard and field data sheets
- ✓ Pencil and Sharpie® marking pen
- ✓ Cooler with frozen ice packs (or ice)
- ✓ Shipping containers
- ✓ First aid kit
- ✓ Personal flotation device (PFD)
- ✓ Monitoring reference sheet
- ✓ Chain of custody record
- ✓ Weather gear: sun-screen and hat for sun protection, rain gear, or cold weather gear
- ✓ Towel for drying off after sampling, if necessary
- ✓ Disinfectant hand wipes, antibacterial lotion or gel

Once you return from the field trip, you will need the following:

- ✓ Space for sample processing with good lighting
- ✓ Incubator or heating lamp and thermometer (if the sample requires incubation)
- ✓ Sterilized laboratory supplies
- ✓ Paper towels or Kimwipes
- ✓ Isopropyl alcohol
- ✓ Latex gloves
- ✓ Bleach and water-tight bag for sample disposal



A temperature-controlled egg incubator can be used for incubating the samples.

Use of an incubator

Several kits require that the sample be incubated. If this is the method you are using, you will need to either make or purchase an incubator to help the *E. coli* colonies grow once you have collected the water samples and plated them. You can buy an egg incubator for about $40 to $50. Use a small cup or tray to add water (deionized if possible) to keep the Petri plates/films from drying out. Incubation time will generally run 24 hours to 48 hours for *E. coli*, depending on the type of kit used.

Labeling and identification of bottles

It is advisable to use a specific system to assign a site number to your sampling locations. One option is to begin with the two-character abbreviation for your state. Next, use the assigned two digit county code that is pre-assigned for each county in a state. Follow this number with a sequential site number. For example, if Iowa's volunteers will be monitoring Prairie Creek in Boone County (county code 08) at 2 locations, the first site would be IA0801 and the second site would be IA0802. Organizations may have their own system of labeling.

When preparing the bottles:

- ✓ Stick tape over the lid to indicate that it has been sterilized
- ✓ Prior to collecting the sample, label each bottle with the location/sample number, time and date of sampling, initials of sample collector and type of sample
- ✓ Cover label with tape for water-proofing
- ✓ Wrap labeling tape around the circumference of the bottle. This will prevent the tape from coming off when the bottle gets wet. Do not, however, cover the lid with the tape
- ✓ Mark replicate samples with an *"R"* or appropriate marking
- ✓ Label 10% of your bottles as field blanks. Only distilled water will be added to these bottles

Safety is most important!

When sampling in a stream, always bring along a partner. It's also recommended that you inform people of where you are going and when you plan to return. It is advisable to carry a cellular phone with you in case of an emergency.

Other important tips include:

- ✓ Obtaining permission from the landowner, if needed
- ✓ Listening to weather reports prior to leaving and rescheduling the sampling if severe weather or temperatures are on the way. (Try www.weather.com for current weather conditions)
- ✓ Dressing appropriately for the weather conditions
- ✓ Bringing a first aid kit with you
- ✓ Parking your vehicle in a safe location so that you do not block traffic. Keep your keys in a safe and secure location
- ✓ Avoiding sampling in areas with very steep or unstable banks and making sure you can access the stream safely while wearing waders
- ✓ Wearing waders or rubber boots to help protect you from cold water and sharp rocks or surfaces in the streambed
- ✓ Making sure the water depth is not so deep nor the stream flow so swift that you risk losing your footing and being carried downstream
- ✓ Wearing a personal flotation device (PFD) while wading in the stream, if needed
- ✓ NOT entering the stream if you observe chemical, oil, or other hazardous substances in or discharging to the water

Once you return to your vehicle and/or home, wash your hands and be careful not to touch your eyes or mouth when processing your water samples.

You should consider reviewing the safety section of the USEPA's *Volunteer Stream Monitoring: A Methods Manual* (see Chapter 9) prior to field sampling.

Site selection

Your selected site should align with the goals of the study. When determining where you should sample, start with a USGS topographic map or similar map of your watershed and determine the extent of the stream and its tributaries (other streams entering the stream in question). If you have Internet access, several online sites listed at the end of this manual provide online maps that can give you latitude/longitude or other locational information. Sampling near a USGS gauging station will help with site identification and allow you to assess *E. coli* results with stream flow data (waterdata.usgs.gov/nwis/rt).

If your stream has many tributaries feeding into it, a site both upstream and downstream of the incoming water can help you determine if a specific tributary or sub-watershed is contributing more *E. coli* than another. If you are doing an impact assessment of a particular activity, you may also want to select sites

above and below the suspected area. However, try to select far enough downstream from stream convergences to allow even mixing of the waters.

As stated in your checklist, if the site is on private land, be sure to obtain written permission to sample prior to going on-site, or find a publicly accessible site instead.

When to sample

The number of times that you'll need to sample varies and depends on what you want to know. The more you sample, however, the better information you'll have when interpreting your data. At a minimum, it is recommended that you sample one time per month between May and September. You should also try to be consistent as to the time of day you sample and the interval of time between sampling. These factors help in the comparison of your data over time. If you have the opportunity to do so, also try to sample just after a relatively heavy storm. Remember that when and how often you sample will depend on the goals of your local program.

Wet versus dry weather sampling may help you identify general sources of the bacteria. For example, if you sample during dry weather, continuous sources will be more easily detected, such as leaking septic tanks or wildlife. If you sample after wet weather, sources that would increase in-stream bacteria levels due to runoff, such as storm water outfalls or field runoff, may be easier to identify.

Quality assurance/Quality control

You've likely heard the term QA/QC. It stands for Quality Assurance/Quality Control. Quality assurance is a method of maintaining quality in all practices and procedures used during your project. Quality control procedures assure that samples are being collected in a consistent and accurate manner at all sites and from all volunteer monitors.

Quality assurance measures include:

- ❑ Assigning responsibilities to volunteer members
- ❑ Training volunteers in collection techniques, handling of equipment, and analysis of samples
- ❑ Calibrating instruments
- ❑ Specifying procedures for field analyses
- ❑ Keeping accurate records of all procedures and conditions.
- ❑ Following chain of custody procedures or tracking samples from their collection in the field to final analyses or destination

Quality control measures include:

- ❑ Blank samples in the field: sampler fills a bottle at the bank of the stream with distilled water at 10% of your sampling sites or 10% of the times you sample. (This sample is plated as usual with the rest of your samples and helps identify contamination errors in the field)
- ❑ Field replicates: taking additional samples with another bottle(s) at 5-10% of your monitoring sites. (This method helps assess variability in the stream)
- ❑ Control plates: plating with distilled water to assure no lab contamination, or plating with a known quantity of sample
- ❑ Split samples: two different analyses from the same sample. In this case, it could involve sending the same sample to another lab for independent analysis
- ❑ Lab replicates: plating two or more separate plates from 1 bottle. (This technique helps assess the variability of the techniques of the person doing the plating and reading)
- ❑ Regular inspection of equipment, growth media, and other items being used

It is important that all volunteers use the same procedures so that samples within and between streams can be compared to each other. Consistency and keeping good field notes is key! Occasionally you may have staff from your local health agency taking side-by-side samples and readings with you to compare results.

The closer you adhere to QA/QC measures, the more confident you and others can be about your data results. Recognition of the importance and continued use of QA/QC protocols are good ways to assure agencies and the public that your data are worth considering.

The USEPA discusses the five key components of QA/QC:

- **Accuracy**: how similar your results are to a true or expected value.
- **Comparability**: the degree that data can be compared between sampling sites or across time.
- **Completeness**: how much data you planned to gather versus how much you actually were able to collect.
- **Precision**: how reproducible your results are, the level of consensus between repeated measurements.
- **Representativeness**: how much your data characterize the true environmental condition when the sample was collected (USEPA, 1996).

Why use replicates?

In the stream, bacteria concentrations can be highly variable since they often grow in clumps, so taking several samples can be very important. Variability can also occur during the transfer of water from one bottle or bucket to another bottle, during plating and culturing the bacteria, and in counting the colonies. Replicates (in duplicates or triplicates) help identify and minimize variability in the sample. Replicates can be two or more samples taken from the same collection bottle or bucket and transferred to other collection bottles or be two separate samples with separate containers taken at the same time at the same place. Split samples always come from the same collection bottle. When sending a replicate to a laboratory for verification, you should use a split sample. As a general rule, replicate samples should be taken at 10% of your monitoring sites or 10% of the time you sample.

Chapter 4: Field Sampling

Site assessment - Choosing a site within a stretch of stream

Safety should be a priority when selecting a sampling site. First make sure the stream has flowing water and that you can reach the site without difficulty. Look for uniform flow across the main streambed. Walk about 60-100 feet upstream and downstream to assess each site and conditions of the bank. Check for any obvious pollutant sources, such as storm water outfalls, lake/pond outflows, or sewage input. If the source is too close to your sampling site, your bacteria samples may not be representative of the stream overall. If the site is acceptable, take pictures, if possible, and be sure to thoroughly describe the site on your datasheet. Identify landmark features, such as crossroads and bridges or unique vegetation, that will help you or another person find your site again.

In-stream field collection

Once you're in the field, it is important to record all information. Forms may include a bacteria data sheet and site description form.

There are several methods for obtaining a sample from the stream depending on stream access, the depth of water, and safety. If you can safely enter the stream, you should obtain your sample where the main current is flowing. As you are wading into the water, try to disturb as little sediment as possible so that the sample is not contaminated by bacteria attached to or living in the soil. You should position yourself downstream of the sampling point (i.e. hold the bottle upstream of your body) so that if sediments are stirred up they won't affect your sample. If a stream site is curved, sample near the outside of the curve. Before entering the water, make sure your sample bottles are labeled correctly and completely.

If you cannot safely access the water, you should sample from a bridge following the procedures at the end of this section. If conditions are safe and you are a skilled boater, you may also sample from a canoe in the stream. If possible, do not take the sample at the stream bank's edge since the water may be stagnant or not well mixed with the rest of the water.

If sampling within the stream, follow these steps:

- ❑ Take 1-2 steps upstream, reach out your arm, and collect the sample upstream from where you are standing. It is recommended that you wear rubber gloves.
- ❑ Open the bottle and remember to not touch the inside of the bottle or the cap with your hands.
- ❑ Rinse the bottle and lid three times.
- ❑ Hold the bottle near its base and plunge it with the top facing downwards into the water to 3-5 inches below the surface or at approximately wrist level. Don't worry if you cannot get the bottle to this exact distance. Just try to avoid sampling water from the surface.
- ❑ Turn the bottle into the current (upstream) and wait for it to fill.
- ❑ Bring the bottle up, pour out some water so that there is 1 inch of air space and close and tighten the bottle with its lid or cap.
- ❑ Place the sample in a cooler with ice packs to be transported back to your house or wherever the tests will be done.
- ❑ Be sure to record all necessary information on field data sheets.

If Whirl-pak® bags are being used instead of bottles, follow these steps:

- ❑ Correctly label the Whirl-pak® bag with indelible marker.
- ❑ Remove the perforated seal from edge of Whirl-pak® bag.
- ❑ Use the two small white tabs to open the bag.
- ❑ Place the bag in the water below the surface and allow the water to flow into the bag.
- ❑ Grab the ends of the twist ties and "whirl" the bag shut.
- ❑ Make sure the bag is securely closed by testing the seal.
- ❑ Place the Whirl-pak® bag in a cooler with frozen ice packs.

If you are collecting your sample with a bucket or other container from a bridge, the following steps are recommended:

- ❑ Attach the bucket/container to a secure rope and lower it into a fast flowing section of the stream.
- ❑ Rinse the bucket/container three times with the stream water.

- ❑ Rinse the sample bottle three times.
- ❑ Do not let the rope, bucket/container or bottle touch the ground.

To minimize exposure to potential pathogens in the water, use disinfectant wipes or gel to wash up after sampling, as a preventive measure.

If you are taking a pipette sample directly from the water, you should:

- ❑ Unwrap the sterile pipette and do not touch its tip
- ❑ Squeeze the bulb of the pipette, lower it into the water to wrist level, and then release the bulb while the pipette is under water
- ❑ Remove the pipette from the water and adjust water volume in the pipette to the exact marking (1 ml)
- ❑ Squirt the water from the pipette into the collection bottle

Packaging your water samples for shipping

All samples taken should be analyzed within 24 hours. So, if you need to ship your water samples to an analytical lab, try to collect them in the early part of the week and no later than a Wednesday to allow time for the lab to process them prior to the weekend. Make arrangements with your mail carrier prior to sampling to make sure the samples will be collected promptly and delivered within 24 hours. On the day of sampling, you will need to sample early in the day so the samples can be shipped out the afternoon of the same day.

When shipping, make sure the bottles are secure, cold, and not going to leak. You should consider:

- ✓ Using a plastic garbage bag to line the shipping container to prevent leaks of water.
- ✓ Sealing each sample in its own plastic bag to prevent any cross-contamination and to contain the sample in case of leaks or breakage.
- ✓ Packing the samples with ice or ice packs.
- ✓ Using a Styrofoam container, cooler, cardboard box, or specialized water sample shipping container.

Be sure to fill out the sampling form completely, the chain of custody form, and any other paperwork, and place them on the top of the container before sealing the box. You may want to first seal the paperwork in a large zippered storage bag. Finally, attach the provided pre-addressed, pre-paid mailing label and ship overnight.

Chapter 5: Use of Kits

Value of volunteer analyses

The expense of sending E. coli samples to a commercial laboratory for analysis can be costly over time. Completing the analyses at your "home lab" is one way to determine E. coli levels in your stream without excessive costs. Through your work, you also help extend limited agency resources for water quality assessments.

General methods and procedures with kits

For the most reliable results, USEPA recommends that you should prepare your sample for analysis within 6 hours of taking it (USEPA, 1997). In many cases it is not possible to meet this recommendation, but samples should not be held longer than 24 hours. In all cases, you should store your samples on ice before lab analysis, and the quicker you get your sample processed the less chance there is for variability. Make sure you indicate on the data sheet the length of time between collecting and processing.

Regardless of the kit used, it is essential that you maintain sterile conditions while filtering and plating, since this is the time with the greatest potential for external contamination of the samples. Thus, it is recommended that you do your plating all at once in the lab and not at the field site. Sanitize your working surface by spraying or wiping it with a 70% isopropyl alcohol solution or with bleach.

You should also:

- ✓ Wash your hands thoroughly with soap
- ✓ Have the following with you: paper towels or wipes; isopropyl alcohol, distilled water, waste container, permanent marker and gloves
- ✓ Label both your bottles and plates/films with the date, time, sampling site number, and replicate number (if applicable). For the petri dishes, make sure the written information does not interfere with your ability to read the plate.
- ✓ Always shake your sample bottle before drawing a sample with a pipette

There are many kits on the market that are being used for determining *E. coli* numbers in water. During the research phase of this project, five kits and variations within the kits were tested by volunteers. Their results were compared with laboratory results. Four of the five methods were found to be acceptable. However, when ease of use, volunteer preference, and economics were added to the equation, one kit, 3M™ Petrifilm™, stood out over the others.

Methods and procedures using Coliscan® Easy Gel® (incubated)

The following information comes from the Indiana Hoosier Riverwatch Program and the Iowa IOWATER program.

Coliscan media incorporates a patented combination of color-producing chemicals and nutrients that make *E. coli* colonies appear blue, coliform bacteria that are not *E. coli* as a pink magenta and non coliforms as white or teal-green colonies. Coliscan® Easygel® employs a pour plate technique, where a liquid media is inoculated with a sample and poured into a Petri dish to solidify.

Preparation and Setup

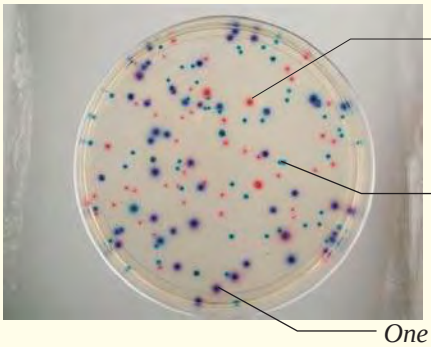
1. Thaw Coliscan® Easygel® at room temperature by removing from freezer before sampling.
2. Label the bottom of Petri dishes using a permanent marker. This label should include site ID, date and time of sample collection, volume of water collected, and sample number.

Preparing the Sample

1. Always SHAKE sample collection bottle before drawing a sample with a pipette!
2. Using a sterile pipette, transfer 0.5 – 5 mL of stream sample directly into the Easygel bottle.
3. Swirl the Coliscan® Easygel® bottles to mix the contents and pour each bottle into the already labeled Petri dishes. Gently swirl the mixture in the Petri dish making a figure eight on the tabletop with the dish until the mixture is evenly distributed, being careful not to splash over the side or on the lid.
4. Place the Petri dishes on a level location out of direct sunlight for 45 minutes to 1 hour. The mixture will solidify on the bottom of Petri dish.

Incubation and Interpretation

Invert the Petri dish(es) and incubate at 35 degrees Celsius for 24 hours. After incubation is complete, count the colonies. Do not count "pin-point" sized colonies. *E. coli* colonies appear blue, dark blue, or purple. Other coliforms appear pink/magenta, and non-coliforms appear white or teal green.



Sample Disposal

1. Carefully place about a teaspoon of household bleach onto the surface of the Coliscan® Easygel® of each plate.
2. Allow to sit at least five minutes.
3. Place in watertight bag and discard in normal trash.

Methods and procedures using 3M™ Petrifilm™

The following information comes from the Indiana Hoosier Riverwatch Program and the Iowa IOWATER program.

Storage and Disposal

Store unopened Petrifilm plate pouches at temperatures <8°C (46°F) – REFRIGERATE!

Official 3M Instructions

Return unused plates to pouch. To prevent exposure to moisture, do not refrigerate opened pouches. Store resealed pouches in a cool, dry place for no longer than one month. Exposure of Petrifilm plates to temperatures greater than 25°C (77°F), and/or humidity greater or equal to 50% relative humidity can affect the performance of the plates.

Citizens Monitoring Bacteria Research Project Instructions

Store plates from opened packages in sets of no more than 8 in a small "snack-size" ziplock or similar type storage bag. Place a weight on top of the package to keep it from curling. Plates may be stored for up to a year.

Allow pouches to come to room temperature before opening – at least 10-15 minutes.

Do not use plates that show orange or brown discoloration.

Expiration date and lot number are noted on each package. (Example expiration date: 2007-10, would expire in the 10th month (October) of the year 2007. The lot number is also printed on individual plates.

Plating

Inoculate and spread one Petrifilm plate before inoculating the next plate.

1. Place a Petrifilm plate on a level surface.
2. Lift the top film and dispense 1 ml of sample or diluted sample on the center bottom film.
3. Slowly roll the top film down onto the sample to prevent trapping air bubbles.
4. With the smooth side down, place the plastic spreader near the top of the plate.
5. If necessary, distribute sample evenly using gentle downward pressure on the center of the plastic spreader.
6. Remove the spreader and leave plate undisturbed for at least one minute to permit the gel to solidify. Incubate plates in a horizontal position, with the clear side up in stacks of up to 20 plates. Incubator should be humidified with distilled water. Incubate 24 hours at 35°C.

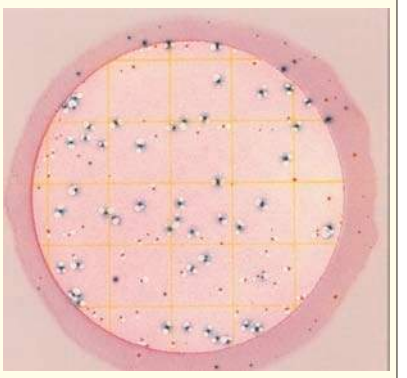
Count blue colonies with gas bubble(s) after 24 hours at 35°C

3M™ Petrifilm™ (continued)

Interpretation

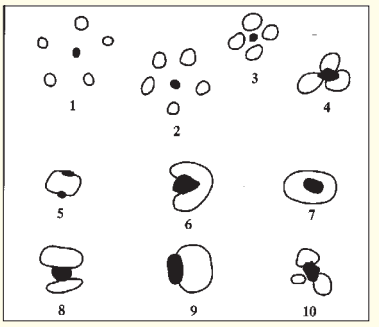
1. Petrifilm *E. coli* plates can be counted on a standard colony counter or other magnified light source. Only count colonies within circle. Do not count artifact bubbles. Approximately 95% of *E. coli* produce gas.

2. In general, *E. coli* colonies are blue to blue-purple and closely associated (approximately one colony diameter) with entrapped gas. General coliform colonies are bright red and closely associated (approximately one colony diameter) with entrapped gas (figure below). **Only count colonies that have one or more associated gas bubbles!**



This plate has 49 E. coli colonies as depicted by blue colonies with gas. (From 3M™ Petrifilm™ interpretation guide)

3. The circular growth area is approximately 20 cm^2. Estimates can be made on plates containing greater than 150 colonies by counting the number of colonies in one or more representative squares and determining the average number per square. Multiply the average number by 20 to determine total count per plate.



All 10 examples depict various bubble patterns associated with gas producing colonies. Each numbered picture would be counted as one colony. (From 3M™ Petrifilm™ interpretation guide)

4. Petrifilm *E. coli* plates with colonies that are too numerous to count (TNTC) have one or more of the following characteristics: many small colonies, many gas bubbles, and deepening of the gel color. High concentrations of *E. coli* will cause the growth area to turn blue while high concentrations of coliforms (non-*E. coli*) will cause the growth area to turn dark red. When any of these occur, you will not be able to count the sample – and should write TNTC on the data sheet. Next time, you may want to use less sample if the stream is under similar conditions.

Disposal

Place the Petrifilm plate in a sealed Ziplock or similar type bag with the Easygel plates that have already been treated with bleach. The excess bleach will spill out and disinfect the Petrifilm plates, too. Discard with regular trash.

Further Information

http://solutions.3m.com/wps/portal/3M/en_US/Microbiology/FoodSafety/products/petrifilm-plates/

Other Kits

Other kits on the market are being used for *E. coli* analysis. Appendix D (beginning on page 45) provides information on three additional kits. Further information on these and other kits can be obtained from the manufacturer or on various web sites.

Chapter 6: Sampling Results

Reading the Results

After removal from the incubation unit, colonies of bacteria with a particular color are counted. The normal incubation time is 24 hours, but if the colonies are not developed enough, wait a total of 48 hours. The E. coli colonies will stand out from general coliforms because they will turn a distinct color. The exact color depends on the test method used. Place the plate on a grid and place a white sheet of paper as a background. Count colonies that are visible to the naked eye. Be sure to have adequate lighting. Sometime it helps to use a pen to mark on the outside of the plate the colonies you have already counted. If there are more than 200 colonies per plate, report this as "too numerous to count" (TNTC) since the colonies are not considered distinct enough for an accurate reading.

The standard reporting unit is colony forming units per 100 ml of water sample (cfu/100ml). To determine the number of colony forming units (cfu) per 100 ml of water sample, the following steps should be taken:

STEP I. Count the number of colonies of the color specified in the test kits you are using and record that number:	Let's assume you counted 6 colonies
STEP II. Take the amount of sample water used and divide it into 100 since you want to report your sample per 100 ml of water:	Assume you used a 5 ml sample Thus, 100 / 5 = 20
STEP III. Now, multiply the number of colonies you counted in step #1 by the number you obtained in step #2:	6 x 20 = 120
STEP IV. You have now determined the number of colony forming units per 100 ml of sample:	120 cfu / 100 ml

Averaging Samples

If you want to obtain an average of replicate samples, and the amount of sample used varies in each replicate, you must first count the total number of colonies in each sample, add them together, and then divide by the total milliliters of sample. Then, multiply both numerator and denominator by 100 to obtain total number of colonies per 100 ml. In the example below if you simply took an average of the three replicate sample totals (1200 + 1100 + 900)/3, your answer would be 1066.6 colonies/100ml which would be incorrect.

Sample Number	**Number of ml Used**	**Colonies Counted**	**Total # / 100 ml**	**Average # / 100ml**
1	1	12	1200 / 100 ml	**12 + 33 + 45 / 1 + 3 + 5 = 90 colonies / 9ml or 10 colonies / ml** **Thus, the average equals 1000 colonies / 100 ml**
2	3	33	1100 / 100 ml	
3	5	45	900 / 100ml	

Disposal safety

After counting the colonies of bacteria on the plates, add ¼ teaspoon of household bleach using either a dropper or other dispensing unit to each plate. Be careful not to get the bleach on your hands or clothes. Place the plates in an airtight ziplock or sealable plastic bag and seal it shut. Finally, dispose of the bag in the trash. Do not be overly apprehensive with this step, since in general, *E. coli* do not pose a huge health risk.

Chapter 7: Interpreting Results

State standards

Using guidance provided by the USEPA, states have developed standards for fecal coliform bacteria and/or E. coli. Compliance is often based on the arithmetic mean of three or more samples taken during the same sampling event at representative locations within a defined sampling area or on the geometric mean based on at least five samples taken over a 30-day period or a total number of samples collected over a specified monitoring period.

State	*E. coli or* Fecal coliform	Water Use	One-time Standard	30-day Geometric Mean
Indiana	*E. coli*	Primary bathing contact. This standard only applies April to October (the recreation season). From November to March, there is no standard.	235 colony forming units (cfu)/100ml	125cfu/100ml
Iowa	*E. coli*	Full contact recreation	235 cfu/100ml	126cfu/100ml
Michigan	*E. coli*	Full body contact recreation	300 cfu/100ml (3 or more samples)	130cfu/100ml
Minnesota	*E. coli**	Full body contact recreation	1260 cfu/100ml	126cfu/100ml
Ohio	*E. coli*	Primary bathing contact	298 cfu/100ml (not exceeded in more than 10% of samples)	126cfu/100ml
Wisconsin	Fecal coliform *E. coli***	Recreational Waters Beach Closures	400 cfu/100ml (not exceeded in more than 10% of samples) 235 cfu/100ml	200cfu/100 ml 126 cfu/100ml
YOUR STATE				

**Proposed in September 2007*

***EPA Guidelines* (see page 10 for other *E. coli* standards in fresh water bodies)

Determining the geometric mean

E. coli concentrations are reported as colony forming units (cfu) per 100 ml of water sample. When measuring *E. coli* concentrations over time, using the geometric mean is a useful reporting tool. The geometric mean takes into account that a few extreme counts may be found among many more closely grouped values. Calculating a geometric mean provides a number that is more representative of the median (or that number where half the samples are higher and half are lower) and helps reduce the effect of a few extreme values. Also, use of a geometric mean over time (often 30 days) minimizes fluctuations in the levels of bacteria in the water or one-time high counts. The 30-day geometric mean helps determine if a stream has a continually high level of *E. coli*.

The geometric mean (GM) can be calculated as follows:

$$GM = (s1 \times s2 \times s3 \times sn)^{1/N}$$

Where "s" is the number of *E. coli* colonies per 100 mls for samples 1, 2, 3, though the n^{th} sample, and N is the number of samples collected.

For example, let's say you have 5 samples and your counts of cfu/100ml at one site over a 30-day period were:

5, 10, 120, 20, 2600

The geometric mean would be determined by taking the 5th root of the product of the 5 readings:

$$(5 \times 10 \times 120 \times 20 \times 2600)^{1/5} = 50$$

If you had just taken an average of the five samples for the 30-day period, your answer would be:

$$(5 + 10 + 120 + 20 + 2600) = 2755$$

and

$$2755/5 = 551$$

The simple average does not reflect the typical value of the set of numbers as well as the geometric mean does, nor does it take into account the one result that is much higher than the others.

Note: The geometric mean can only be used with positive numbers greater than zero.

Getting "high" bacteria counts

If you find a "high" bacteria count (over your state's standard for a one-time sampling), it may be a one-time event or occurrence. This information is useful, but before taking further action, you should return to the site to take more samples. When you return, pay careful attention to anything out of the ordinary at the site. Look for the presence of animals and be alert for any unusual odors. Walk the banks again to look for obvious sources of pollution (see Chapter 2), and note past and current weather conditions. Continue to sample and contact your local health agency if numbers remain high. Be sure to wear long rubber gloves while sampling and wash your hands carefully afterwards.

If you do find a high *E. coli* count what steps should you take? Generally, you should:

- ❑ Continue to monitor the site. This will help identify if there is a chronic bacteria problem or a high count resulting from a one-time event.
- ❑ If you continue to find a high count, work through your volunteer monitoring program to alert your local agency.

You may wish to alert your local watershed group or local agency about your monitoring efforts and the results so far. These groups will likely have an interest in your results regardless of whether or not you have detected a problem. They may be able to work with you on determining the possible sources of *E. coli* pollution if a problem does exist.

Tracking, storing and retrieval of data

Keep track of your *E. coli* data on a spreadsheet (electronic, if possible) or data form (see Appendix B for a sample data sheet). An electronic spreadsheet may be advantageous in that it allows for easy calculations to show ranges, pollutant loads, or to make graphs. After entering the results on your data sheet, mail or fax this to your program leader as promptly as possible.

Alternatively, you can enter the data on the *E. coli* electronic database website developed as a part of this project. It can be accessed at www.iwr.msu.edu/cmb. The site is password protected; however, the password can be obtained by emailing any of the contacts listed near the beginning of this manual.

Source tracking

One method for determining sources of *E. coli* is called bacterial source tracking. Bacterial Source Tracking (BST) is a collective group of new methodologies being developed to determine sources of fecal pollution in environmental samples. Sources of fecal pollution may come from domestic pets, cows, deer, geese, hogs, other wild animals, and humans.

If used successfully, BST methodologies have the potential to turn nonpoint (diffuse) sources into point sources. Current BST research is being driven by the recent implementation of the Total Maximum Daily Load (TMDL) concept by EPA. BST methods represent the best tools available for determining sources of fecal pollution in water and should be an integral part of any project that involves TMDL development for fecal coliform. BST methods can also be used in the design and implementation of Best Management Practices to reduce fecal loading in water.

Currently, both molecular (genotypic) and biochemical (phenotype) BST methods are under development. DNA fingerprinting has received the greatest publicity, but numerous methods show potential. Most researchers believe that some combination of BST methods will be needed to provide the most accurate and reliable source identification answers. It is doubtful that any one BST method will emerge as the "best" method for all situations.

While this is not a procedure that the volunteers will be conducting, it is a procedure to be aware of, and a possible step that state agencies might take. At this point, it is still an emerging and costly technology, even for agencies, so it is not used routinely.

Pollution prevention actions you can take

Our valued streams and rivers are subject to pollution stress from land uses in the watershed. These pollutants come from many sources, including those around our own homes. You can practice certain activities that can help reduce water pollution risks from bacteria. Some examples may include:

- Planting any bare soil with native grasses, shrubs, or other plants. The roots of these plants will help contain the soil from running off into the nearest stream.
- Cleaning up after your pet. Pet wastes can be a source of *E. coli* and excess nutrient contamination in our waterways. Pet wastes can make their way from the lawn to a river, so dispose of wastes in the toilet or trash.
- Draining roof downspouts onto vegetated areas, not on the street or pavement, so that water can soak into the ground.
- Limiting paved surfaces; landscape with rocks, plants, or gravel.
- Supporting active interaction, communication, and education between technical advisors and land users.
- Encouraging community appreciation of watershed health through community events, e.g. outdoor sports, river cleaning, and other events.

Chapter 8: Conclusions

The purpose of this training manual is to discuss sampling and monitoring techniques for E. coli and to highlight the test kits that are reliable, economical and usable by volunteers. However, it is important to keep in mind that bacteria monitoring is only one component of water quality monitoring, and that E. coli data alone do not indicate the ecological health of your stream. They do, however, provide valuable information that can be used in concert with other monitoring data to help assess overall ecosystem health.

Volunteer time is valuable, and the remarkable power of your efforts is your positive impact on the environment and the enthusiasm and commitment of your teams. By using standardized sampling and analysis procedures along with acceptable test kits, the *E. coli* data you collect as a volunteer can be very useful and utilized in various watershed programs. The bacteria monitoring data you collect and disseminate will help determine baseline conditions, provide continued data on your stream, and assist in assessing future water quality trends. It can help build partnerships with agencies and other groups from the local to federal level.

By remaining vigilant in your monitoring efforts, water quality problems can often be targeted and addressed before they become major.

Notes

Chapter 9: Resources for Further Information

Internet sites

Center for Disease Control's information on the pathogenic *E. coli* 0157:H7 www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm

The **Center for Watershed Protection** provides local governments, activists, and watershed organizations around the country with the technical tools for protecting our streams, lakes and rivers. www.cwp.org/

Volunteer Water Quality Monitoring National Facilitation Project is designed to expand and strengthen the capacity of existing Extension volunteer monitoring programs and support development of new groups. www.usawaterquality.org/volunteer/

Building Capacity of *E. coli* Monitoring By Volunteers: A Multi-State Effort is the web site that complements this training manual. www.uwex.edu/ces/csreesvolmon/EColi/index.html

EPA: **Microbiology** homepage: www.epa.gov/nerlcwww/

EPA: **National Newsletter of Volunteer Water Quality Monitoring** www.epa.gov/owow/monitoring/volunteer/issues.htm

EPA: **STORET** (short for STOrage and RETrieval) is a repository for water quality, biological, and physical data. www.epa.gov/storet/

EPA: The **Volunteer Monitor's Guide To Quality Assurance Project Plans** www.epa.gov/owow/monitoring/volunteer/qappcovr.htm

Michigan State University's **Digital Watershed**: Type in any address and obtain an aerial photograph as well as data on the watershed. www.iwr.msu.edu/dw

Purdue University's **stream delineation** site: Pick your stream from an interactive map. Click on a portion of the stream and the tool delineates the watershed of the stream from that point to upstream. pasture.ecn.purdue.edu/~watergen/owls/htmls/select_your_state.htm

U.S. Geological Survey's **Water Science Glossary** of Terms. ga.water.usgs.gov/edu/dictionary.html

Water Resources of the United States (U.S. Geological Survey) Access to water-resources data. water.usgs.gov/

Volunteer stream monitoring manuals

Volunteer Stream Monitoring: A Methods Manual, US Environmental Protection Agency www.epa.gov/volunteer/stream/stream.pdf

Volunteer Stream Monitoring Training Manual, Hoosier Riverwatch, Indiana Department of Natural Resources - http://www.in.gov/dnr/riverwatch/trainingmanual/

Volunteer Surface Water Monitoring Guide, Minnesota Pollution Control Agency http://www.pca.state.mn.us/water/monitoring-guide.html

Vermont Citizen's Guide to Bacteria Monitoring in Vermont Waters, Department of Environmental Conservation - http://www.anr.state.vt.us/dec//waterq/lakes/docs/lp_citbactmonguide.pdf

Washington State's Department of Ecology, A Citizen's Guide to Understanding and Monitoring Lakes and Streams - http://www.ecy.wa.gov/programs/wq/plants/management/joysmanual/

Watershed Watch (University of Rhode Island) - http://www.uri.edu/ce/wq/ww/Manuals.htm

Wisconsin Water Action Volunteers Citizen Stream Monitoring http://watermonitoring.uwex.edu/wav/monitoring/methods.html

Other Guides to Volunteer Monitoring can be found on the National Volunteer Monitoring website at: http://www.uwex.edu/ces/csreesvolmon/links.html

Watershed and stream management guides

A **Beginner's Guide to Water Management - Bacteria,** University of Florida edis.ifas.ufl.edu/FA103

Developing a Watershed Plan for Water Quality: An Introductory Guide (Michigan) www.deq.state.mi.us/documents/deq-swq-nps-Watershe.pdf

Getting to Know Your Local Watershed - A Guide for Watershed Partnerships www.ctic.purdue.edu/KYW/Brochures/GetToKnow.html

Indiana Watershed Planning Guide from the Indiana Department of Environmental Management, August 2003. http://www.in.gov/idem/catalog/documents/water/iwpg.pdf

Michigan Department of Environmental Quality's **Stormwater Management Guidebook** http://www.deq.state.mi.us/documents/deq-water-sw-links-SW_Management_Guidebook.pdf

Minnesota Shoreland Management Resource Guide - www.shorelandmanagement.org/quick/

Ohio **Stream Management Guide** fact sheets - www.dnr.state.oh.us/water/pubs/fs_st/streamfs.htm

Rapid Watershed Planning Handbook: A Comprehensive Guide for Managing Urbanizing Watersheds. 1999. Center for Watershed Protection. Ellicott City, MD

U.S. Geological Survey: **National Field Manual** for the collection of water-quality data water.usgs.gov/owq/FieldManual/

Wisconsin Department of Natural Resources **Runoff Management** http://www.dnr.state.wi.us/runoff/about.htm

Chapter 10: References

Frenzel, S.A. and C.S. Couvillion (2002) Fecal-indicator bacteria in streams along a gradient of residential development. Journal of the American Water Resources Association. 38:265-273.

Niemi, R.M. and J.S. Niemi (1991) Bacterial pollution of waters in pristine and agricultural lands. Journal of Environmental Quality. 20:620-627.

Overdevest, C., C. Huyck Orr, and K. Stepenuck (2004) Volunteer stream monitoring and local participation in natural resource issues. Human Ecology Review. Vol. 11(2): 177-185.

USDA Natural Resources Conservation Service photo gallery http://photogallery.nrcs.usda.gov

USEPA (1986) Ambient Water Quality Criteria for Bacteria EPA 440/5-84-002. Office of Water. Regulations and Standards. Criteria and Standards Division. January 1986.

USEPA (1996) The Volunteer Monitor's Guide To Quality Assurance Project Plans. (http://www.epa.gov/owow/monitoring/volunteer/qappcovr.htm) EPA 841-B-96-003. Office of Wetlands, Oceans and Watersheds. September 1996.

USEPA (1997) Volunteer Stream Monitoring: A Methods Manual. (www.epa.gov/OWOW/monitoring/volunteer/stream) EPA 841-B-97-003. Office of Water. November 1997.

USEPA (2002a). Water Quality Conditions in the United States: 2000 National Water Quality Inventory. EPA-841-R-02-001. August 2002.

USEPA (2002b). Implementation Guidance for Ambient Water Quality Criteria for Bacteria (Draft). May 2002 (www.epa.gov/waterscience/standards/bacteria/bacteria.pdf).

United States Geological Survey (2004). National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9 http://pubs.usgs.gov/twri

Appendix A: Glossary of Terms

Agar - A gelatinous medium on which to grow *E. coli* colonies.

CFU - Colony Forming Units (bacteria colonies).

Colony – Visible growth of microorganisms.

Culture - Growing microorganisms (i.e., *E. coli*) in a nutrient medium that encourages their growth.

Delineate - To define or portray, often by drawing.

E. coli - A species of fecal bacteria that lives in the intestinal tract of warm-blooded animals and is essential in digestion.

EPA - The U.S. Environmental Protection Agency, a government agency who's mission is "…to protect human health and the environment."

Gastroenteritis - Irritation of the digestive tract, often resulting in abdominal pain, vomiting and/ or diarrhea.

GIS - Geographic Information Systems. A software program that combines different layers of information (streams, land use, cities, counties, elevation, etc.) for analyses.

GPS - Global Positioning System. Hand-held or larger devices that triangulate your position on earth from satellites in orbit. One can take reading(s) at a sampling site, and later download this data into a software program.

Imperviousness - Impenetrable surfaces such as driveways, roads, etc.

Pathogen – A disease-causing life form such as a virus, bacterium, or other microorganism.

Replicate – Samples collected in the field in duplicate, triplicate, or more. Or samples plated in the lab in duplicate, triplicate, or more. Replicates help identify any variability in the stream or lab procedures.

TMDL - Total Maximum Daily Load. A TMDL is a regulation that specifies the sum of the pollutant contributions from point source discharges, *non-point* (diffuse) sources, and natural background levels that a water body can process and still meet water quality standards.

TNTC - Too Numerous To Count. If there are too many *E. coli* colonies on a plate, they are considered as too many or numerous to count.

Tributary - Smaller streams that feed into a larger portion of the main stream or river.

Watershed - The area of land that drains to a common water body.

Appendix B: Forms

Survey tools and other forms have been developed to help in the implementation of a volunteer monitoring program. These include: pre-post knowledge surveys given to volunteers at the start and end of the training sessions, to assessments done following the training, to those following a season of monitoring to assess user preferences in regards to using the test methods. These tools are available at www.uwex.edu/ces/csreesvolmon/EColi/SurveyTools.htm as pdf files.

Various forms have been developed for recording data, gathering information about your volunteer samplers, and keeping track of sites to be sampled and the data collected from these sites. A summary sheet that provides a step-by-step approach for sampling has also been developed. An example Data Sheet to record site conditions and bacteria data, and a Sampling Plan Summary are included beginning on the following page.

Citizens Monitoring Bacteria Data Sheet

Date ____/____/____ Volunteer ID _____

Collection Time _____:_____ (am/pm) Site ID _____

Monitor's Name _____

Stream/River Name _____

Stream Flow

❒ High ❒ Normal ❒ Low

Air Temp _____ (^{o}C)

Water Temp_____ (^{o}C)

Current Weather

❒ Clear/Sunny ❒ Overcast ❒ Showers ❒ Rain (Steady) ❒ Storm

Worst Weather in Past 48 hrs.

❒ Clear/Sunny ❒ Overcast ❒ Showers ❒ Rain (Steady) ❒ Storm

Transparency ____ (cm) or ____ (NTU) *(optional)*

Stream assessment comments and observations:

For each method, record the volume of water (in mL) used when plating the Easygel samples. Note the incubation temperature and the time samples were placed in the incubator. After incubating for 24 hours, count how many colonies you see on the plate. Repeat after 48 hours. To calculate the number of *E. coli* colony forming units (CFUs) per 100 mL, divide 100 by the number of mL of sample you used and multiply that result by the number of colonies you counted. You now have the estimated number of CFUs in 100 mL of sample. To properly average your replicates, see page 26.

Test Method	Sample Volume (mL)	Number *E. coli* colonies counted @ 24 hours	Number *E. coli* (calculated) CFU /100mL @ 24 hours	Number *E. coli* colonies counted @ 48 hours	Number *E. coli* (calculated) CFU /100mL @ 48 hours
EASYGEL – Sample 1		**A**		**A**	
EASYGEL – Replicate 2		**A**		**A**	
EASYGEL – Replicate 3		**A**		**A**	
3M Petrifilm – Sample 1	**1 mL**	**B**		**B**	
3M Petrifilm – Replicate 2	**1 mL**	**B**		**B**	
3M Petrifilm – Replicate 3	**1 mL**	**B**		**B**	

Incubation Temperature

_____^{o}C

Time Samples Placed in Incubator

_____

A = count dark blue and purple colonies; **B** = count blue (or blue-purple) colonies with gas bubbles

Comments, observations and concerns about the sample prep or the analysis (include the time samples were counted if different from 24 or 48 hours):

Citizens Monitoring Bacteria Sampling Plan

Note: *This sampling plan includes steps for both Easygel and Petrifilm tests. Volunteers may decide to just use one of the tests. The sampling plan also includes steps to take if you are sending split samples to a laboratory for comparison of results. Depending on your location, you may need to sample on Monday, Tuesday, or Wednesday to get samples shipped overnight to the lab in time for them to complete the tests.*

Before You Go Out to Sample

1. Take 3 bottles of Easygel per each site out of freezer to thaw – if rapid thawing is required, they may be rinsed in warm water.
2. Take 3M™ Petrifilm™ out of the refrigerator – 3 for each site.
3. Turn on incubator – be sure the lid is tight and that it's the correct temperature (35°C) Fill appropriate channels in plastic tray with distilled water and set in bottom of incubator. Place wire tray on top.

Take to the Sampling Site

- ❑ soap, antibacterial lotion or wipes
- ❑ plastic gloves
- ❑ waders
- ❑ cooler with ice
- ❑ Sharpie® or permanent marker (to label bottles)
- ❑ shipping containers/ice packs and forms
- ❑ sterile collection containers (one per site)
- ❑ sterile lab sample bottles (one per site)
- ❑ 2-3 data sheets (one per site) on clipboard
- ❑ 1 or 2 thermometers
- ❑ transparency tube
- ❑ sampling device with rope (if sampling from bridge)

At the Site

1. Hang thermometer where it is not in direct wind or sunlight (for air temperature reading) – it may take about 5 minutes to stabilize
2. Complete top of data sheet, stream flow stage, and stream assessment comments
3. Take water temperature (hold approximately 2 minutes in main stream flow) – record on data sheet
4. Rinse labeled sterile collection bottle (500mL bottle) three times with sample water using proper sample collection technique – lower in upside down position to a depth of 3-5 inches below the water's surface (or approximately up to your wrist), fill at an angle facing upstream – be sure your hand and or fingers are not in front of the mouth of the bottle
    - ❑ If sampling from a bridge – rinse sampling device with stream water 3 times, then collect a sample and rinse the collection bottle three times – then fill collection bottle (be sure the bucket and rope do not come into contact with the ground during this process)
5. After rinsing the bottle 3 times, collect sample and top with lid after removing from stream – place collection bottle in cooler with ice for transporting
    - ❑ If shipping samples to lab before returning home/office, SHAKE COLLECTION BOTTLE TO MIX THE SAMPLE, then fill the lab sample bottle to its shoulder from the collection bottle (DO NOT rinse the laboratory sample bottle; it may be filled with a preservative) – also put this bottle in cooler on ice.
6. Record air temperature reading on data sheet

7. Take transparency reading and record on data sheet
8. Wash hands when finished

Tips for Preparing/Plating the Samples

1. Prepare table by cleaning with bleach or isopropyl alcohol
2. Wash hands thoroughly with soap
3. Items to have at home/office "lab" station

- ❑ paper towels or Kimwipes
- ❑ isopropyl alcohol/bleach
- ❑ distilled water
- ❑ rinse/waste container
- ❑ Sharpie® or permanent marker
- ❑ gloves
- ❑ pipettes
- ❑ Petrifilm spreader

4. Set up stations for each site you sample:
   - ✓ You should have one collection bottle and one lab sample bottle **per site**
   - ✓ You should have 3 Petrifilm plates and/or 3 Easygel bottles and 3 Easygel petri dishes, and 1 pipette **per site**
   - ✓ Label Easygel bottles with site #s; label bottom of petri dishes and Petrifilm plates with site #, replicate number, date, and volume (mL) of sample to be used.
5. ALWAYS SHAKE SAMPLE BOTTLE BEFORE DRAWING A SAMPLE WITH A PIPETTE!
6. Add an appropriate volume of sample water (using a sterile pipette and drawing from the collection bottle) to the three duplicate Petrifilm plates and/or Easygel bottles. You will always use 1mL for the Petrifilm. You can chose between 0.5 mL up to 5 mL for the Easygel bottles. (Note: you can use the same pipette to transfer the sample water to each of the appropriate tests if you use sterile technique.). Each site you sample requires using a new sterile pipette.
7. Complete the Petrifilm test by using the spreader as described on page 23.
8. Complete the Easygel tests by inverting each bottle, pouring each into a separate petri dish and swirling each as described on page 22.

Incubation (Remember to write down what time incubation begins!)

- ✓ Place plated samples in incubator: Easygel petri dish (upside down) and 3M™ Petrifilm™ (right side up) – three per site. **Remember:** Easygel needs to sit for at least 45 minutes to gel before placed in incubator upside down
- ✓ After 24 hours, count *E.coli* colonies on the Petrifilm plates and Easygel petri dishes
- ✓ After 48 hours, count *E.coli* colonies on Petrifilm plates and Easygel petri dishes (*optional*)
- ✓ After use, rinse incubator with dilute bleach or distilled water and let it dry
- ✓ Dispose of petri dishes and plates in a ziplock bag with a teaspoon of bleach added

Which items need to be sterile?

- ✓ Collection bottles and any bottle sent to the lab for confirmation
- ✓ Pipettes

Don't forget to **take photos** (or have someone take photos of you) at your site and while performing the methods – these can be used for a variety of purposes!

Appendix C: Sample Training Agenda

Below is a recommended agenda for an *E. coli* volunteer monitoring workshop. We recommend that you cover these essential topics, but you may wish to add additional information of your own.

1. Introduction
2. What the Citizen Monitoring Bacteria Project is
3. Implementation of the Pre-Test Survey and Demographics Survey; Liability and Photo Release Forms
4. Bacteria 101 – What is bacteria, why should we monitor for it, what do we know about bacteria, and how do we monitor for bacteria?
5. Site selection – how to pick a site to monitor (where, how, why). Sampling frequency
6. Safety
7. How to collect a field sample – hands on; QA/QC, field replicates
8. Lab protocol – how to collect a lab sample, how to ship the sample FedEx, chain of custody, shipping instructions
9. Field parameter instructions
10. How to use the kits – hands on
11. How to use the incubator and other bacteria equipment
12. Practice reading the plates
13. Data sheets
14. Disposal of kits
15. What does the data mean – interpretation of results
16. Post-Test Survey; End of Training Volunteer Assessment; End of Training Staff Assessment
17. Contact information for questions; wrap up; hand out kits and supplies

Appendix D: Other Methods

IDEXX Colisure

Because of the equipment costs associated with the IDEXX Colisure, it was not selected for use by volunteers. However, its accuracy when compared with laboratory analyses was as good as the two methods selected.

Preparation and Setup

1. Turn on IDEXX Quanti-Tray® Sealer.
2. Label Quanti-Trays using a permanent marker. This label should include site ID, date and time of sample collection, and sample number.

Preparing the Sample

1. Water samples are collected in 100 ml plastic IDEXX bottles by filling the bottles up to the 100 ml graduation.
2. Add Colisure reagent and two drops of anti-foam solution into sample.
3. Mix thoroughly until reagent is dissolved.
4. Pour sample into Quanti-Tray.
5. Place Quanti-Tray on rubber insert, and seal with Quanti-Tray Sealer.
6. Remove from back of sealer as soon as sealing is completed.

Incubation and Interpretation

Incubate at 35 degrees Celsius for 24-48 hours. After incubation is complete, read results. Wells containing total coliforms will turn from yellow to magenta. Wells containing *E. coli* will turn from yellow to magenta and fluoresce under UV radiation. If wells appear pink or orange, return tray to incubator and reexamine in 4 hours.

After all positive wells are counted, refer to a table of Most Probable Numbers (MPN) to determine total coliform MPN and *E. coli* MPN.

Sample Disposal

Because Quanti-Trays need to be sterilized by autoclaving, used trays are stored in large Ziplock bags and returned for disposal during each subsequent sample transfer.

IDEXX Colilert

Because of the equipment costs associated with the IDEXX Colilert, it was not selected for use by volunteers. However, its accuracy when compared with laboratory analyses was as good as the two methods selected.

Preparation and Setup

1. Turn on IDEXX Quanti-Tray® Sealer.
2. Label Quanti-Trays using a permanent marker. This label should include site ID, date and time of sample collection, and sample number.

Preparing the Sample

1. Water samples are collected in 100 ml plastic IDEXX bottles by filling the bottles up to the 100 ml graduation.
2. Add Colilert reagent and two drops of anti-foam solution into sample.
3. Mix thoroughly until reagent is dissolved.
4. Pour sample into Quanti-Tray.
5. Place Quanti-Tray on rubber insert, and seal with Quanti-Tray Sealer.
6. Remove from back of sealer as soon as sealing is completed.

Incubation and Interpretation

Incubate at 35 degrees Celsius for 24. After incubation is complete, read results. Wells containing total coliforms will turn from clear to yellow. Wells containing *E. coli* will turn from clear to yellow and fluoresce under UV radiation.

After all positive wells are counted, refer to a table of Most Probable Numbers (MPN) to determine total coliform MPN and *E. coli* MPN.

Sample Disposal

Because Quanti-Trays need to be sterilized by autoclaving, used trays are stored in large Ziplock bags and returned for disposal during each subsequent sample transfer.

Coliscan Membrane Filtration

Coliscan media incorporate a patented combination of color-producing chemicals and nutrients that make *E. coli* colonies appear blue, coliform bacteria that are not *E. coli* as a pink magenta and non coliforms as white or teal-green colonies.

There are two methods of Coliscan® : Coliscan-MF (membrane filter) and Coliscan® Easygel®. Coliscan-MF uses a sterile soaked pad in Coliscan medium as platform growth. Coliscan® Easygel® forms a gelled surface on which bacteria grows.

The Coliscan-MF method can be used when the water being tested has very few coliforms and/or *E. coli*. About a half cup (115 ml) of sample water is drawn through a membrane filter apparatus that traps bacteria on the surface of the filter. The filter is placed within a small petri dish on a sterile pad saturated with Coliscan-MF. The incubated colonies grow on the surface of the filter and are then counted.

Equipment

- ✓ 1.8 - 2 ml Coliscan-MF from a 20 ml bottle
- ✓ Membrane filter apparatus with holding pad
- ✓ 1 sterile dropper
- ✓ membrane filter with grid
- ✓ 2 inch petri dish with sterile pad
- ✓ forceps or tweezers (alcohol for sterilizing)

How To Use Coliscan-MF

Preparation and Setup

1. Thaw Coliscan-MF at room temperature by removing from freezer the night before sampling. (Note: Unused MF medium may be refrozen.)
2. Carefully open petri dish and use a sterile dropper to add less than 2 ml (1.8 ml) Coliscan-MF to soak the pad in the petri dish. Replace lid. (Note: the same pipette may be used to transfer the MF medium to each petri dish – one per site – if all are done at the same time following sterile technique.)
3. Twist the funnel to remove it from the collection container. Place a sterile holding pad on the top blue circle of the container. (Note: This pad does not have to be sterile, but should be clean. Store in Gelman plastic container or Ziplock bag. Use tweezers to transfer to the blue filter top. Only one pad will be used for each day's sampling. The same pad can be used for different sites because only sterile water is passed through the membrane filter. Discard holding pad after one day's use.)
4. Wipe forceps with alcohol to sterilize. Open a sterile filter envelope and remove the membrane filter with clean forceps. Be sure to separate the filter from the 2 blue protective backings when taking the filter from the filter envelope. Handle the filter carefully with tweezers or forceps so the filter does not tear. Place the filter grid-side up on top of the holding pad on the collection container. Be sure there are no air spaces between filter and pad.
5. Firmly push the funnel back down onto the filtering device bottom to hold the membrane filter in place and to create a seal. Double check that the funnel is securely against the blue filtering plate, over the red "O" ring, and touching the bottom vessel before filtering the water. Press down firmly.
6. Attach the hose to the collection container by pushing the end of the hose onto the side port of the container. Be sure the syringe plunger is pushed in.

Preparing the Sample

1. ALWAYS SHAKE SAMPLE COLLECTION BOTTLE BEFORE DRAWING A SAMPLE WITH A PIPETTE!

   Option 2a.) Using a sterile pipette, transfer 0.25 – 5 mL of stream sample to the filter funnel, then add distilled water (about 10-15 mL) to the filter funnel and gently swirl to mix.

   Option 2b.) Using a sterile pipette, transfer 0.25 – 5 mL of water sample to a pre-labeled bottle of diluent (sterile water) and shake vigorously to mix well. Mixing the sample with 10 – 99 mL of diluent helps distribute the colonies over the membrane filter more evenly. (Note: You will calculate the number of colonies/100 ml using the original sample size, disregarding the added volume of sterile water.)

Filtering the Water

1. Create a vacuum by pulling out the plunger of the syringe or by squeezing the handle of the pump.

   The water will be pulled through the filter, depositing any microorganisms present onto the filter. If all of the sample water is not drawn through the filter after the plunger has been pulled out, remove the plunger hose from the collection container, push the plunger back in, reattach the plunger hose and pull the plunger out again
2. When the water sample has been completely passed through the filter, disconnect the syringe and remove the funnel. With clean tweezers, remove the filter (grab near the edge) and place it grid-size up directly on top of the pad in the dish which was soaked with 2 ml of Coliscan-MF earlier. Place the lid on the dish, and place the dish in the incubator.
3. The filtered water in the collection container should be emptied and the filter apparatus prepared for repeat use by sterilization.

<You now need to sterilize the filter funnel for use during your next sampling event.>

Option 1. Rinse the funnel with isopropyl alcohol and let air dry

Option 2. Immerse in boiling water for at least 5 minutes and let dry

Place caps on funnels and store filtering device in plastic bag or sealed container until next use.

Incubation and Interpretation

Incubate the prepared dish (do not turn upside down) at 35^{o}C for 48 hours. After incubation is complete, count the colonies. *E. coli* colonies appear blue, dark blue, or purple. Other coliforms appear pink/magenta and non-coliforms appear white or teal green.

Confirmation Media Double Checks for Presence of *E. coli*

When using the Coliscan MF method, if the color of a colony is in question, you can add a drop of Kovac's reagent on or at the edge of the colony in question. A bright red zone will develop within 5 seconds if the colony is *E. coli.* An unused toothpick, plastic loop or small wire may be used to transfer the drop. The red color must be observed within the first minute after transferring the drop.

Funding for this manual has been provided by:

- CSREES 406 National Integrated Water Quality Program
- CSREES Great Lakes Regional Water Project

With support from:

University of Minnesota Extension

IOWATER Volunteer Water Quality Monitoring

Michigan State University Extension

UW Extension

Wisconsin Dept. of Natural Resources

Purdue University

The Ohio State University Extension

Water Resources Center

Hoosier Riverwatch

Institute of Water Research, Michigan State University

Applying knowledge to improve water quality
Great Lakes Regional Water Program
A Partnership of USDA CSREES & Land Grant Colleges and Universities

Water Action Volunteers

CSREES USDA

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, Agreement number 2003-51130-01787. "Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture."

Appendix 3 – Documentation of Consultation

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

March 4, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Study Plans for Mussels, Water Quality, and Wood and Blanding's Turtle Nesting Habitat, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) is consolidating our comments for the three aforementioned studies received by email dated February 2 and 3, 2022.

The NPS reiterates our request for information reflected in our original study requests on April 27, 2021 for shoreline surveys and hydraulics, sedimentation, and channel change, and our August 31, 2021 comments on your draft Study Summary and Responses. The study plans reviewed here have components that would contribute important information relating to our original study requests.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System, as established by Congress in 1968 (Public Law 90-542). Under this law, the NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and its tributary, the Namekagon River, in a natural condition; to protect and enhance the exceptional natural, scenic, and cultural resources of the Riverway; and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic, cultural, recreation, and scenic/aesthetic resources. The Namekagon River is managed as part of the St. Croix National Scenic Riverway and is protected under the Organic Act.

Prior to the FERC issuing a new license, the NPS will need to evaluate the proposed license under Section 7(a) of the Wild and Scenic Rivers Act and to determine whether it will have direct and adverse effects on the values for which the river was designated. If the NPS identifies direct and adverse effects, the license/project will need to be modified to ensure that park resources are protected. The NPS study requests are needed to provide information to enable timely completion of this NPS review as well as the FERC NEPA analysis. Continuing impacts on resource values must be identified so that protection and enhancement measures can be incorporated into a new license.

Comments on Draft Study Plans

Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov to obtain all required NPS scientific research and collecting permits prior to implementing the study plans.

1. **Mussels**
   - Mussels are a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. It is our agency's understanding that drawdowns may be necessary during the proposed forty-year license period for maintenance and other purposes. Drawdowns have the potential to affect mussels that are present in the portion of riverbed that emerges during the drawdown. To better understand potential effects to mussels, additional reaches will need to be included within the impoundments, especially in the areas near the shoreline that would become exposed during a drawdown event. The study area as currently proposed includes only two riverine reaches at either end of the Project boundaries, which is inadequate to understand the presence, species, and density of mussels in the areas of the impoundments that would be most affected by a drawdown. Please add additional reaches within each impoundment to the study area. The NPS is available to consult further on identifying and prioritizing additional reaches for the purposes of this study.
   - The NPS concurs with the use of WDNR guidelines.
   - On page 3, include the NPS in the notification list, along with WDNR and USFWS, if any federally or state-listed species is observed, dead or alive. This will also be specified within the required NPS research and collecting permits.
   - When assessing and characterizing mussel habitat, researchers should reference *Aquatic Habitat Classification on the St. Croix National Scenic Riverway* by Haibo Wan et al.

2. **Water Quality Study**
   - Water quality is a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. The Wild and Scenic Rivers Act directs the NPS to protect water quality of the Namekagon (Sec. 1(b)) and work with the Environmental Protection Agency and the WDNR to eliminate or diminish water pollution of the river (Sec. 12(c)).
   - The NPS concurs with the use of WDNR protocols and the rationale for not monitoring cyanobacteria.
   - The NPS requests that sediment accumulation also be monitored. Results would provide needful baseline information and facilitate better understanding of sedimentation within the project boundaries.

3. **Wood and Blanding's Turtle Nesting Habitat Study**
   - This is another example, like the Aquatic and Terrestrial Invasive Plant study, where the effort that goes into the study could provide shoreline survey information outlined in the NPS study request; however, the draft plan does not provide enough detail on shoreline survey methods to determine if NPS needs would be met through this work.
   - The NPS-requested shoreline study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license. The NPS has responsibility to review shoreline alteration activities such as bank stabilization and small boat docks as water resources projects under Section 7 of the Wild and Scenic Rivers Act.
   - The NPS Shoreline Survey request Method 1[1] recommended a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still) and cited the High-

[1] NPS comments on the Pre-Application Document and Study Requests, dated 4/28/21, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CF9CB-66E2-5005-8110-C31FAFC91712

Definition Stream Survey (HDSS) method (Trutta, 2019)[2] used in recent FERC hydropower licensing proceedings, which enables mapping, a visual record of stream and shoreline characteristics, and data collection from multiple sensors. For any planned boat surveys of the shoreline (e.g., turtle, cultural resources, vegetation), please reconsider adopting study Method 1 proposed in the NPS shoreline survey study request to systematically evaluate, quantify, and photograph shoreline conditions including streambank conditions, bank stabilization types and conditions, docks/piers, and public access locations.

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27,2021 letter, including the shoreline survey and hydraulics, sedimentation, and channel change. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Conclusion

Thank you for your consideration of our agency's comments as you develop your final study plan. The NPS looks forward to the results of the three studies reviewed in this letter, as well as the opportunity to continue to collaborate with you throughout the licensing process. Please distribute future communications through Lisa Yager, chief of resource stewardship and education at the St. Croix National Scenic Riverway. Information will be distributed to the NPS team as appropriate through Lisa.

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

CRAIG HANSEN Digitally signed by CRAIG HANSEN Date: 2022.03.04 13:13:56 -06'00'

Craig Hansen
Superintendent

[2] Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021:
https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850582&accessionnumber=20200410-5091

Document Accession #: 20220304-5265 Filed Date: 03/04/2022

Document Content(s)

NPSCommentsProposedMusselsWQTurtles03042022.pdf.....1

WDNR did not provide comments on the Water Quality Study Plan

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

April 21, 2022

VIA Electronic Filing

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Study Plans for Relicensing**
Hayward (P-2417) and Trego (P-2711) Hydroelectric Projects

Dear Secretary Bose:

Per the request of the relicensing participants that requested studies, Northern States Power Company, a Wisconsin corporation (NSPW), developed draft study plans which are being pursued as part of the relicensing process for the Hayward (P-2417) and Trego (P-2711) Hydroelectric Projects. The draft study plans were provided to the requesting party for their comments prior to finalizing the plans and conducting the studies.

The final study plans, summarized in the table below, are attached herein and include the stakeholders' comments along with NSPW's responses to said comments. They are attached to notify each requestor what studies will be implemented during the relicensing process.

Final Study Plans for Relicensing the Hayward and Trego Hydroelectric Projects

Study Name	Requesting Entities	Attachment Name
Aquatic and Terrestrial Invasive Species Study (includes substrate and bathymetric data collection)	Wisconsin Department of Natural Resources, National Park Service, and Trego Lake District	Attachment A
Mussel Study	Wisconsin Department of Natural Resources	Attachment B
Recreation Study	Wisconsin Department of Natural Resources and National Park Service	Attachment C
Water Quality Monitoring Study	Wisconsin Department of Natural Resources	Attachment D
Wood and Blanding's Turtle Nesting Habitat Study	Wisconsin Department of Natural Resources	Attachment E

Should you have any questions, please contact Matthew Miller at 715-737-1353 or matthew.j.miller@xcelenergy.com.

Sincerely,

Scott Crotty

Digitally signed by Scott Crotty
Date: 2022.04.21 15:23:26 -05'00'

Scott A. Crotty
Senior Hydro Operations Manager

Attachments: A through E

cc: Ms. Cheryl Laatsch - WDNR (via e-mail)
Ms. Lisa Yager – NPS (via email)
Mr. Charlie Petersen – Trego Lake District (via email at tld@trego.net)

Attachment A

Aquatic and Terrestrial Invasive Species Study
(submitted as a separate file)

Attachment B

Mussel Study (submitted as a separate file)

Attachment C

Recreation Study (submitted as a separate file)

Attachment D

Water Quality Monitoring Study (submitted as a separate file)

Attachment E

Wood and Blanding's Turtle Nesting Habitat Study
(submitted as a separate file)

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Final Study Plan Work Scope 22 IHT

Aquatic and Terrestrial Invasive Species Study

Prepared for

Northern States Power Company, a Wisconsin corporation

Prepared by

meadhunt.com

March 2022

1. Introduction

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 and 2711 respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a Final License Application (FLA) to FERC no later than November 30, 2023. The FLA, in part, must include an evaluation of the existing botanical resources (including invasive species) and potential impacts to botanical resources associated with continued Project operations.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that the Licensee complete an invasive species study as part of the relicensing process.

The WDNR recommended that the Licensee conduct an aquatic and terrestrial invasive species study using the WDNR Early Detection Early Response Protocols. The WDNR also noted that additional methodology may be needed for terrestrial species, and other methodologies such as point-intercept, may be appropriate if combined with other studies. The WDNR also requested in-water plant community data within the project boundaries of each Project to provide baseline information on the condition of the aquatic plant community.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this aquatic and terrestrial invasive species (ATIS) study is to provide baseline data on native and invasive aquatic and terrestrial species. The study also provides a method for identifying newly established invading species early enough to increase chances of control and will help prevent the spread of other nearby invasive species.

2.2 Background and Existing Information

There is limited information available regarding invasive species within the Project boundaries. WDNR Lake Facts and Figures webpage identified four invasive species within the Hayward Project, including Chinese mystery snail (*Cipangopaludina chinensis*), curly-leaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), and hybrid Eurasian/northern watermilfoil (*Myriophyllum spicatum x Myriophyullum sibiricum*) are present within the Project reservoir (WDNR 2020a). NSPW has also identified purple loosestrife (*Lythrum salicaria*) within the Project reservoir during annual purple loosestrife surveys.

The WDNR Lake Facts and Figures webpage identified four known invasive species within the Trego Project including Chinese mystery snails, curly-leaf pondweed, Eurasian water milfoil and Japanese mystery snails *(Cipangopaludina japonica)*.

2.3 Nexus between project operations and effects on resources

Invasive species can be introduced to Project waters and lands through recreational activities such as boating, bank fishing, and hiking. These species, once established within the Project boundary, can be transferred downstream through water releases or to areas outside of the Project boundary by recreationists.

2.4 Study Area

The ATIS Study will encompass the upstream and downstream areas inundated by the Namekagon River that are contained within the existing and proposed Project boundaries as outlined in the Pre-Application Document (PAD). It will also encompass upland areas owned in fee by the Licensee within the Project boundary, two recreation sites owned by the City of Hayward and two recreation sites owned by the Town of Trego. The study area is depicted in Appendix 1.

2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas

Samples will be collected in locations outlined in a point intercept grid provided by the WDNR[1]. Sampling will be conducted completed once in June and once in late July or early August of 2022 to account for both early season and late season species. The sampling will be conducted completed by boat using either a pole-mounted or rope-mounted rake. The methods will be similar to approximating the protocol found in the WDNR Recommended Baseline Monitoring of Aquatic Plants in Wisconsin protocol (point-intercept protocol), including the voucher collection (see Appendix 2). The methodology will also incorporate as many parameters as applicable of those listed in Table 1, page 31 of the protocol.

One rake sample per collection site will be taken by lowering the rake to the bottom and slowly drawing it up to the surface. The sample will be inspected for the presence of invasive species as included in NR40[2]. Their presence and percentage of abundance within the sample will be recorded on a field data sheet accordingly along with the presence and percentage of abundance of native species.

Any areas that are not safely accessible will be noted in the report with one of the following reasons:

- Non-navigable (due to thick emergent plant growth or shallow water);
- Terrestrial (point intercept located in an upland area not owned by Licensee);
- Obstacle (rocks, dock, swim area);
- Temporary obstacle (temporary obstacle should be noted);
- No information (accidentally missed or inaccessible, state reason); and
- Other (provide brief description).

[1] [redacted]

[2] https://dnr.wi.gov/topic/invasives/documents/NR40plantlist.pdf.

Vouchers shall be collected for all NR40 listed aquatic and terrestrial invasive species not currently verified within each Project. Steps for vouchering invasive plant species are listed as follows:

- Take a digital photo(s) of the plant in the setting where it was found. Try to capture details such as flowers, leaf shape, leaf and stem arrangement, and fruits. Include a common object in the photo such as a dollar bill, coin or pencil for a size scale, or stand next to tall plants.
- If possible, collect 5-10 intact specimens to ensure precise identification. Try to get the root system and all leaves, as well as seed heads and flowers when present. Place in a zip-lock bag with a damp paper towel. Place on ice and store in a refrigerator as soon as possible.
- Note the location of the plant you found. If using a GPS device please note the datum being used (e.g., WGS 84 {preferred}, UTM, WI Transverse Mercator, etc.).
- Notify Applicant Representative and then complete the WDNR Form 3200-125 – Aquatic Invasive Plant Incident Report and deliver it, your photo(s), and specimens to your WDNR AIS regional coordinator as soon as possible. See: https://dnr.wisconsin.gov/topic/Invasives/report.

In the event wild rice is encountered as part of the survey, additional effort will be required to determine the extent of the wild rice beds. Additional information on bed substrates will be collected at each sample point in water depths up to 15 feet deep. Under normal point-intercept protocols, the bed substrate is classified into one of three types; muck, sand, or rock. To assist in determining habitat within the littoral zone, bed substrates will be classified into one of the following nine substrate types: clay, silt, sand, gravel, cobble, boulder, bedrock, wood, or organic. The presence of woody debris on the bottom will also be identified during the rake sampling. Water depth information collected for all survey points during the survey will be used to develop a bathymetric map of each reservoir.

Areas not included in the point intercept grid will be monitored for the aquatic invasive rapid response species identified in the ***Wisconsin Aquatic Invasive Species Early Detector Handbook*** which is included in Appendix 3. If any rapid response species are identified in any of the surveying efforts, WDNR notification as described in Section 2.5.5 below will occur.

In addition to the rake sampling, one water sample will be collected in both the reservoir and the tailwater during the July/August survey period. The water samples will be provided to the WDNR invasive species coordinator who will then analyze them for the presence of spiny water flea (*Bythotrepohes longimanus*), fishhook water flea (*Cercopagis pengoi*), and zebra mussel (*Dreissena polymorpha*).

In order to determine the presence/absence of Asian clam and other invasive macroinvertebrates, the Licensee will conduct sediment samples at all existing public boat landings. The sampling

method will involve using a shovel to scoop approximately 6 inches of sediment into a net with a maximum 3/8-inch mesh. Fine sediment will be flushed out of the net and the remaining materials will be examined for Asian clam and other invasive macroinvertebrates.

2.5.2 Upland Shorelines Not Owned by the Licensee

Upland shoreline areas not owned by the Licensee will be surveyed from a boat (or on foot from the water where the use of a boat is not feasible, i.e., shallow areas) while moving slowly along the shoreline. During the survey, the locations of course woody habitat (greater than 4 inches in diameter and five feet in length) that is in the water and/or below the high-water line will be noted for future mapping. An overall characterization of the terrestrial plant community will also be made. Invasive terrestrial plants listed in NR40 will be noted and their locations on the shoreline identified by latitude and longitude. If any terrestrial invasive plants listed in NR40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of relative abundance and the extent of the area where the species is present will be recorded for future mapping. The route traveled during the boat-based surveys will also be recorded for future mapping.

2.5.3 Upland Shorelines Owned by the Licensee and Recreation Sites

At both Projects, an "on the ground" meander survey will be conducted on upland areas within the Project boundary owned by Licensee. At the Hayward Project, a meander survey will also take place at the Hayward City Boat Landing and the Hayward City Beach recreation sites. At the Trego Project, a meander survey will also take place at the Town of Trego Boat Landing and the Town of Trego Park Boat Landing.

In addition to surveying for terrestrial invasive species, an overall characterization of the terrestrial plant community will be made. If any terrestrial invasive plants listed in NR40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of each species relative abundance and areal coverage will be recorded for future mapping. The route traveled during the meander surveys will also be recorded for future mapping.

2.5.4 Personnel Qualifications

All surveys will be conducted by an individual with prior aquatic plant identification training and experience with aquatic and terrestrial invasive species monitoring[3].

2.5.5 Information Reporting

Should monitoring reveal a new occurrence of an invasive species listed in the ***Wisconsin Aquatic Invasive Species Early Detector Handbook,*** contained in Appendix 3, the WDNR shall be notified at invasive.species@wisconsin.gov as soon as possible, but no later than five working days after its discovery[4]. The notification shall include photographs and the online WDNR Early Detection Form.

[3] The consultant(s) selected to complete the work are responsible for obtaining all NPS and WDNR Scientific collector or other permits necessary to complete the work. Contact Caitlin Nagorka at Caitlin_Nagorka@nps.gov.
[4] In addition to notifying the WDNR, the consultant shall notify the Licensee representative.

Information collected during the study will be summarized in a final report. Completed survey sheets will be appended to the report. Based upon the data collected, additional invasive species mitigation and enhancement recommendations (if any) may be included in the FLA.

2.6 Consistency with generally accepted scientific practice

The ATIS Survey follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been approved by the Commission in post-licensing compliance plans.

2.7 Project Schedule and Deliverables

Results from this study will be summarized in an ATIS Study Report. The study report will include the following elements:

- Project information and background
- Study Area
- Methodology
- Study Results
- Analysis and Discussion
- Agency correspondence and/or consultation
- Literature cited

The written report will summarize the monitoring results including the location of each species observed and their relative abundance. The information will be provided in an Excel spreadsheet format following the point-intercept protocol. The survey locations depicting the presence of aquatic invasive species listed in NR 40 will be differentiated from the locations with negative sample results. The report will also include all field sheets and completed forms for any observed new occurrences of aquatic or terrestrial species as identified in the ***Wisconsin Aquatic Species Invasive Species Early Detector Handbook***, including the verification photographs.

Several maps will be developed and presented in the report including:

1) a map showing the overall predominant species along shoreline areas including the extent of any wild rice beds;
2) a map showing the locations of coarse woody habitat;
3) a map showing the locations and identities of invasive species observed during the surveys;
4) a map showing the substrates identified during the point-intercept survey;
5) a map showing the predominant substrate type and presence or absence of woody habitat;
6) a bathymetric map of the reservoir

NSPW anticipates that field work will be completed by the end of August 2022 and the draft study report will be available by October 31, 2022.

3. Consultation

The ATIS study was requested by WDNR. As a result, the Licensee consulted with WDNR as follows:

3.1 Wisconsin Department of Natural Resources

On January 13, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the WDNR for comment. The WDNR did not respond with comments. Documentation of Consultation is included in Appendix 5.

3.2 National Park Service

On January 13, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the NPS for comment. The NPS responded via letter dated February 8, 2022, included in Appendix 5, which also includes licensee's responses.

3.3 Trego Lake District

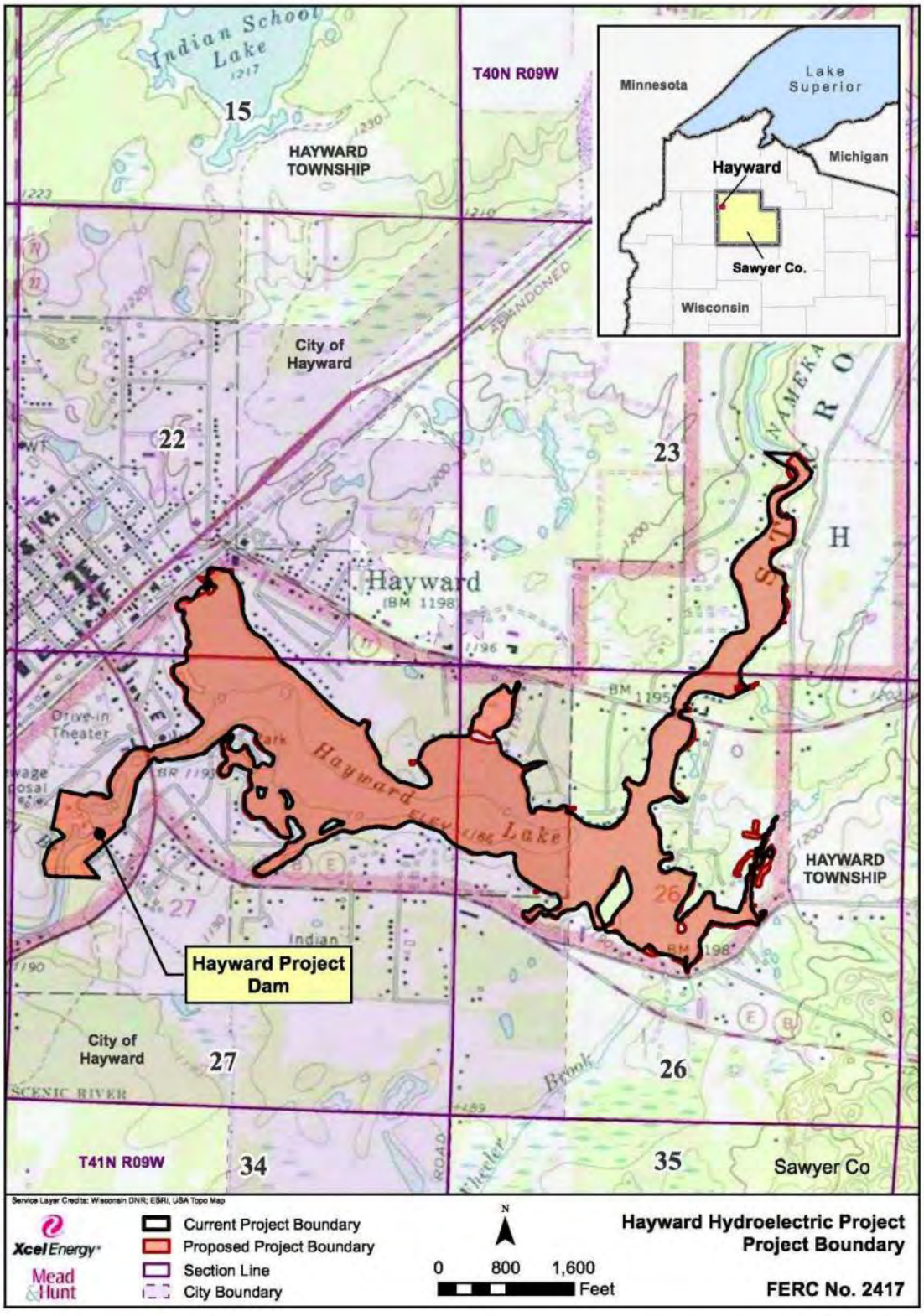
On January 13, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the ATIS plan to the Trego Lake District (TLD) for comment. The TLD did not provide comments. Documentation of Consultation is included in Appendix 5.

4. References

Wisconsin Department of Natural Resources Website. (2020a). Hayward Lake. Facts and Figures. https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2725500&page=facts. Accessed July 27, 2020.

Wisconsin Department of Natural Resources Website. (2020b). Trego Lake. Facts and Figures. https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2712000&page=facts. Accessed July 27, 2020.

Appendix 1 – Invasive Species Study Area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T40N R09W
15
HAYWARD TOWNSHIP
Minnesota
Lake Superior
Michigan
Hayward
Sawyer Co.
Wisconsin
ABANDONED
City of Hayward
22
23
Hayward
(BM 1198)
Drive-in Theater
Hayward Lake
Hayward Project Dam
HAYWARD TOWNSHIP
City of Hayward
27
26
SCENIC RIVER
T41N R09W
34
35
Sawyer Co
Service Layer Credits: Wisconsin DNR; ESRI, USA Topo Map
Xcel Energy
Mead & Hunt
Current Project Boundary
Proposed Project Boundary
Section Line
City Boundary
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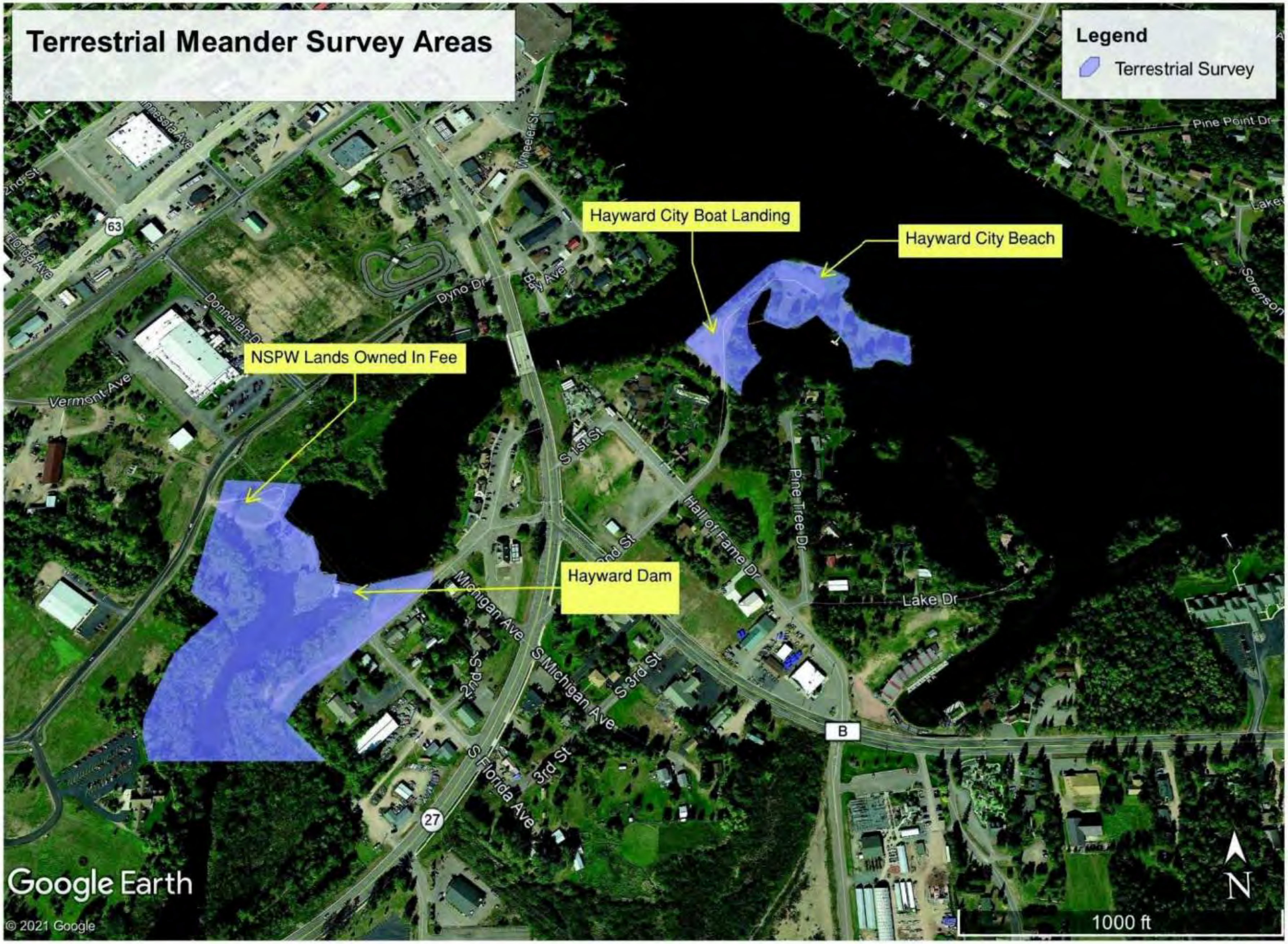
Feet
Hayward Hydroelectric Project
Project Boundary
FERC No. 2417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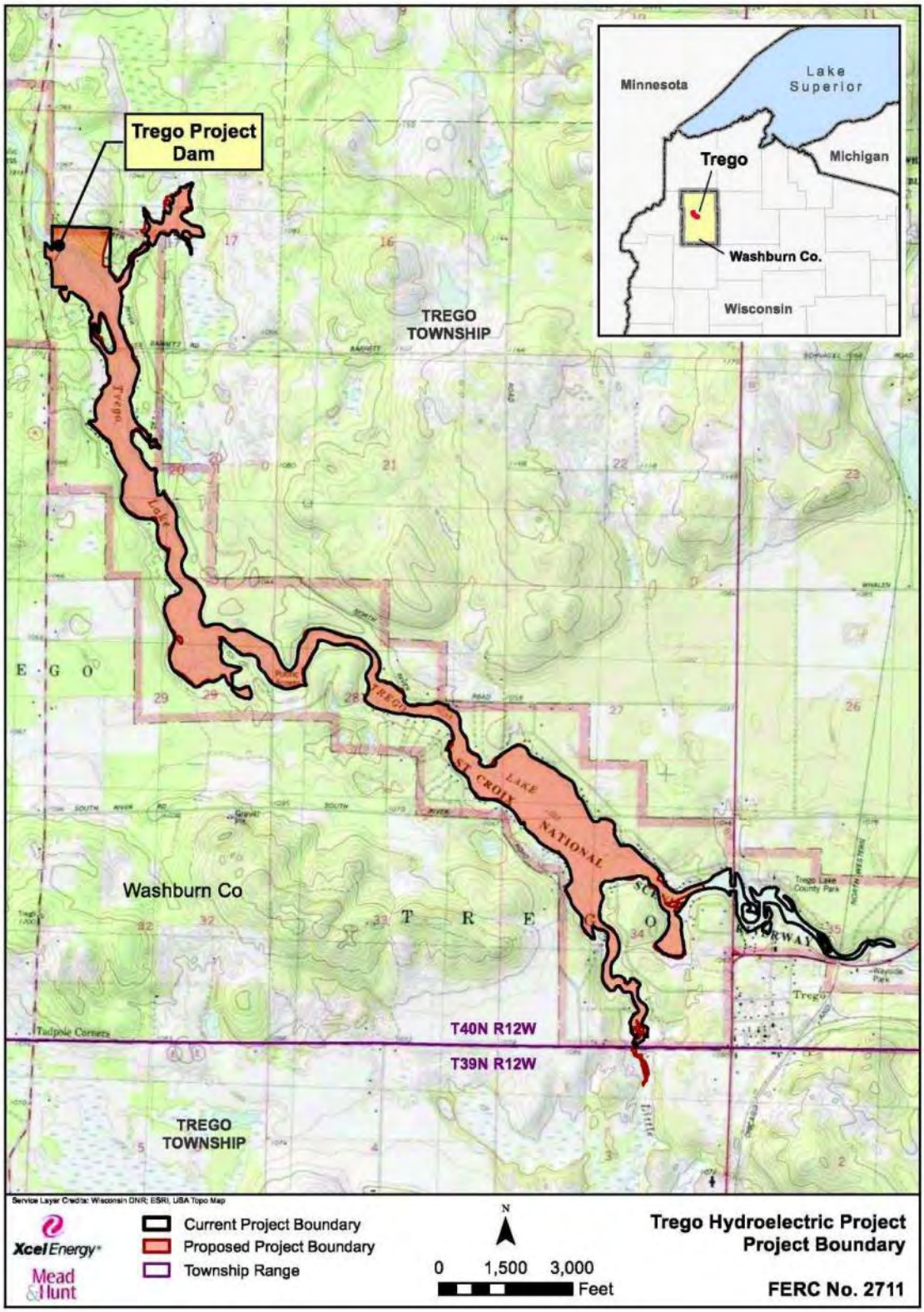
Legend
Terrestrial Survey
Hayward City Boat Landing
Hayward City Beach
NSPW Lands Owned In Fee
Hayward Dam
Pine Point Dr
Sorenson
Wheeler St
Bay Ave
Dyno Dr
Donnellan Dr
Vermont Ave
S 1st St
2nd St
Hall of Fame Dr
Pine Tree Dr
Lake Dr
Michigan Ave
S Michigan Ave
S 3rd St
2nd St
3rd St
S Florida Ave
63
27
B
N
1000 ft
Google Earth
© 2021 Google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Minnesota
Lake Superior
Michigan
Trego
Washburn Co.
Wisconsin
TREGO TOWNSHIP
Washburn Co
T40N R12W
T39N R12W
TREGO TOWNSHIP
Service Layer Credits: Wisconsin DNR; ESRI; USA Topo Map
Xcel Energy
Mead & Hunt
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Proposed Project Boundary
Township Range
N
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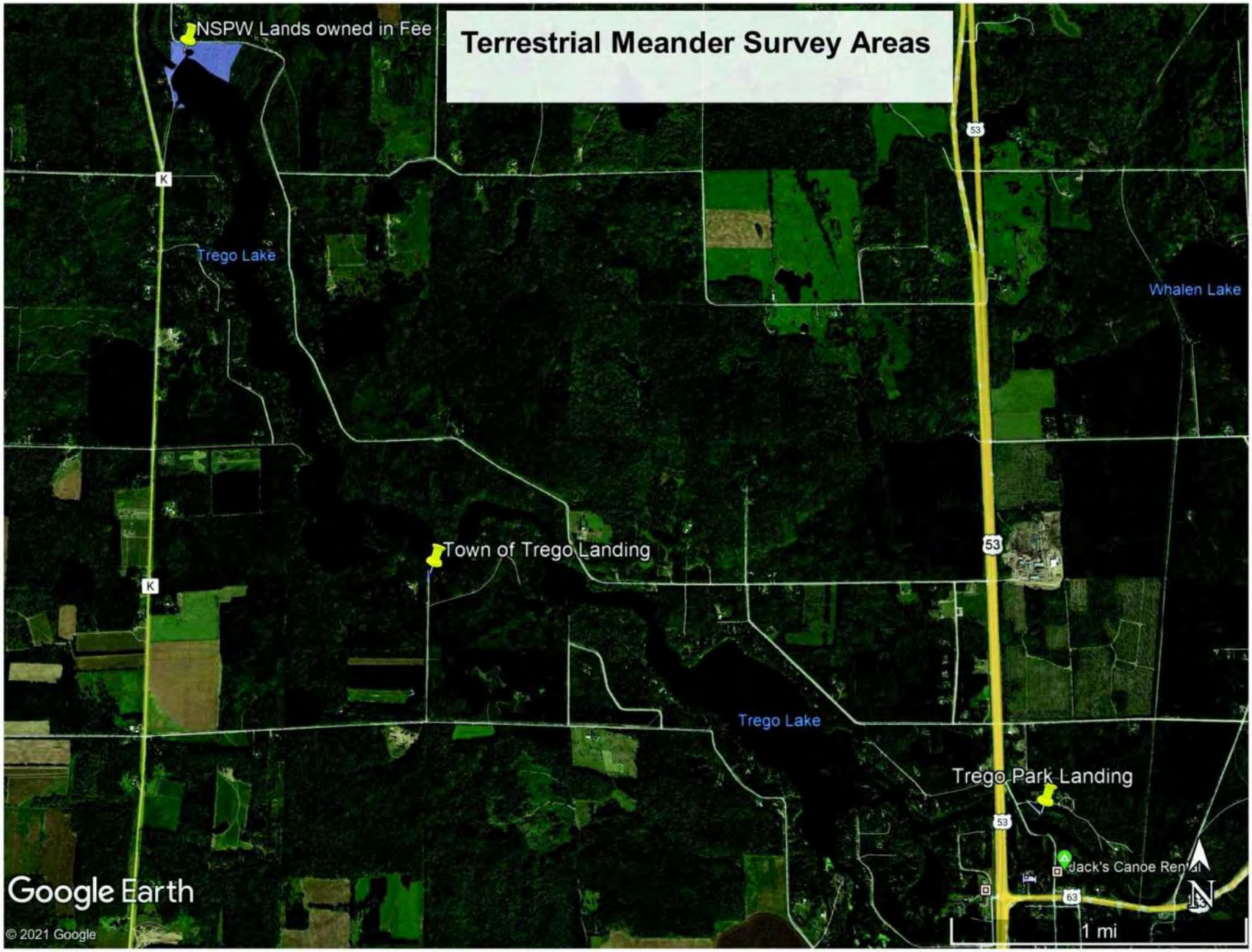
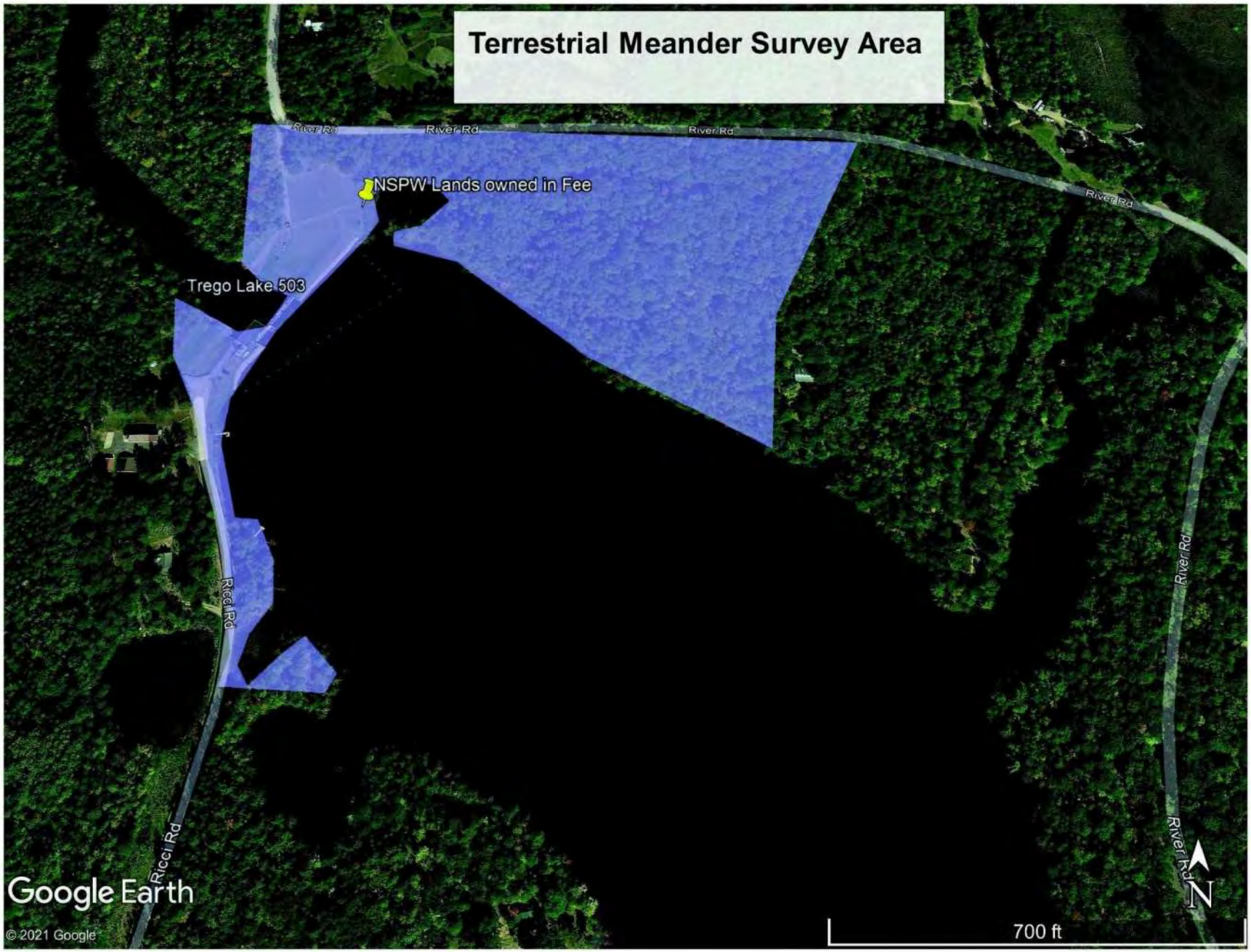
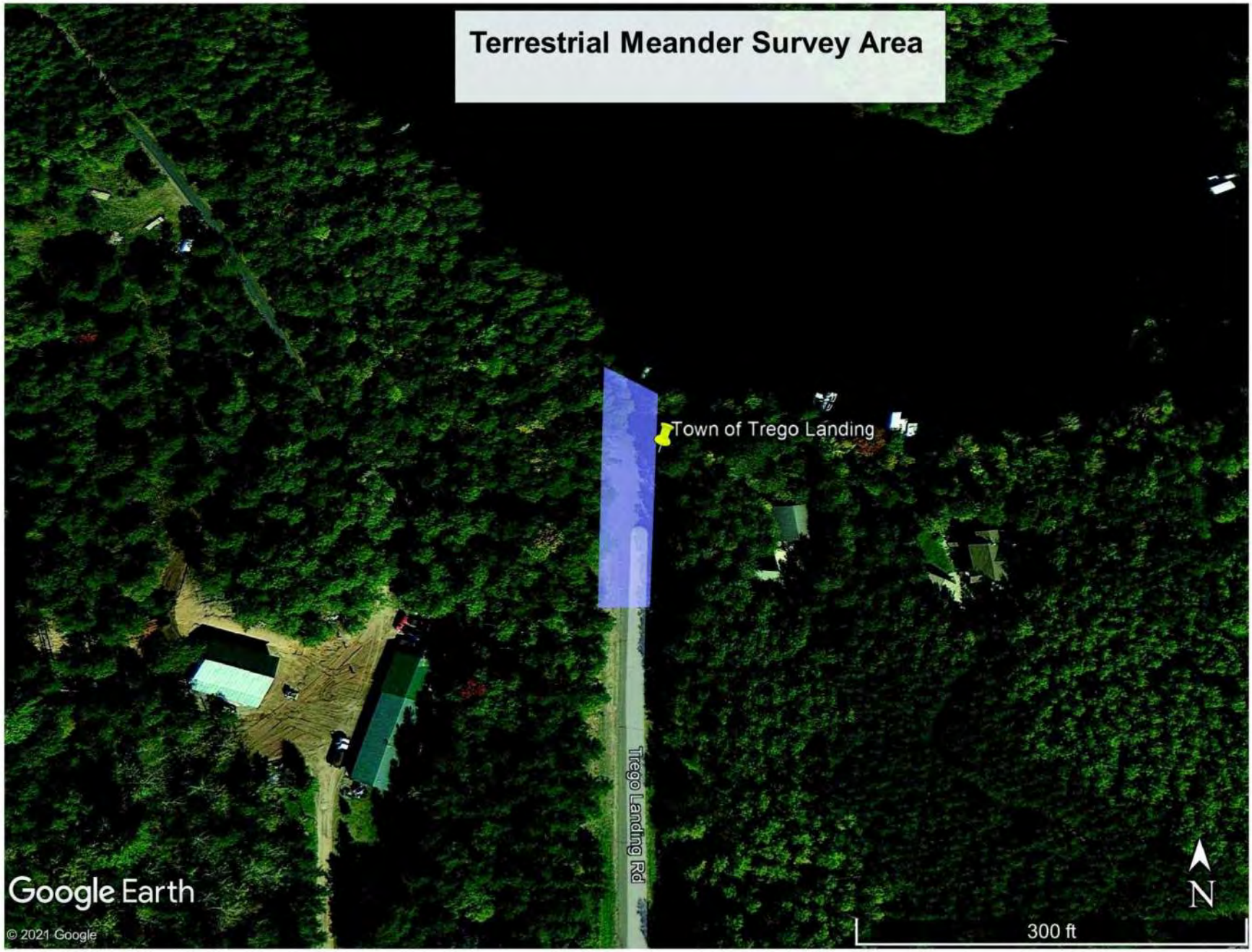
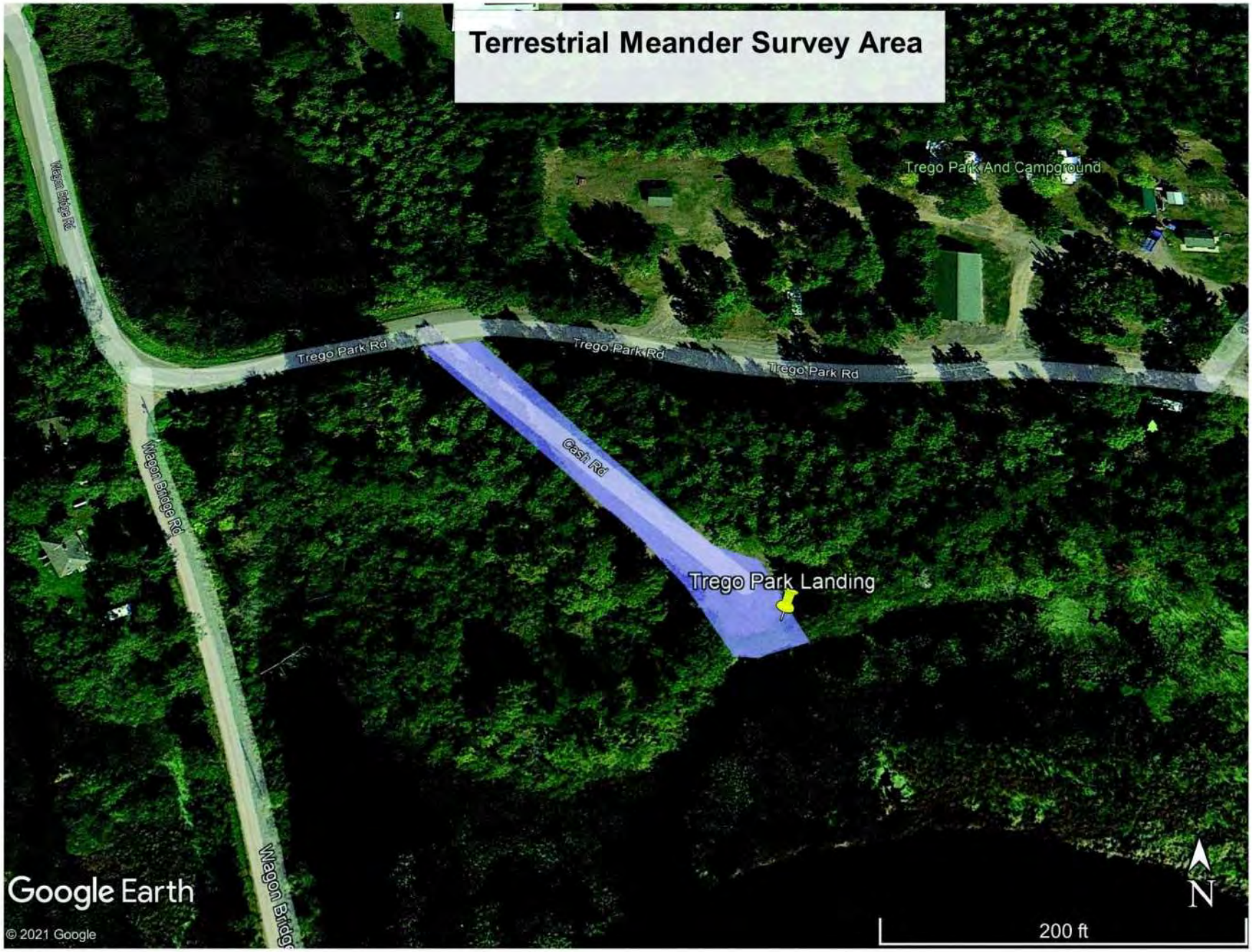
Feet
Trego Hydroelectric Project
Project Boundary
FERC No. 2711


Terrestrial Meander Survey Areas
NSPW Lands owned in Fee
Trego Lake
Whalen Lake
Town of Trego Landing
Trego Lake
Trego Park Landing
Jack's Canoe Rental
K
K
53
53
53
63
Google Earth
© 2021 Google
1 mi
N


Terrestrial Meander Survey Area
River Rd
River Rd
River Rd
River Rd
NSPW Lands owned in Fee
Trego Lake 503
Ricci Rd
Ricci Rd
River Rd
River Rd
Google Earth
© 2021 Google
700 ft
N


Terrestrial Meander Survey Area
Town of Trego Landing
Trego Landing Rd
Google Earth
© 2021 Google
N
300 ft


Terrestrial Meander Survey Area
Trego Park And Campground
Trego Park Rd
Trego Park Rd
Trego Park Rd
Wagon Bridge Rd
Wagon Bridge Rd
Wagon Bridge Rd
Cash Rd
Trego Park Landing
Google Earth
© 2021 Google
N
200 ft

Appendix 2 – Point Intercept Protocol ~~See Separate File~~

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

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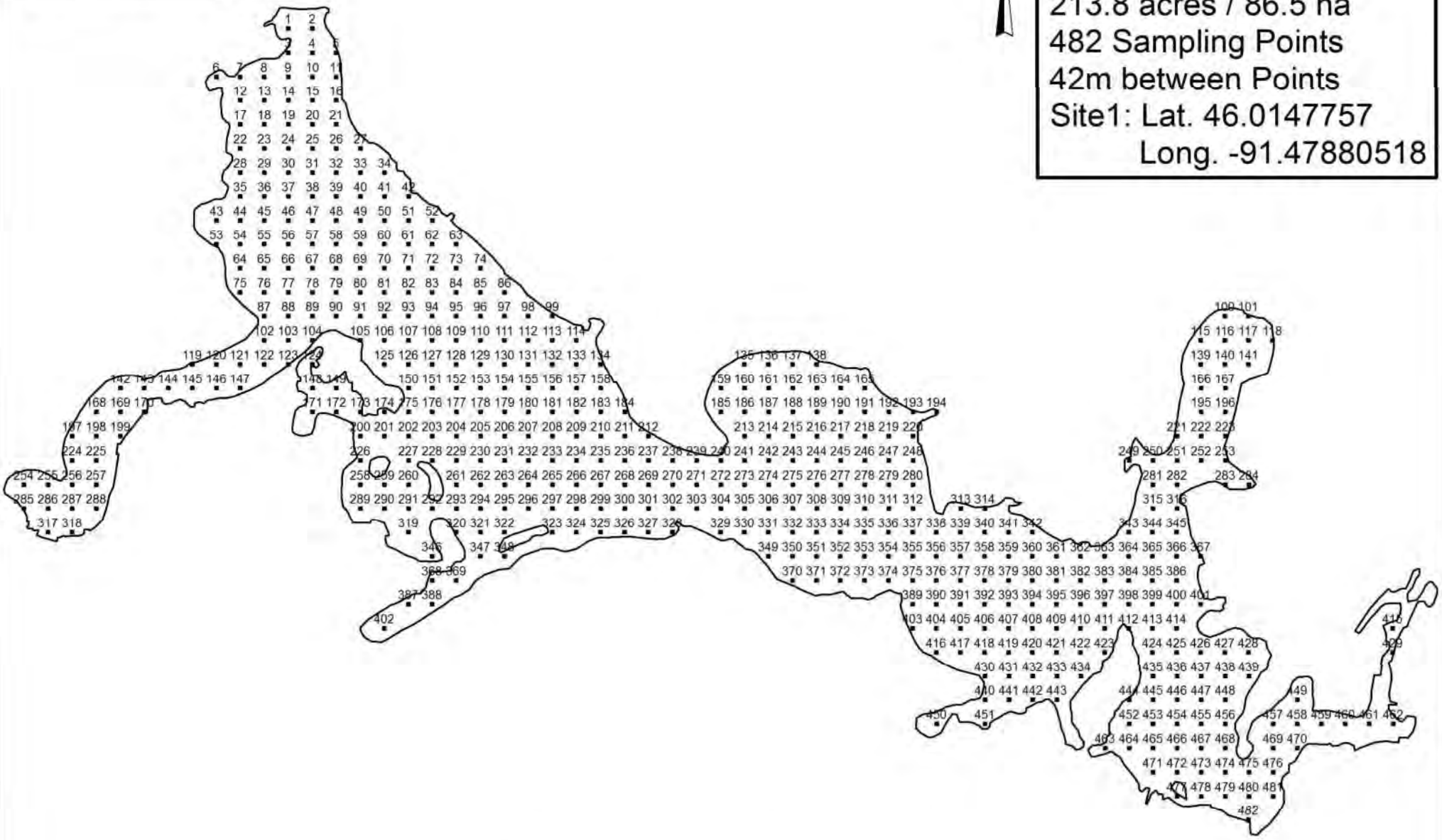
N

Hayward Lake
Sawyer County
WBIC 2725500
T41N R09W S27
213.8 acres / 86.5 ha
482 Sampling Points
42m between Points
Site1: Lat. 46.0147757
Long. -91.47880518



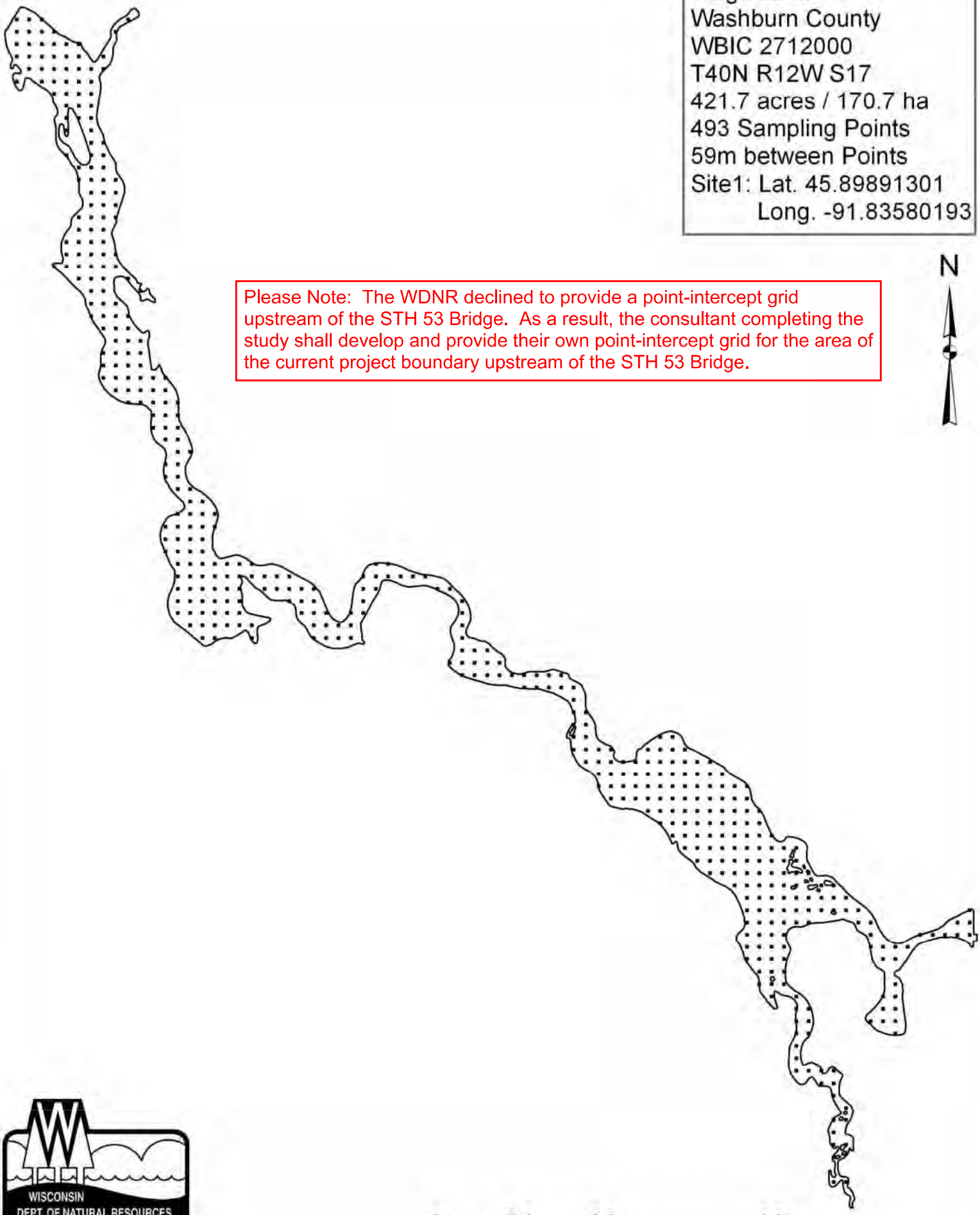
0 0.375 0.75 1.5
Kilometers

Created: 2013

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Trego Lake
Washburn County
WBIC 2712000
T40N R12W S17
421.7 acres / 170.7 ha
493 Sampling Points
59m between Points
Site1: Lat. 45.89891301
Long. -91.83580193

Please Note: The WDNR declined to provide a point-intercept grid upstream of the STH 53 Bridge. As a result, the consultant completing the study shall develop and provide their own point-intercept grid for the area of the current project boundary upstream of the STH 53 Bridge.



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Created: 2011

Recommended Baseline Monitoring of Aquatic Plants in Wisconsin:

Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell, Susan Knight, Kelly Wagner, Alison Mikulyuk, Michelle Nault, Meghan Porzky and Shaunna Chase

March 2010

Document citation:
Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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J. Hauxwell, Wisconsin Department of Natural Resources
B. Korth, University of Wisconsin-Extension
F. Koshere, Wisconsin Department of Natural Resources
A. Mikulyuk, Wisconsin Department of Natural Resources

Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

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Last Updated:
March 2010

EXECUTIVE SUMMARY

We outline a baseline monitoring protocol designed to quantitatively assess the distribution and abundance of aquatic plants in lake ecosystems. This protocol employs a point-intercept sampling design, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness. In addition, a qualitative survey is recommended to map obvious species and augment the species list generated through quantitative sampling. Application of this methodology allows: 1) assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization; and 2) comparisons of aquatic plant variables over time and among lakes. This document contains complete instructions for conducting a baseline aquatic plant survey, including details on obtaining an electronic file of site coordinates, uploading site coordinates into a Global Positioning System (GPS) receiver, conducting field work, entering data, working with data summaries, processing voucher specimens, and provides example applications of the collected data. Final products from each baseline survey will include: 1) raw data from the quantitative survey which provides individual site-by-site species distribution and rake fullness data, 2) summary statistics useful in characterizing and comparing populations, 3) additional species observations from the general qualitative survey, and 4) voucher specimens cataloguing species presence. All electronic data should be sent for long-term record-keeping to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

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INTRODUCTION

In lake ecosystems, the aquatic plant community serves as critical habitat and nursery for fish and other animals, a source of oxygen for all organisms, a refuge for prey as well as a foraging area for predators, a buffer against erosion and sediment resuspension from both waves and shoreline inputs, and can significantly contribute to overall lake primary productivity. Over the past several decades, losses of or changes in assemblages of native submersed aquatic vegetation has been a reoccurring phenomenon due to a relatively limited number of factors. Repeatedly, changes in landscapes and atmospheric conditions as a result of human activities have increasingly affected the ecology of adjacent aquatic systems, including aquatic plant communities. In addition, in-lake aquatic plant management activities have increased due to the increasing spread of invasive exotic plants[1].

The Wisconsin Department of Natural Resources (WDNR) is charged with protecting and enhancing the state's natural resources, including lake ecosystems. Given the many ecosystem services associated with aquatic plant communities as well as the recent threats to native species, it has become increasingly important to develop monitoring techniques to support science-based decision-making for effectively managing lake ecosystems. In this document, we present a quantitative, replicable monitoring protocol. Standardized, quantitative and replicable data are an essential part of strategic lake management for three reasons. First, good data allows us to better understand each individual lake; we can use survey data to produce detailed lake maps that show the locations of native, rare, or exotic plant species. Data can then be used as a baseline against which any changes in a lake associated with water clarity, exotic species introduction, water level, or lake management activity can be compared. Second, good data helps direct management by taking the conflict and guesswork out of planning. Aquatic plant management requires weighing a number of potential management options, some of which can be very costly or extensive. Baseline data allows lake groups to identify the most appropriate management options and design the best possible management plan. Additionally, by conducting quantitative comparisons between the aquatic plant communities before and after management actions, lake groups and managers may evaluate whether or not management goals were achieved. Third, by compiling and comparing survey information on lakes statewide, we are able to identify regional trends and refine our understanding of aquatic plant populations on a broader scale in both space and time.

SURVEY OBJECTIVE

In this document, we outline a baseline monitoring protocol designed to assess aquatic plant communities on a whole-lake scale. We recommend a formal quantitative survey conducted at pre-determined sampling locations distributed evenly throughout the lake, accompanied by a general qualitative survey to map obvious species and augment the species list generated through the quantitative survey. Our primary goals in adopting this methodology are to:

[1] Knight, S., and J. Hauxwell. 2009. Distribution and abundance of aquatic plants- human impacts. *In*: G. Likens (editor-in-chief), *Encyclopedia of Inland Waters*. Elsevier, Oxford, United Kingdom.

1) Collect quantitative data describing the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization for use in developing various management plans; and

2) Use the data to statistically compare aquatic plant variables over time and among lakes.

The importance of a statewide standardized protocol is that observed differences in a lake's plant community can be attributed to actual changes in the community over time, without the confounding variation that results from different field workers employing different sampling techniques.

The quantitative survey employs a point-intercept sampling design, adapted from terrestrial methods, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness ratings. Although the presence/absence data cannot be used to estimate biomass or percent cover, it is less sensitive to interannual or seasonal variations in plant abundance[2]. The method is also relatively rapid and cost-effective and can be used on the large scale to collect baseline data and statistically compare communities over time[2,3]. In summary, it has the following attributes for estimation of aquatic plant distribution and abundance:

- Systematic, quantitative, and replicable
- Appropriate for lakes that vary in depth, size, region, shoreline complexity, and vegetation distribution
- Evenly spaced distribution of sites results in a good coverage of the entire lake, precluding the random exclusion of niche habitats
- Procedural simplicity
- Inexpensive implementation
- Results are easily analyzed with scientifically rigorous statistical methods
- Spatial data preserved and can be mapped for both the managers' use and for clearly communicating distributional data with the public

These guidelines are intended to work on most lakes. However, modifications may be required if a lake is uniquely shaped so that a uniform distribution of points isn't representative (long, skinny lake shape), or if obtaining rake samples is difficult due to substrate (rocky/cobble bottom).

Please note that these are "baseline" recommendations. Additional monitoring activities may be warranted if the goal is to assess a specific management activity. For example, to gauge the ability of chemical spot-treatments to control relatively small stands of an exotic species in a

[2] Madsen, J.D. 1999. Point intercept and line intercept methods for aquatic plant management. Aquatic plant control technical note MI-02. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[3] Dodd-Williams, L., G.O. Dick, R.M. Smart and C.S. Owens. 2008. Point Intercept and Surface Observation GPS (SOG): A Comparison of Survey Methods – Lake Gaston, NC/VA. ERDC/TN APCRP-EA-19. Vicksburg, MS: U.S. Army Engineer Research and Development Center

relatively large lake, we recommend additional mapping of the beds following the pre- and post-treatment protocol available in Appendix D of the Aquatic Plant Management guide[4].

Unlike the procedures used by the Citizen-Based Lake Monitoring Network, this protocol is not designed for most volunteers. The protocol requires at least one of the field workers be an experienced plant taxonomist and able to identify most plant species in the field. Less experienced volunteers may be able to help with data recording and navigation, but without the help of a professional aquatic ecologist, volunteers may not be able to conduct an entire plant survey without a significant degree of training or study.

SURVEY OVERVIEW

Sampling Sites

This method employs a point-intercept design in which a grid of sampling sites is distributed evenly over the entire lake surface (Figure 1). Lake organizations or individuals can request an electronic file of survey sites by contacting the WDNR Lake Coordinator from their region (see Appendix 1) with the lake name and county, as well as the town, range and section (TRS) or water body identification code (WBIC). Please make requests well in advance of planned field work to allow WDNR staff sufficient time for map creation (recommend at least 1 month). WDNR staff will determine the number of sites and grid resolution based on the estimated size of the littoral zone (the area in which plants grow) and shape of the lake. Grids will be scaled to produce a greater number of sites on lakes that are larger and have more complex shorelines. Lakes with a narrow littoral zone may be assigned a comparatively high number of sampling sites to achieve sufficient survey coverage. Once created, the sampling map (Figure 1) and an associated GPS text file containing the latitude and longitude information associated with each sample site will be provided electronically by the WDNR.

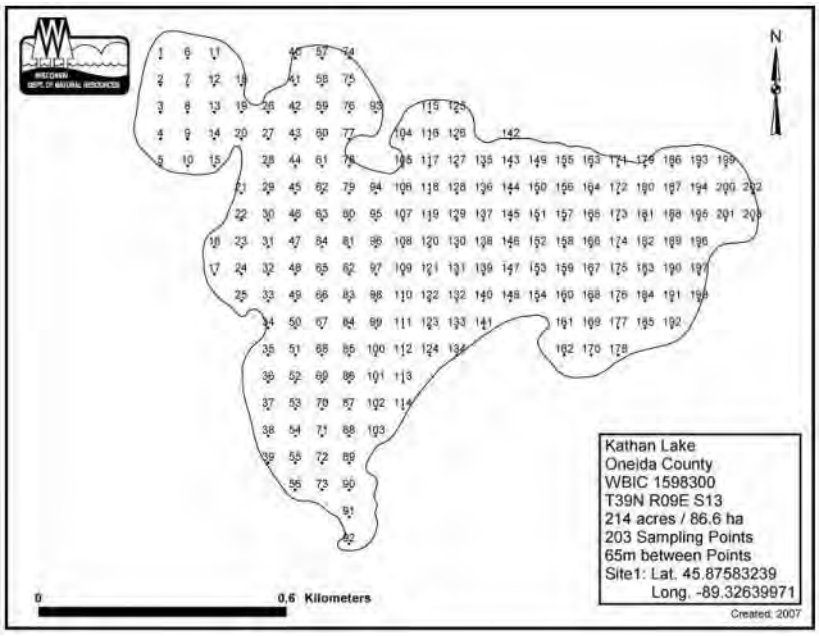


Figure 1: The point-intercept grid for Kathan Lake, Oneida County, WI, with 203 sampling sites.

Timing of Sampling

Surveys should be conducted between early July and mid August. Although certain plant community parameters (such as rake fullness and biomass) can change over the course of the

[4] Aquatic Plant Treatment Evaluation. http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-D.pdf

growing season, presence/absence data is less sensitive to seasonal variation[2]; presence can often be detected throughout the season. For many species, including Eurasian water milfoil (EWM), plant biomass and density may increase as the season progresses, whereas some species like curly-leaf pondweed (CLP), senesce much earlier in the sampling season. Rake fullness data for these species must be interpreted carefully with the sampling date in mind. If early-senescing species such as CLP are targets of management actions, please contact the WDNR Lake Coordinator in your region to coordinate the best possible sampling time.

Time Spent Sampling

Depending on the size of the lake, a survey may be completed in a few hours, or it may take several days. Ideally, a crew spends one-half to three minutes per sample site; however, this may vary depending on the following factors:

- Distance between sample sites
- Weather (i.e. wind, rain, etc.)
- Rake fullness
- Ease of navigation
- Experience; less experienced field workers may take longer to identify unfamiliar plants. However, most field workers have found that the time spent per site drops dramatically with experience. Others have reported their speed increasing greatly with a few hours of training.

PREPARING FOR FIELD WORK

Field Gear

Necessary equipment:

- Appropriate watercraft and all equipment required by state law
- Double-sided sampling rake attached to a 15-ft (4.6m) pole
- Weighted sampling rake attached to a 40-ft (12m) rope
- Handheld GPS receiver with WDNR sample sites loaded
- Print-out of lake map with WDNR sample sites
- Print-out of WDNR field datasheets on waterproof paper
- Pencils
- Sealable storage bags for voucher specimens
- Waterproof voucher sample labels
- Cooler(s) with ice for storing voucher specimens
- Depth finder

Helpful, but not required:

- Trolling motor for reaching shallow sites
- Bathymetric map
- Plant ID references or guides to aid in plant identification
- Hand lens to aid in plant identification
- Digital camera for plant specimens or field pictures
- Underwater video camera for viewing the maximum depth of plant colonization

Loading Sample Site Locations onto the GPS Receiver

Detailed instructions on loading sample site locations onto the GPS receiver depend greatly on the type of GPS receiver as well as the software used to translate site location from the text file to "waypoints" in the receiver. The WDNR commonly utilizes Garmin 76 model GPS receivers and the WDNR Garmin GPS Standalone Tool software. The WDNR Standalone Tool is only available to WDNR employees, and only works with Garmin GPS receivers. The Minnesota Garmin GPS Tool and appropriate guidance documents are available to the public and can be found online at the Minnesota DNR internet site[5]. The two programs are similar; their chief difference is that the Minnesota tool requires the GPS text file to be comma-delimited instead of tab-delimited. Procedures for other GPS models with a Wide Area Augmentation System (WAAS-capability) may be used; please refer to the manufacturer's instructions for details on uploading site locations.

Please note that storage capability varies by GPS model. Some GPS receivers are unable to store the large numbers of data sites required in some surveys. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files of sites as needed or work from multiple receivers in the field.

The instructions below describe how WDNR employees can use the WDNR Garmin Standalone Tool software to load sample site locations, or "waypoints," onto a Garmin 76 model GPS receiver.

To upload waypoints from a GPS text file to the GPS receiver, you will need:

- **PC/laptop with WDNR Garmin GPS Tool.** Your IT administrator can help you obtain and install the software.

- **GPS text file (.txt extension).** A tab-delimited text file containing the sample sites and their geographical information.

- **A Garmin 76 model GPS receiver with external data port.**

[5] Available online at: http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html (accessed September, 2009)

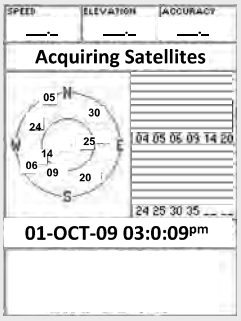
- **PC interface cable (with USB or 9-pin serial connector).** Can be purchased online at http://www.garmin.com

Step 1: Set GPS to the "Simulating GPS" Mode

Operating the receiver in "Simulating GPS" mode prevents the GPS receiver from trying to acquire a satellite signal indoors.

1. Press and hold the red [ON/OFF] button for two seconds to turn the GPS receiver on.

2. Press [PAGE] to navigate through the welcome screens until the "Acquiring Satellites" page is visible.



3. Press the [MENU] button, select "Start Simulator", and press [ENTER]; the screen heading should now read "Simulating GPS."

Step 2: Set Serial Data Format (this setting will **not** have to be re-set upon each use)

Set the serial data format on the Garmin 76 receiver to GARMIN prior to transferring data. Failure to set the serial data format to GARMIN will cause a communication error.

1. Press the [MENU] button twice to reach the main menu, use the rocker key to select "Setup", and then press [ENTER].

2. Use the rocker key to scroll left or right until the "Interface" tab is highlighted. Use the rocker key to scroll down to highlight the drop-down box and press [ENTER].

3. A menu will appear; select "GARMIN" and press [ENTER]. Press [QUIT] twice to exit the menu.

Step 3: Plug in the PC Interface Cable

1. The GPS receiver should be on and in simulation mode.

2. Plug the 9-pin serial connector cable into COM port #1 on your PC. If port #1 is in use, plug into the next available port and note the port number. The newest version of the WDNR Garmin GPS Tool (ver. 8.2.8) supports USB connectivity as an alternate to COM port connection.

3. Plug the round end of the PC interface cable into the external data/auxiliary power port under the rubber panel on the back of the GPS receiver.

Step 4: Load the GPS text file into the WDNR Garmin Standalone Tool

1. Open the WDNR Garmin GPS Tool file on your computer. Select:

   File > Load > Waypoints From > Lat-Long GPS Text File.

2. Navigate to and select the appropriate GPS text file and select OK. The waypoints will be visible in the Tool's status bar.

3. If necessary, you can view and edit waypoints by clicking the [Advanced] button on the WDNR Garmin GPS Tool.

4. Troubleshooting COM-enabled setups
   - **a.** Check that the correct COM port is selected in the WDNR Garmin GPS tool.
     - **i.** GPS > Assign Port > select correct port #
   - **b.** Check that the baud rate matches that of the GPS receiver.
     - **i.** GPS > Assign Port >Baud Rate > 9600
     - **ii.** A Garmin 76 receiver will transfer at 9600 bits per second

c. Check that the serial data format is set to "GARMIN" (see Step 2).

d. If your problem persists, please consult your GPS unit's user's manual.

Step 5: Upload Waypoint Data from the WDNR Garmin GPS Tool to the GPS receiver

1. In the menu bar, select: Waypoint > Upload

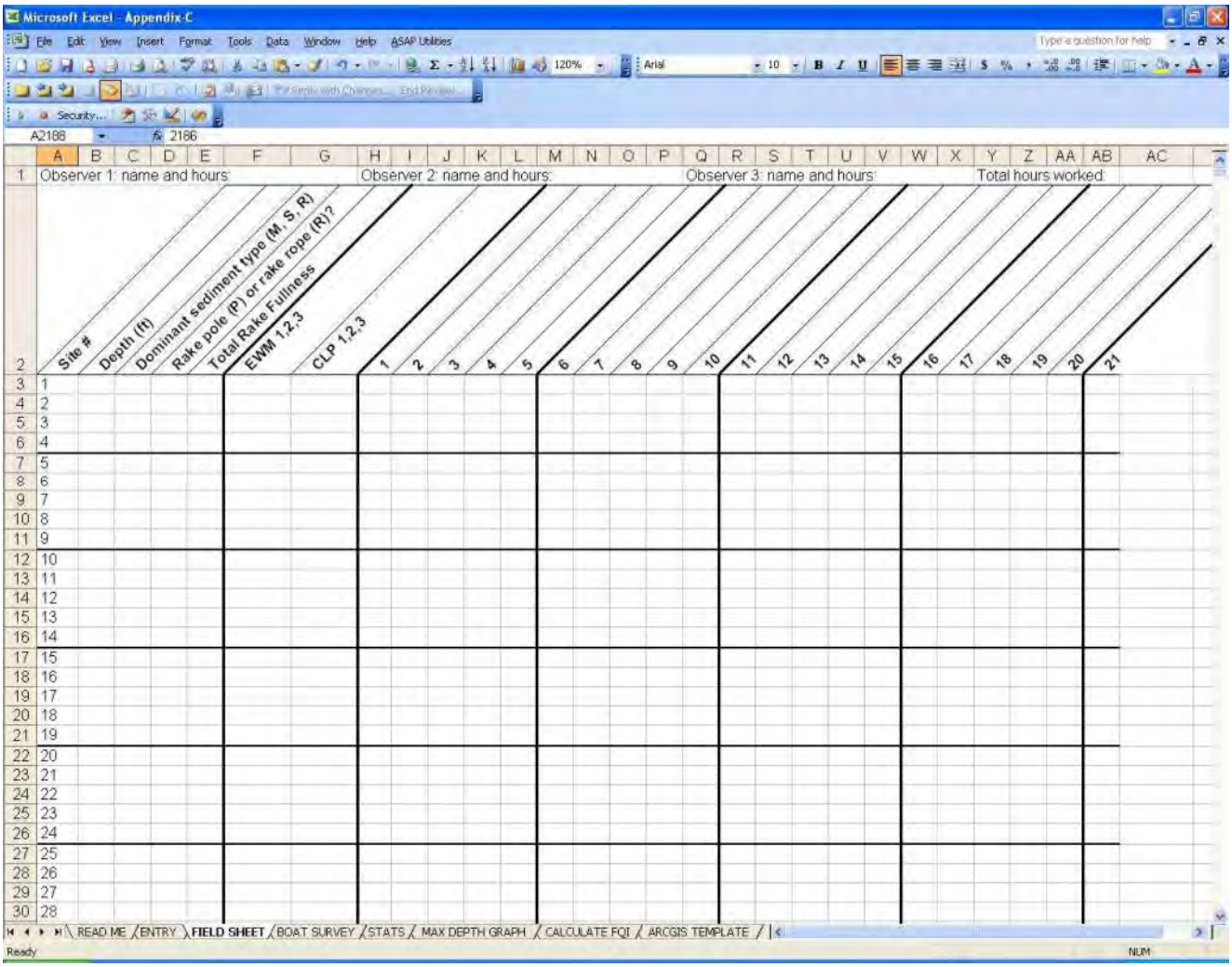
2. A pop-up window will indicate the completion of a successful upload. Click OK.

3. Check that the uploaded waypoints are visible on the GPS receiver: press [MENU] twice to get to the main menu, select "Points", press [ENTER], select "Waypoints", and press [ENTER].

4. Troubleshooting
   a. Storage capability varies by GPS model. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files as needed or work from multiple receivers in the field.
   b. For more help, please refer to the appropriate online documentation or user's manuals.

Printing Datasheets

The form used for recording data can be found on the tab labeled "FIELD SHEET" in the Aquatic Plant Survey Data Workbook, downloadable from the University of Wisconsin Extension website (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls). Print the field sheet (waterproof paper recommended), using the "Print Area > Set Print Area" function under the "File" menu to set the appropriate number of rows to print. Under Header (View > Header and Footer > Custom Header) record lake name, Waterbody Identification Code (WBIC), county and survey date.



Constructing the Rake Samplers

The rake samplers are each constructed of two rake heads welded together, bar-to-bar, to form a double-sided rake head. The rake head is 13.8 inches (35 centimeters) long, with approximately 14 tines on each side. For use in shallow waters, mount a double-sided rake head to a pole that has the capability to extend to 15 feet (4.6 meters). For use in deeper waters, attach a second double-sided rake head to a rope; this rake head should also be weighted (Figure 2).

Pole Sampler

To make the pole samplers shown in the photographs, we removed the handles from 2 standard bow rakes (available at most hardware stores), and welded the rake heads together bar-to-bar. We mounted the rake head to an 8-foot (telescoping to 15.5 feet) pool skimmer handle purchased from a supply store (left, $50). For an even sturdier sampler we purchased an aluminum Co-Handle from Duraframe Dipnet and designed a rake pole which attaches and detaches into 3 sections (right, $200). For depth recording, mark the rake handle in one-foot increments. Electrical tape marked with permanent marker, then covered with a length of clear packing tape works well and holds up over time.

Rope Sampler

A similar rake head should be constructed and attached to a 40-foot-long rope or anchor line. In order to ensure a quick vertical descent to the lake bottom, attach a light weight (~5 lb) to the rake head, away from the tines. The rope sampler pictured here has a short piece of steel tubing welded to the rake head to serve as a handle through which 45 feet of rope is attached.

Figure 2: Examples of sampling rakes used during surveys.

COLLECTING AND RECORDING FIELD DATA

Using the Rake Samplers

Collect one rake sample per sample site.

In water shallower than 15 feet deep, use the pole sampler. At each sample site, lower the rake straight through the water column to rest lightly on the bottom, twist the rake around twice, and then pull the rake straight out of the water.

In water deeper than 15 feet, drop the rope sampler straight into the water alongside the boat, drag the rake along the sediment surface for approximately one foot (0.3 m), and then pull the rake to the surface.

A large tray or bin may be used to aid in processing the entire sample.

Navigating to Sites

Accuracy

The location reported by the GPS receiver has an element of error that varies under different conditions. The total error from the GPS and your navigational error *combined* should not exceed half of the sampling resolution. Therefore, when sampling with a Garmin 76 receiver, navigate at no greater than an 80-foot zoom level and aim to completely cover the sampling site with the arrow. At 80-foot zoom, the locator arrow shown on the screen represents approximately 25 feet in length. In order to sample with acceptable accuracy, the arrow must completely cover the sample site on screen. At coarser zoom levels, because the size of the arrow remains constant, the boat may be more distant from the site even though the arrow completely covers the site. You can use a lower zoom level (120-feet is appropriate) in order to travel from site to site, but as you approach the target site, you must confirm your location at using at least the 80-ft zoom resolution to ensure you are sampling with acceptable accuracy.

Determining Maximum Depth of Plant Colonization

When sampling, you will have to determine the maximum depth at which the plants are rooted. The maximum depth of colonization (MDC) can vary greatly among lakes, from just a few feet to as deep as the physiological requirements of a species will allow. When sampling a line of sites heading from shore out to deep water, take samples until plants are no longer found on the

rake. Continue sampling at least two sites deeper to ensure you sampled well over the maximum depth of colonization. If no plants are found at these sites, simply record the depth, sampling tool used, and dominant sediment type. Leave the rake fullness and species information blank. Depending on the lake bathymetry, you may choose to continue down the same row to the other side of the lake. Use a depth finder and begin sampling again when the depth reaches that of the last (no plant) site sampled. Alternatively, if the rows are very long, you may choose to move over to the next row and sample sites back into shore, working back and forth along the shoreline and around the lake. However, if the second row is shallower than the first, be sure to start sampling sufficiently far from shore so that the depth is similar to that at which you stopped sampling in the first row. By sampling in this way, over time you will begin to hone in on the maximum depth of plant colonization.

After working several rows crossing the edge of the littoral zone, estimate the maximum depth of colonization (e.g. 20 feet) and only continue to sample deeper sites within 6 feet of this estimation (all sites ≤ 26 feet). As you complete more rows and gain confidence in your estimation, you can then begin to gradually omit sampling depths that are too deep for plants to grow. Once you have sampled the deep end of your estimated maximum depth of colonization (i.e. 26 feet) at least three times and have not found any plants, then you can discontinue sampling at anything deeper, but continue to sample any sites shallower (≤ 25 feet). If you then sample a shallower depth three times (i.e. 25 feet) and find no plants at any of those sites, you may now discontinue sampling at these deeper sites and only sample sites shallower than this new sampling depth (≤ 24 feet). Continue to successively eliminate shallower depths in sequence until you establish the maximum depth of colonization. To account for patchiness and other sources of variation, never narrow the sampling window to less than 1.5 feet of the estimated maximum depth of colonization. Use your best judgment when eliminating depths, and remember that plant distribution may be uneven and that different areas of a single lake may have plants growing relatively deeper or shallower. It is good practice to err on the side of oversampling.

Recording Data

Completing the Field Sheet

1. General site information
   Complete the top portion of the "Field Sheet" with the lake name, county, WBIC, date, names of observers, and how many hours each person worked during the survey.

2. Site number
   Each site location is numbered sequentially. Each site number will have one row of data on the "Field Sheet."

3. Depth
   Measure and record the depth to the nearest half-foot increment at each site sampled, regardless of whether vegetation is present. The pole mounted rake and rope sampler should be marked to measure the depth of water at a sample site. However, a variety of options exist for taking depth measurements, including sonar handheld depth finders (trigger models) and boat-mounted depth finders. If you are using a depth finder, it is useful to know that the accuracy may decrease greatly in densely vegetated areas. Depth finders sometimes report the depth to the top of the vegetation instead of to the sediment surface. In most cases, it is best to use depth markings on a pole-mounted rake for shallow sites.

4. Dominant sediment type
   At each sample site, record the dominant sediment type based on how the rake feels when in contact with the sediment surface as: mucky (M), sandy (S), or rocky (R).

5. Pole vs. Rope
   Record whether the pole (P) mounted rake or the rake-on-a-rope (R) was used to take the sample.

6. Rake fullness
   At each site, after pulling the rake from the water record the overall rake fullness rating that best estimates the total coverage of plants on the rake (1 - few, 2 - moderate, 3 - abundant; see Figure 3). Also identify the different species present on the rake and record a separate rake fullness rating for each. Account for plant parts that dangle or trail from the rake tines as if they were fully wrapped around the rake head. The rake may dislodge plants that will float to the surface, especially short rosette species not easily caught in the tines. Include the rake fullness rating for plants dislodged and floating but not collected on the rake. Record rake fullness ratings for filamentous algae, aquatic moss, freshwater sponges, and liverworts, but do not include these ratings when determining the overall rake fullness rating. While at a site, perform a brief visual scan. If you observe any species within 6 feet (2m) of the sample site, but not collected with the rake, record these species as observed visually ("V") on the field sheet. These species will be included in total number of species observed.

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

Figure 3: Illustration of rake fullness ratings used during the survey.

7. Species names

   Note that the field datasheet does not include any species names, except for EWM (Eurasian water milfoil) and CLP (Curly-leaf pondweed). The sampling crew must write the species name in subsequent columns the first time that species is encountered. Names must be re-written on successive field sheets as they are encountered. You may use common or Latin names, but be sure there is no ambiguity in the name that will present problems during data entry. The use of standard abbreviations can greatly shorten this process. It is generally safe to shorten the names to include the first three letters of the genus name followed by the first three letters of the species name (i.e. *Ceratophyllum demersum* = CerDem).

8. Inaccessible sites

   It may be impossible or unsafe to reach some sample sites. Where the water is very shallow, rocks are present, or dense plant growth prevents navigation, field workers should attempt to access the site as long as doing so is safe and relatively practical. It is often possible to reach difficult sites by using oars or poling; however, keep safety in mind and practice good judgment. Do not get out and drag the boat through mucky sediment to reach a site. If the sampling site is shallow but the substrate is firm, you may be able to walk to the site from shore or from the boat. If you cannot access a site, leave the depth blank and record the appropriate comment on the field datasheet from the list below. Remember to also transfer these to the "Comments" column of the ENTRY sheet (see data entry section):

a. NONNAVIGABLE (PLANTS)

1. Sample site cannot be accessed due to thick plant growth.
2. Aquatic plants that are visible within 6 feet of a non-navigable sample site (e.g. water lilies, cattails, bulrushes, etc.) should be recorded as visuals (V) on the datasheet.

b. TERRESTRIAL

1. Sample site occurs on land (including islands).
2. Aquatic plants visible within 6 feet of a terrestrial sample site (e.g. water lilies, cattails, bulrushes, etc.) may be included in the general boat survey list, but should not be marked as visuals (V) on the datasheet.
3. Only species rooted in water should be recorded as present or as part of the boat survey.

c. SHALLOW

1. Sample site is in water that is too shallow to allow access.
2. Aquatic plants that are visible within 6 feet of a shallow sample site should be recorded as visuals (V) on the datasheet.

d. ROCKS

1. Sample site is inaccessible due to the presence of rocks.

e. DOCK

1. Sample site is inaccessible due to the presence of a dock or pier.

f. SWIM AREA

1. Sample site is inaccessible due to the presence of a designated swimming area.

g. TEMPORARY OBSTACLE

1. Sample site is inaccessible due to the presence of a temporary obstacle such as a boater, swimmer, raft, loon, etc.
2. If possible, try to revisit this site later on during the survey once the temporary obstacle has moved.

h. NO INFORMATION

1. No information is available about the sample site because it was not traveled to (inaccessible channel, accidently omitted during survey, skipped due to time constraints, etc.).

i. OTHER

1. Site was not sampled for another reason; please provide a brief description.

9. Filling Out the Boat Survey Datasheet

Often there will be localized occurrences of certain species (e.g., floating-leaf or emergent species) that are missed by the point-intercept grid. For areas that are outside the grid or in between sampling sites, record the name of the plant and the closest site to the plant. This information will be entered into the "BOAT SURVEY" section of the data entry file. Emergent near-shore vegetation should only be recorded if it's rooted in water.

Collecting and Identifying Voucher Samples

Voucher each plant species for verification and identification. You can often use plants collected on the rake as vouchers. However, if the sample is of poor quality or lacks reproductive structures, attempt to collect a better specimen. If a better specimen is unavailable, voucher and press what you are able to collect. Remember that the more material collected, the easier identification will be. Whenever possible, collect at least two specimens, and include reproductive material such as seeds, flowers, fruit, roots, etc. Place the voucher plant into a re-sealable plastic bag with a waterproof voucher label. The voucher label should include the species name, or in the case of unknown species, a unique identifier, the lake name, county, sample site, sediment type, collector's name, and the date. Additional information about habitat or co-occurring species may also be included on the tag. Place all specimens in a cooler for transport to the lab. See below, "Pressing Plants" for instructions once back at the laboratory.

Plant Identification and Troublesome Taxa

1. Plants should be identified to species whenever possible. Certain genera, including *Carex*, *Sparganium*, and *Sagittaria* must be flowering and/or fruiting to confirm identification and may not be identifiable to species without these parts.

2. Non-angiosperms such as *Chara* or *Nitella* are identified to genus only. Often, *Isoetes* can be identified to species by looking at spores, if present. Filamentous algae, aquatic moss, and freshwater sponge can be referred to simply as algae, moss, and sponge.

3. If a plant cannot be identified in the field, place the two voucher specimens in a re-sealable bag with a separate voucher label. Take these specimens back to the lab to verify the identity. The label should include a unique identifier, lake, county, the sample site number, and sediment type. The presence and fullness of the species should be recorded on the field datasheet under the same unique identifier name listed on the voucher label.

4. In the lab, try to identify the plant using plant identification keys and a stereo microscope. If you are still uncertain of the identity of the plant, contact a DNR biologist in your region to help with identification. Do not send specimens to an expert until you notify them of your intended shipment and they have instructed you to do so. Once the plant is identified, record this information so that the correct identification is used during data entry.

ENTERING DATA ELECTRONICALLY

Worksheet Descriptions and Instructions

The Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls) contains eight worksheets:

1. READ ME

   Provide a brief description of the six other worksheets included in the workbook.

2. FIELD SHEET

   The FIELD SHEET should be printed on waterproof paper for recording the field data.

3. ENTRY

   a. There are many formulas embedded in the ENTRY sheet that allow for the statistical calculations on the STATS sheet. Thus, **DO NOT add or delete columns or rows on the ENTRY or STATS sheets**.

   b. Data collected in the field is recorded on the FIELD SHEET and afterwards transferred to the electronic ENTRY sheet.

   c. Copy latitude and longitude information for the sample sites from the GPS text file and paste into the appropriate columns of the ENTRY sheet.

   d. Record the lake and county name, WBIC, survey date, and the names of the field workers.

   e. There is a column for comments on the ENTRY sheet. Please use the standardized comments discussed on page 18 of this protocol.

   f. Species' Latin names appear alphabetically in the first row of the spreadsheet. Species such as aquatic moss, freshwater sponge, filamentous algae, and liverworts are listed separately at the end of the alphabetical list.

   g. Additional species not already listed should be added in the columns at the end of the alphabetical list (sp1, sp2, etc.). Any vouchered specimens that are awaiting ID confirmation should be entered here as well. You should use the same unique voucher identifier established in the field to for ease of updating the information.

h. We strongly recommend double-checking the electronically entered data against the original field datasheets to ensure that no errors or omissions occurred during the entry process.

4. BOAT SURVEY

a. Enter information on plants observed during the survey that were observed more than 6 feet away from a sample site.

b. Additional comments about field conditions, known management activities, or other observations can also be recorded in this worksheet.

5. STATS

The STATS worksheet automatically calculates summary statistics using the data entered into the ENTRY worksheet (see Appendix 2, Table 1). There are several summary calculations including:

a. Individual Species Statistics:

i. **Frequency of occurrence within vegetated areas (%)**: Number of sites at which a species was observed divided by the total number of vegetated sites. Frequency of occurrence is sensitive to the number of sample sites included. Including non-vegetated sites will lower the frequency of occurrence.

ii. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of sites a species was observed at divided by the total number of sites shallower than maximum depth of plants.

iii. **Relative frequency (%)**: This is a proportional value that reflects the degree to which an individual species contributes to the sum total of all species observations. The sum of the relative frequencies of all species is 100%. Relative frequency is not sensitive to whether all sampled sites, including non-vegetated sites, are included. Relative frequency does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts.

iv. **Relative frequency (squared)**: This value is only part of a calculation and is not used directly.

v. **Number of sites where a species was found**: This is the sum of the number of sites at which a species was recorded on the rake.

vi. **Average rake fullness**: Mean rake fullness rating, ranges from 1-3.

vii. **Number of visual sightings**: This is the total number of times a plant was seen within 6 feet of the boat, but not collected on the rake.

viii. **Present (visual or collected)**: Automatically fills in “present” if the species was observed at a sample site.

b. **Summary Statistics:**
   i. **Total number of sites visited**: Total number of sites where depth was recorded, even if a rake sample was not taken.
   ii. **Total number of sites with vegetation**: Total number of sites where at least one plant was found on the rake.
   iii. **Total number of sites shallower than maximum depth of plants**: Total number of sites where the depth was less than or equal to the maximum depth at which plants were found. This value is used for frequency of occurrence at sites shallower than maximum depth of plants.
   iv. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of times plants were recorded at a site divided by the total number of sites sampled that were shallower than the maximum depth of plants.
   v. **Simpson's Diversity Index**: A nonparametric estimator of community heterogeneity. It is based on relative frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.
   vi. **The maximum depth of plants**: This is the depth of the deepest site sampled at which vegetation was present. Please note that this value does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts. See "MAX DEPTH GRAPH" below for more information.
   vii. **Number of sites sampled using rake on rope (R)**
   viii. **Number of sites sampled using rake on pole (P)**
   ix. **Average number of all species per site (shallower than max depth)**: Mean number of species found at sample sites which were less than or equal to the maximum depth of plant colonization.
   x. **Average number of species per site (vegetated sites only)**: Mean number of species found at sample sites were vegetation was present.
   xi. **Average number of native species per site (shallower than maximum depth)**: This does not include Eurasian water milfoil, Curly-leaf pondweed, Purple loosestrife, Spiny naiad, or Reed canary grass.
   xii. **Average number of native species per site (vegetated sites only)**
   xiii. **Species richness**: Total number of species observed not including visual sightings. Please note that this value does not include aquatic moss, freshwater sponges, filamentous algae, or liverworts.
   xiv. **Species richness (including visuals)**: Total number of species observed including visual sightings recorded within 6 feet of the sample site (but does not include additional species found during the boat survey).

6. MAX DEPTH GRAPH

The maximum depth of colonization is an important metric to characterize accurately, as it can indicate changes in water clarity and water quality over time. This worksheet automatically displays a histogram of plant occurrences by water depth. Occasionally, unrooted plants floating in the water column are snagged by the rake, which can sometimes result in an inaccurate estimation of the maximum depth of colonization. It is

important to examine the reported maximum depth of plant colonization in order to detect potential outliers. As a general rule, a single plant occurrence reported at a site which is 2 or more feet deeper than the next shallowest site with plants is considered an outlier, and should be excluded when determining the maximum depth of plant colonization (see Figure 4).

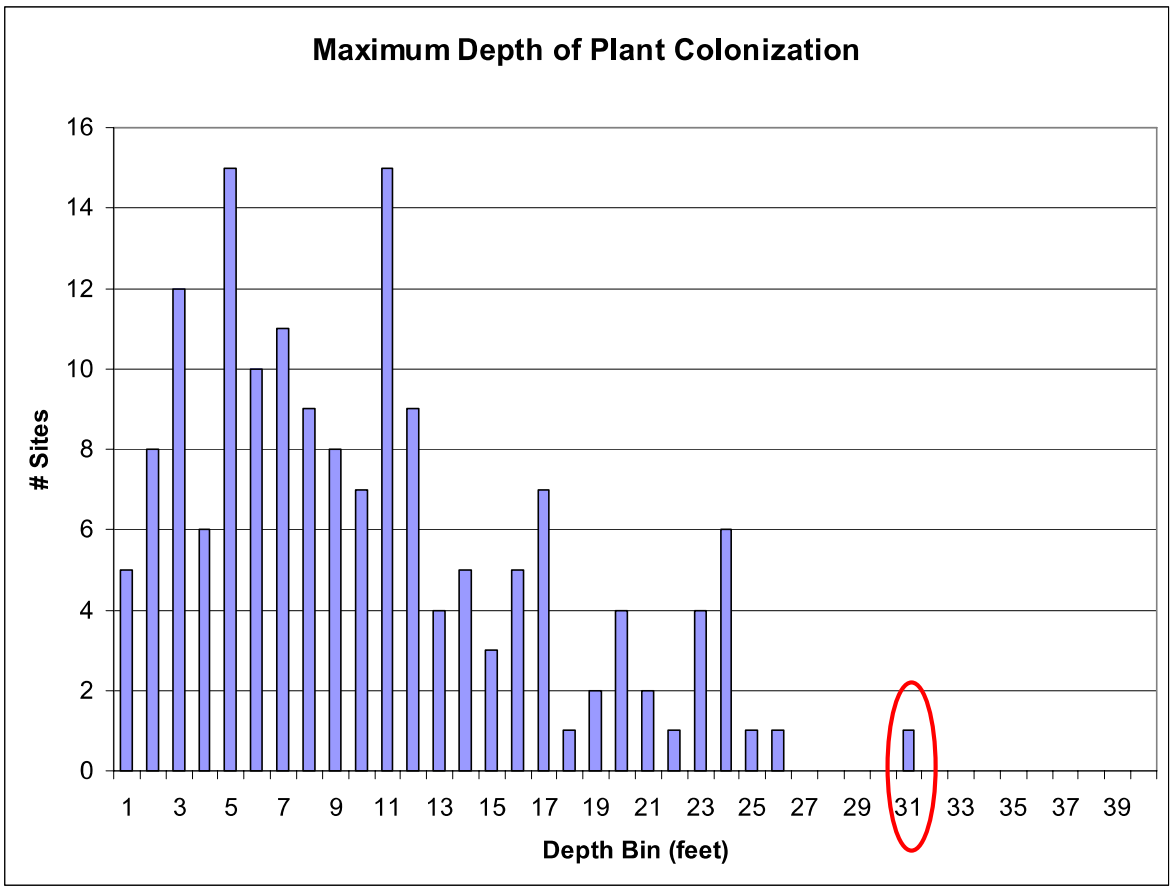


Figure 4: Distribution of plant occurrences versus water column depth. The value circled in red is more than 2 feet deeper than all other plants found during the survey, and is considered an outlier. Outliers should be omitted when determining the maximum depth of plant colonization.

It is necessary to delete the occurrence of this outlier from the ENTRY spreadsheet so that the automatically-calculated statistics will reflect the revised maximum depth of colonization. To do this, locate the sampling point number on the ENTRY worksheet where the outlier was found. Scroll across the row until you find the outlier to omit. Once you've located the cell with the outlier, press delete to clear the cell. Right click on the cell and select "Insert Comment". Briefly describe the occurrence of the outlier and the reason for omitting it. Follow the same steps with the overall rake fullness column, deleting out the contents of the cell and including a brief comment. Please also include information regarding any omissions of outliers and revised MDC directly on the STATS spreadsheet, typing all comments in the space below "See Max Depth Graph Worksheet to Confirm".

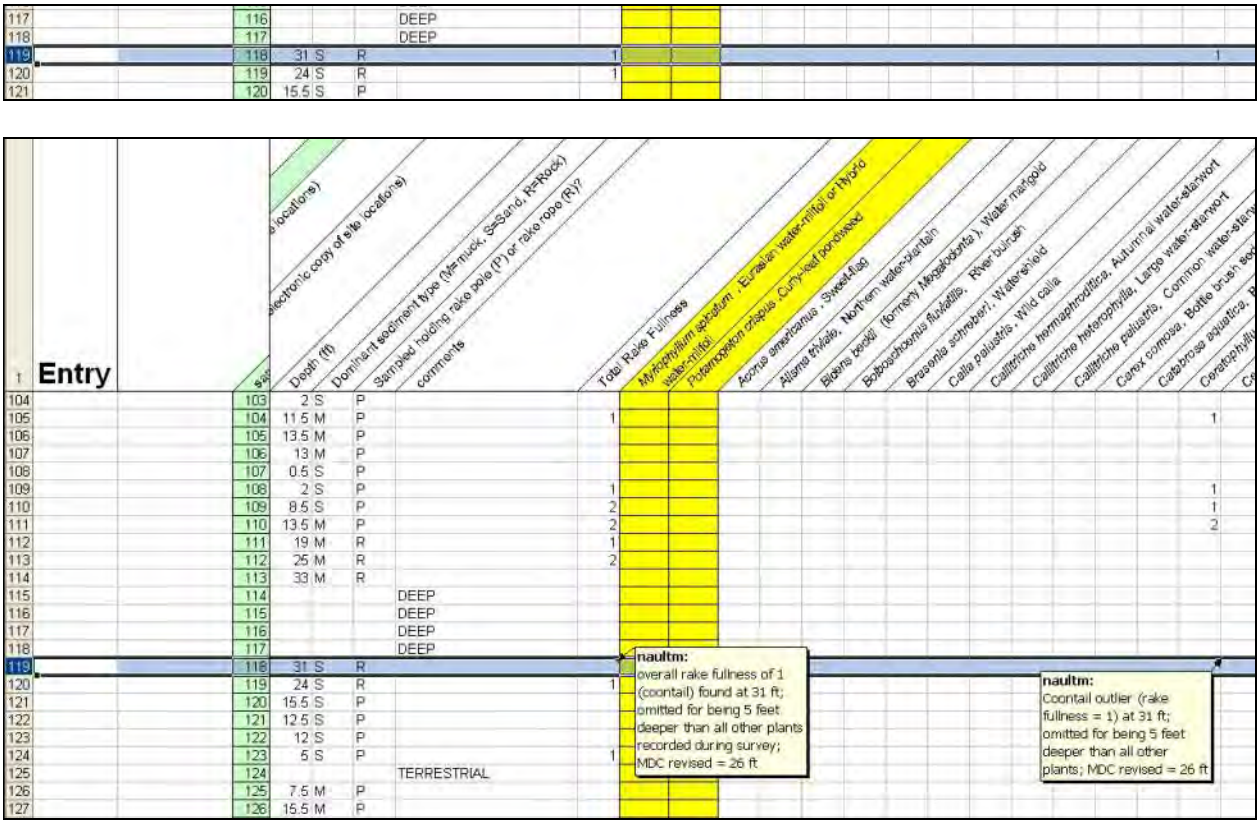


Figure 5: *Top* - Ceratophyllum demersum outlier at 31 feet (sampling point #118). *Bottom* - C. demersum outlier at 31 feet deleted from both C. demersum and total rake fullness columns. Brief descriptive comments should be inserted in cells where outliers have been deleted.

7. CALCULATE FQI

This worksheet automatically calculates the Floristic Quality Index (FQI) based upon the data entered into the ENTRY worksheet. The FQI metric is designed to evaluate the closeness of the flora in an area to that of undisturbed conditions[6]. The species list considered in this calculation is that which Nichols[6] originally considered, and the "C values" used in this spreadsheet reflect those currently accepted by the Wisconsin State Herbarium[7]. Species are counted as being present only if they are collected on the rake at some point during the baseline survey.

8. ARCGIS TEMPLATE

This worksheet of truncated species names is used when creating plant distribution maps using ArcGIS 9.3. See Appendix 3 for more information.

[6] Nichols, S.A. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management, 15(2):133-141.

[7] University of Wisconsin-Madison, 2001. Wisconsin Floristic Quality Assessment (WFQA). Retrieved October 27, 2009 from: http://www.botany.wisc.edu/WFQA.asp

Saving the File

Once the data is electronically entered into the Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls), please save the file with a name indicating the lake, county, WBIC, and year sampled. The format we recommend is: Lake_County_WBIC_(year).xls. For example, Lake Mendota sampled in 2009 would be named: Mendota_Dane_805400_(2009).xls

Double-Checking the Data

We strongly recommend double-checking the electronic data against the field sheet to catch any errors made during the entry process.

Sending the Data

Send the final electronic file to the WDNR via email (DNRBaselineAquaticPlants@wisconsin.gov). There should be one file for each completed lake survey.

Creation of Plant Distribution Maps

Aquatic plant distribution maps can be easily created using the point-intercept data collected during the survey. Instructions on how to create these maps can be found in Appendix 3 and 4.

Statistical Analysis of Data

Statistical comparisons of datasets can easily be analyzed between pre- and post-management activities or between two survey years by using a simple chi-square analysis. The chi-square analysis is commonly used to examine whether or not there was a statistically significant change in the occurrence of a plant species between the survey years or after management activities have occurred. The "Compute Pre-Post Data" worksheet (available at: http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Apendix-D1.xls), allows users to enter in the number of sites at which a species was recorded during each survey, and provides an output indicating whether or not differences reflect a statistically significant change in the plant community.

PRESSING PLANTS – PREPARATION OF VOUCHER SPECIMENS

"Floating" Specimens

Because most aquatic plants, especially finely dissected specimens, tend to stick to paper as they dry, it is usually better to "float" the plant directly onto herbarium paper. However, if the plant is large and robust, or not entirely aquatic (such as bulrushes, emergent sedges or pickerelweed) you can press the plant in newsprint.

1. Use a pencil to label the mounting paper with the plant name, geographic location, date collected, and serial code (a unique identifier in a series that identifies all specimens you have pressed; we use the initials of the presser followed by the year and a sequential number; i.e. AM2009-01). Mount only one species per sheet, and do not cut herbarium sheets in half.

2. Carefully rinse the plant so it is free of epiphyton, silt, and other debris.

3. Fill a sink or tray with about one inch of water. Slip the labeled mounting paper into the water.

4. Float the plant in the water and arrange it onto the sheet.

5. If the plant has fine leaflets, such as water milfoil or bladderwort, cut off one leaf and display it floated out onto the paper so that leaflet characteristics can be readily observed.

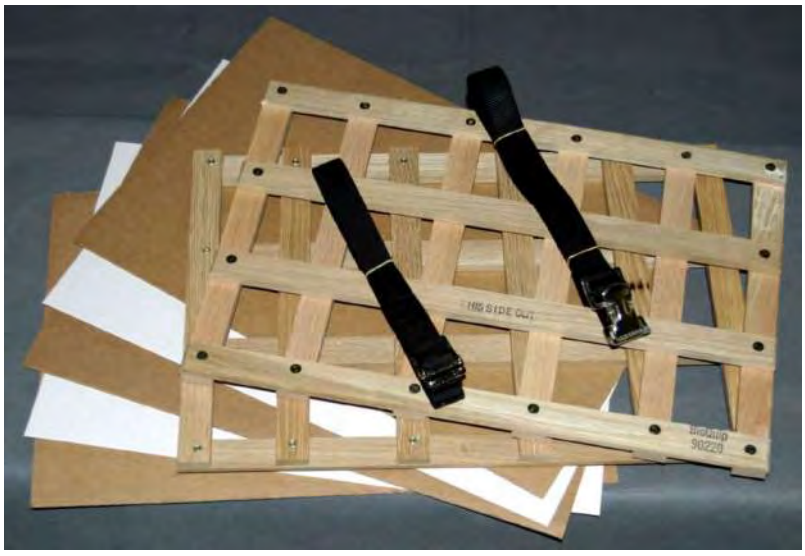
6. The plant may be bent into a "V" or "W" or curled shape to fit on the sheet.

7. Slowly lift the paper out of the water by one end. Keeping the plant in place, let the water slowly drain off.

8. Use a toothpick or probe to spread out plant parts for better display, making sure to expose identifiable characteristics such as stipules, sheaths or seeds.

Pressing Specimens

- Cover the plant with a sheet of waxed paper or plastic wrap if it is especially delicate (we recommend this technique especially for bladderworts and other fine, delicate species).
- Place the specimen sheet inside folds of newspaper.
- Place the newspaper between two sheets of blotting paper, and the blotting paper between two sheets of corrugated cardboard.
- Place multiple specimens in a plant press. Use rope or straps to compress plants to keep specimens flat as they dry.



- Place the press somewhere warm and dry. Placing the press on its long edge on top of a ventilated aluminum or aluminum-lined box containing incandescent light bulbs allows for quick drying. Remove plants after several days when they are thoroughly dry.

Suggested Herbarium Materials

Herbarium and science supply businesses such as the Herbarium Supply Company (www.herbariumsupply.com; 800-348-2338) sell many herbarium products including mounting paper, plant presses, blotting paper, and cardboard spacers. When ordering herbarium mounting paper, look for acid-free, non-glossy, 100% rag, and heavy or standard weights.

Preparing Dried Specimens for Shipment to an Herbarium

1. **Package specimens**. Place each dried specimen with unique identifier clearly marked on the newsprint or mounting paper in the fold of a single sheet of newspaper and place all of the newspaper/specimens between two pieces of cardboard. Tie or rubber band the cardboard bundle together, and put it into a padded envelope or a box. As long as the package is going to or from an educational institution, a special 4th class mailing rate called "Library Rate" can be used.

2. **Label information**. Both of the herbaria utilized by the WDNR label the dried plant specimens themselves. Prepare an electronic spreadsheet with the relevant information for each specimen. Send the file to Mark Wetter (mawetter@wisc.edu) for the Madison herbarium or to Robert Freckmann (rfreckma@uwsp.edu) for the Stevens Point herbarium. Each row (i.e. each specimen) in the file will need a unique identifier such as the collector's initials followed by a specimen number. Use the same identifier on the specimen so the herbaria can match the label to the specimen. Each row of the spreadsheet should include columns for the following (column heading in **bold**, example in plain text):

    a. **Specimen Identifier** CD2009-01
    b. **Collector Name** Isabel Velez
    c. **Preparer's Name** (If different from collector) Chad Douwe
    d. **Lake Name** Little John Jr.
    e. **County** Vilas
    f. **Date collected** 7 July 2009
    g. **Specimen ID** *Potamogeton spirillus,* Spiral-fruited pondweed
    h. **Habitat** muck over sand
    i. **Associated species (if known)** *Najas gracillima, Potamogeton friesii*
    j. **TRS** T41N R07E S29
    k. **WBIC** 1861700
    l. **More detailed location** (if known) SW edge of lake, 1 m depth
    m. **GPS lat/long coordinates** (if known) N 46°15.037' W090°01.804'
    n. **Herbarium of deposition** UWSP

3. **Send pressed plants** to Mark Wetter or Ted Cochrane (UW- Madison), or to Dr. Robert Freckmann (UW-Stevens Point). **Please notify the herbarium of your intention and wait for confirmation before sending plants**:

Mark Wetter or Ted Cochrane
University of Wisconsin-Madison Herbarium
Department of Botany, Birge Hall
430 Lincoln Drive
Madison, WI 53706-1381
tel.: (608) 262-2792
FAX: (608) 262-7509
www.botany.wisc.edu/herbarium/

Dr. Robert Freckmann
Robert Freckmann Herbarium
0310 CNR Addition
1900 Franklin Street
Stevens Point, WI 54481
rfreckma@uwsp.edu

4. **Send electronic record to the WDNR.** Please send a copy of the electronic herbarium file along with the plant data to DNRBaselineAquaticPlants@wisconsin.gov.

CONCLUSIONS

There will be four products from each plant survey. First, there will be the raw data from the quantitative survey which provides a lakewide plant species list and distribution and rake fullness data for each species observed. Second, there will be summary statistics useful in characterizing and comparing populations. Third, there will be observations from the general boat survey. Fourth, voucher specimens will provide a catalog of plant species present in the lake and will bolster the state collections. All electronic data should be sent by email to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to the WDNR Lake Coordinators and Aquatic Plant Management staff for recommendations and comments in the design, implementation, and applications of the data and the survey methodology. The many hours the field staff put into testing this methodology was integral to its successful development, and we are very grateful for all of their hard work.

Appendix 1

Current (02/2010) contact information for regional WDNR aquatic plant management (APM) and lake coordinators

Northern Region (NOR)

(Ashland, Barron, Bayfield, Burnett, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Oneida, Polk, Price, Rusk, Sawyer, Taylor, Vilas, & Washburn Co.)

Frank Koshere
APM Coordinator
715-392-0807
frank.koshere@wisconsin.gov

Kevin Gauthier, Sr.
Florence, Forest, Langlade, Lincoln, Oneida, & Vilas Co.
715-365-8937
kevin.gauthiersr@wisconsin.gov

Pamela Toshner
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pamela.toshner@wisconsin.gov

Jim Kreitlow
Ashland, Iron, Price, Rusk, Sawyer, & Taylor Co.
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james.kreitlow@wisconsin.gov

Southeast Region (SER)

(Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, & Waukesha Co.)

Heidi Bunk
: Ozaukee, Sheboygan, Walworth, Washington, & Waukesha Co.
262-574-2130
heidi.bunk@wisconsin.gov

Craig Helker
Kenosha, Milwaukee, & Racine Co.
262-884-2357
craig.helker@wisconsin.gov

South Central Region (SCR)

(Columbia, Dane, Dodge, Green, Grant, Iowa, Jefferson, Lafayette, Richland, Rock, & Sauk Co.)

Susan Graham
Lake & APM Coordinator
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Northeast Region (NER)
(Brown, Calumet, Door, Fond du Lac, Green Lake, Kewaunee, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Shawano, Waupaca, Waushara, & Winnebago Co.)

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Greg Sevener
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West Central Region (WCR)
(Adams, Buffalo, Chippewa, Clark, Crawford, Dunn, Eau Claire, Jackson, Juneau, La Crosse, Marathon, Monroe, Pepin, Pierce, Polk, Portage, St. Croix, Trempealeau, Vernon, & Wood Co.)

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Lake Coordinator
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Appendix 2

This appendix contains examples of statistical outputs created through the point-intercept sampling method for Kathan Lake, Oneida County. The data was collected during a survey conducted August 21-22, 2007.

Table 1. Summary Statistics

Total number of sites set-up	**203**
Total number of sites visited	**171**
Total number of sites with vegetation	**149**
Total number of sites shallower than maximum depth of plants	**165**
Frequency of occurrence at sites shallower than maximum depth of plants	**90.30**
Simpson Diversity Index	**0.94**
Maximum depth of plants (ft)	**9.50**
Number of sites sampled using rake on Rope (R)	**0**
Number of sites sampled using rake on Pole (P)	**171**
Average number of all species per site (shallower than max depth)	**3.96**
Average number of all species per site (veg. sites only)	**4.39**
Average number of native species per site (shallower than max depth)	**3.56**
Average number of native species per site (veg. sites only)	**3.95**
Species Richness	**37**
Species Richness (including visuals)	**38**
Species Richness (including visuals & boat survey)	**40**

Table 2. Individual species frequency of occurrences

Common Name	Scientific Name	% Frequency (Littoral)	% Frequency (Whole lake)	% Frequency (in vegetated areas)	Relative Frequency (%)
Bushy pondweed	*Najas flexilis*	41.2	39.8	45.6	10.4
Common waterweed	*Elodea canadensis*	40.6	39.2	45.0	10.2
Eurasian water milfoil*	*Myriophyllum spicatum**	40.0	38.6	44.3	10.1
Filamentous algae	*Algae* spp.	26.1	25.1	28.9	6.6
Coontail	*Ceratophyllum demersum*	23.0	22.2	25.5	5.8
Stoneworts	*Nitella* spp.	21.8	21.1	24.2	5.5
Watershield	*Brasenia schreberi*	20.6	19.9	22.8	5.2
Small bladderwort	*Utricularia minor*	17.6	17.0	19.5	4.4
Small pondweed	*Potamogeton pusillus*	17.0	16.4	18.8	4.3
Common bladderwort	*Utricularia vulgaris*	16.4	15.8	18.1	4.1
Wild celery	*Vallisneria americana*	15.2	14.6	16.8	3.8
Flat stem pondweed	*Potamogeton zosteriformis*	13.9	13.5	15.4	3.5
Stiff pondweed	*Potamogeton strictifolius*	11.5	11.1	12.8	2.9
Ribbon leaf pondweed	*Potamogeton epihydrus*	9.1	8.8	10.1	2.3
White water lily	*Nymphaea odorata*	7.9	7.6	8.7	2.0
Muskgrasses	*Chara* spp.	7.3	7.0	8.1	1.8
Freshwater sponge	Sponge spp.	6.1	5.8	6.7	1.5
Moss	Moss spp.	6.1	5.8	6.7	1.5
Large-leaf pondweed	*Potamogeton amplifolius*	5.5	5.3	6.0	1.4
Spiny-spored quillwort	*Isoetes echinospora*	4.9	4.7	5.4	1.2
Waterwort	*Elatine minima*	4.2	4.1	4.7	1.1
Creeping spikerush	*Eleocharis palustris*	4.2	4.1	4.7	1.1
Water horsetail	*Equisetum fluviatile*	4.2	4.1	4.7	1.1
Northern water milfoil	*Myriophyllum sibiricum*	4.2	4.1	4.7	1.1
Thin floating-leaf bur-reed	*Sparganium* sp.	4.2	4.1	4.7	1.1
Spatterdock	*Nuphar variegata*	3.6	3.5	4.0	0.9
Spiral-fruited pondweed	*Potamogeton spirillus*	3.6	3.5	4.0	0.9
American bur-reed	*Sparganium americanum*	3.6	3.5	4.0	0.9
Shoreweed	*Littorella uniflora*	3.0	2.9	3.4	0.8
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	2.4	2.3	2.7	0.6
Variable pondweed	*Potamogeton gramineus*	2.4	2.3	2.7	0.6
Twin-stemmed bladderwort	*Utricularia geminiscapa*	1.8	1.8	2.0	0.5
Pipewort	*Eriocaulon aquaticum*	0.6	0.6	0.7	0.2
Clasping leaf pondweed	*Potamogeton richardsonii*	0.6	0.6	0.7	0.2
Broad-leaved arrowhead	*Sagittaria latifolia*	0.6	0.6	0.7	0.2
Thin-leaved pondweed	*Potamogeton* sp.	0.6	0.6	0.7	0.2
Flat-leaved bladderwort	*Utricularia intermedia*	0.6	0.6	0.7	0.2
Cattail	*Typha* sp.	Visual	Visual	Visual	Visual
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	Boat Survey	Boat Survey
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	Boat Survey	Boat Survey

Table 3. Number of sites where species was found and average rake fullness rating

Common Name	Scientific Name	# sites where species was found	# sites where species was found (including visuals)	Average rake fullness rating
Bushy pondweed	*Najas flexilis*	68	68	1.28
Common waterweed	*Elodea canadensis*	67	67	1.28
Eurasian water milfoil*	*Myriophyllum spicatum**	66	71	1.47
Filamentous algae	*Algae* spp.	43	43	1.00
Coontail	*Ceratophyllum demersum*	38	38	1.37
Stoneworts	*Nitella* spp.	36	36	1.00
Watershield	*Brasenia schreberi*	34	58	1.68
Small bladderwort	*Utricularia minor*	29	29	1.10
Small pondweed	*Potamogeton pusillus*	28	28	1.14
Common bladderwort	*Utricularia vulgaris*	27	27	1.30
Wild celery	*Vallisneria americana*	25	26	1.36
Flat stem pondweed	*Potamogeton zosteriformis*	23	25	1.22
Stiff pondweed	*Potamogeton strictifolius*	19	19	1.16
Ribbon leaf pondweed	*Potamogeton epihydrus*	15	18	1.27
White water lily	*Nymphaea odorata*	13	42	1.69
Muskgrasses	*Chara* spp.	12	12	1.25
Freshwater sponge	Sponge spp.	10	11	1.00
Moss	Moss spp.	10	10	1.20
Large-leaf pondweed	*Potamogeton amplifolius*	9	10	1.33
Spiny-spored quillwort	*Isoetes echinospora*	8	11	1.00
Waterwort	*Elatine minima*	7	8	1.00
Creeping spikerush	*Eleocharis palustris*	7	9	1.14
Water horsetail	*Equisetum fluviatile*	7	15	1.43
Northern water milfoil	*Myriophyllum sibiricum*	7	7	1.00
Thin floating-leaf bur-reed	*Sparganium* sp.	7	7	1.00
Spatterdock	*Nuphar variegata*	6	22	1.17
Spiral-fruited pondweed	*Potamogeton spirillus*	6	6	1.00
American bur-reed	*Sparganium americanum*	6	11	1.50
Shoreweed	*Littorella uniflora*	5	5	1.00
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	4	5	1.25
Variable pondweed	*Potamogeton gramineus*	4	5	1.00
Twin-stemmed bladderwort	*Utricularia geminiscapa*	3	3	1.00
Pipewort	*Eriocaulon aquaticum*	1	2	1.00
Clasping leaf pondweed	*Potamogeton richardsonii*	1	1	2.00
Broad-leaved arrowhead	*Sagittaria latifolia*	1	1	1.00
Thin-leaved pondweed	*Potamogeton* sp.	1	1	1.00
Flat-leaved bladderwort	*Utricularia intermedia*	1	1	1.00
Cattail	*Typha* sp.	Visual	3	n/a
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	n/a
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	n/a

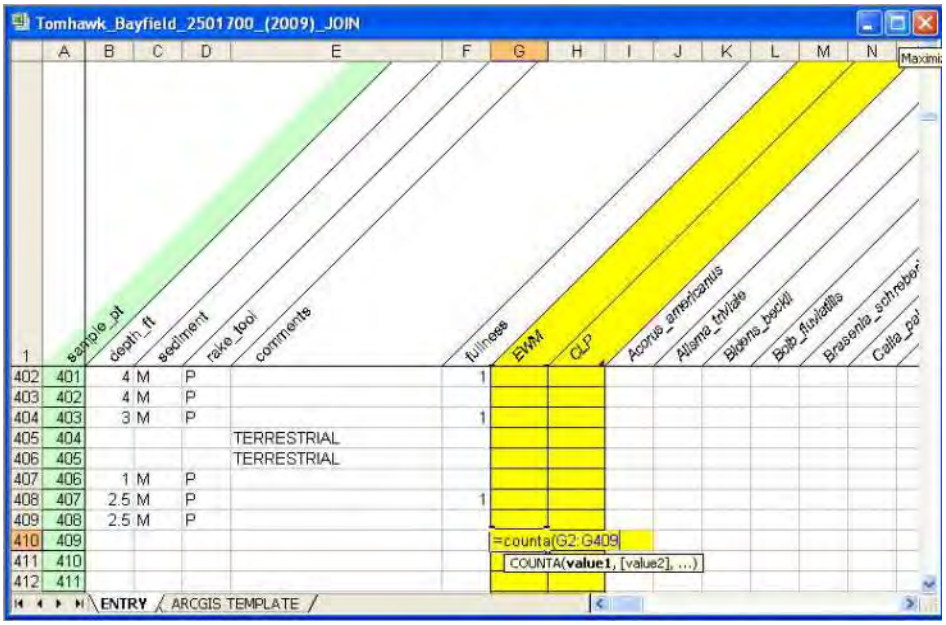
Appendix 3

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 9.3

This is a protocol for making a plant distribution map using ArcGIS 9.3 and the Excel (2003 version) file of data from the point intercept (PI) survey. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

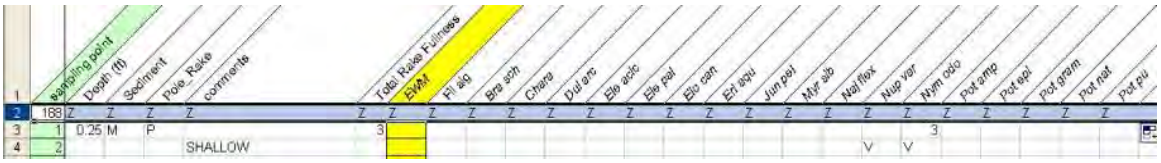
1. After entering the PI survey data into the Aquatic Plant Survey Data Workbook (Appendix-C.xls), save the file using a unique name. We recommend the convention: Lake_County_WBIC_(YYYY).xls

2. Prepare <Lake_County_WBIC_(YYYY).xls> For Join
    a. Open file in Excel
    b. File → Save As → Lake_County_WBIC_(YYYY)_JOIN.xls (DO NOT MODIFY ORIGINAL FILE)
    c. Delete all worksheets except for ENTRY and ARCGIS TEMPLATE (make sure to scroll left and delete the README sheet)
        i. Click on worksheet tab; Edit → Delete Sheet → Delete
    d. Delete the following columns
        i. Entry columns (A & I) and calculated columns (B-H)
            1. Columns B-H are normally hidden. To "unhide" them, cursor over the column heading (A) at the top of the sheet and click/drag to highlight it and the adjacent column (I). Right click the highlighted region, then select unhide. Columns B-H are colored blue. Now delete all columns A-I.
        ii. Latitude, Longitude columns (possibly hidden, located between sampling point and depth columns)
        iii. Replace first row of ENTRY with ARCGIS TEMPLATE
            1. Copy the entire first row of truncated species names from the ARCGIS TEMPLATE worksheet
            2. Highlight the first row on the ENTRY worksheet and replace with the template (Edit → Paste)
        iv. Species columns with no data
            1. Add a count row to identify empty columns to delete
                a. Select all cells and remove any validation
                    i. Select All (Ctrl-A)
                    ii. Data → Validation → OK → Allow Any Value → OK
                b. In the row below the last sampled point, and in the first column under a plant species, enter the formula =counta(
                c. Then highlight the column up to the first sampling point. The beginning of this procedure is depicted below.



d. Finally, add a closing) and hit enter. The final formula will be similar to this: =counta(G2:G500)
e. Point the cursor over the bottom right corner of the cell until cursor turns into a "+". Click/Drag this formula all the way across to the end of the species list.
f. Delete any columns where the sum row is equal to 0
g. Then delete the sum row

e. Delete any rows after the last applicable sample point
   i. The "sample_pt" column is usually populated up to 4000 points; delete any rows where the sampling point column is numbered, but these sample points are greater than the number of points set-up in the lakewide grid, and therefore the row doesn't contain any information.
f. Add a "dummy" row so all data imports into ArcGIS as "text"
   i. Add a row directly above the first sampled point
   ii. In this newly created row, under the Sampling Point column, enter the number equal to the total number of sample points plus 1 (i.e. total sampling points in example image is 187. The number 188 would be entered into the "dummy" row under the sampling point)
g. Enter "Z" in all other cells in all columns that contain any information



h. Save the file and close Excel

3. Save the lake specific polygon and point shapefiles to a folder on a local drive
   a. We'll refer to this folder as "MapFolder"

4. Open ArcMap
   a. Select to Start using ArcMap with "a new empty map" and click "OK"

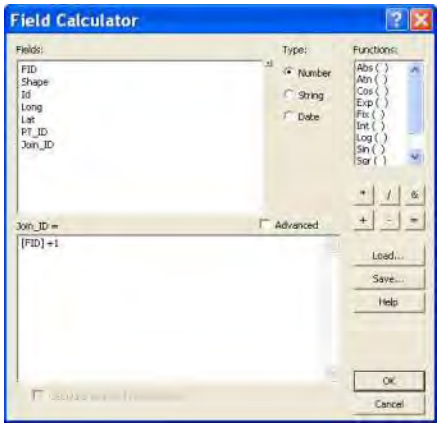
5. Add Data (either method "a" or "b")
    a. Using Add Data Button
        i. Select the "Add Data" button; or File → Add Data 
        ii. Navigate to MapFolder
        iii. Highlight both the lake polygon (lake_country_WBIC_poly.shp) and point (lake_county_WBIC_XXmpts.shp) shapefiles
        iv. Click on 'Add'
    b. Directly from ArcCatalog
        i. Situate ArcMap and ArcCatalog windows so that you can see both
        ii. Navigate to MapFolder in ArcCatalog
        iii. Highlight both the lake polygon (lake_county_WBIC_poly) and point (lake_county_WBIC_XXmpts) shapefiles
        iv. Drag and drop these shapefiles into ArcMap
        v. Note: Shapefiles should only be saved, deleted, moved, etc. in ArcCatalog. Using Windows Explorer with shapefiles can result in accidental deletion of individual shapefile files (i.e. *.shp, *.dbf, *.sbn, *.shx, *.sbx, and *.sbn files must all be stored together. ArcCatalog packages these files together so nothing gets lost)

6. Defining Shapefile Projections
    a. If after adding in your shapefiles a warning message regarding "Unknown Spatial Reference" appears, the shapefiles coordinate system is not defined
        i. To define and verify projection, please contact DNRBaselineAquaticPlants@wisconsin.gov
        ii. Alternatively, the shapefile projection can be defined manually by using the Define Projection Tool located in ArcToolbox
            1. ArcToolbox → Data Management Tools → Projections and Transformations → Define Projection
            2. Input Dataset or Feature Class
                a. Select the shapefile that needs a defined projection
            3. Click on the browse button (right side of dialog box)
            4. In the Spatial Reference Properties dialog box, click on the "Select" button
            5. Browse for the correct coordinate system
                a. Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj; Click Add.
                    i. Do not use the US Feet system
                    ii. The coordinate system name may also be displayed as NAD 1983 HARN Transverse Mercator
                    iii. Coordinate system parameters:
                        1. Projection → Transverse Mercator
                        False Easting → 520000.00000000
                        False Northing → -4480000.000000
                        Central Meridian → -90.00000000
                        Linear Unit → Meter

6. Select "OK" on Spatial Reference Properties dialog box, and "OK" on define projection tool

7. Edit Attribute Table for point shapefile
   a. Open Attribute Table
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select "Open Attribute Table"
   b. Add a Field
      i. Select the "Options" button → "Add Field"
      ii. Name: Join_ID
      iii. Type: Double
      iv. Precision: 10
      v. Scale: 3

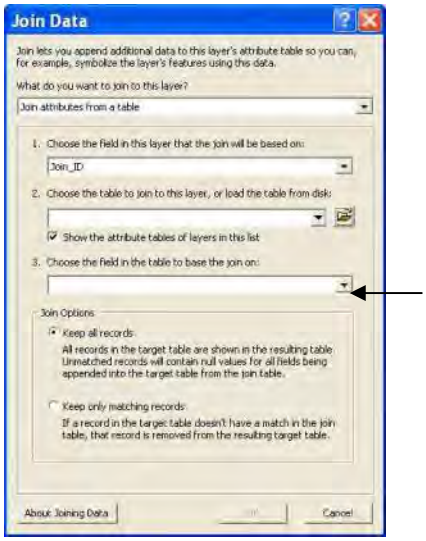
   c. Populate Join_ID Column
      i. Right click on "Join_ID" column heading
      ii. Select "Field Calculator"
      iii. If Field Calculator warning message pops up, click "Yes"
      iv. Set expression by double-clicking FID in the "Fields:" box and typing +1. The white box under "Join_ID =" should now read **[FID] +1**
      v. Click "OK"
      vi. Your Join_ID column should now be populated in sequential order, starting with point #1 at the top
      vii. Close the attribute table
      viii. Note: This expression is assuming that each unique ID was based off of the calculation [FID] +1 when creating the initial point file. If the unique ID's were not created in sequential order based on the FID field, then calculate Join_ID field accordingly (example: Truncate a unique ID such as 'Como001' so that it just reads '001' in the Join_ID field.)



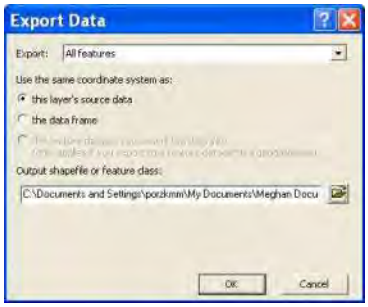
8. Join shapefile to <Lake_County_WBIC_(YYYY)_JOIN.xls>
   a. Right click on point shapefile in ArcMap table of contents
   b. Select Joins and Relates → Join…
   c. Set the following options:
      i. Join Attributes from a table
      ii. Join will be based on "Join_ID"
      iii. Choose the table to join to this layer
         1. Click on Window Folder (See arrow)

2. Navigate to and double-click on the Excel file saved in step 2
3. Double-click on the 'ENTRY $' sheet
4. Click "Add"

iv. Base the join on "sample_pt"
v. Join Options: Keep All Records (If using ArcGIS 9.2, these options can be viewed by clicking the "Advanced" button)
vi. Click "OK"
vii. If prompted to create index, select "Yes"



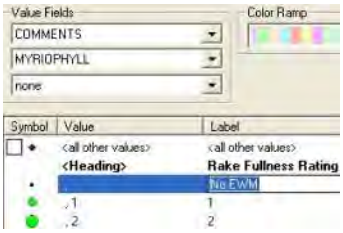
9. Export joined shapefile to make it permanent
   a. Right click on joined point shapefile in ArcMap table of contents
   b. Select Data → Export Data
   c. Set the following options:
      i. Export: All Features
      ii. Use the same coordinate system as: this layer's source data
      iii. Output shapefile or feature class: Save in MapFolder as **Lake_County_WBIC_ XXpts_YEAR_JOIN.shp**



   d. Click "OK"
   e. When asked if you want to add the exported data to the map as a layer, select "Yes"
      i. This final joined shapefile will now be referred to as "Joined Point Shapefile"
   f. Remove the Join from the original point shapefile
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select Joins and Relates → Remove Join(s) → Remove All Joins
   g. In the table of contents, uncheck or remove the original point shapefile that was used to create the Joined Point Shapefile.

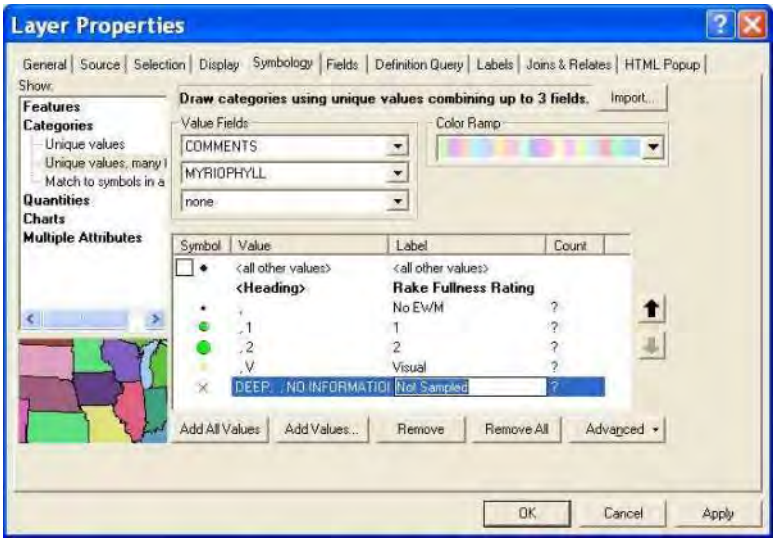
10. Check Join Results
   a. Right click on the Joined Point Shapefile in the table of contents
   b. Select "Open Attribute Table"
   c. Verify that Join was successful
      i. All data present in Excel file should now be located in the Joined Point Shapefile attribute table, and the Join_ID and Sample_Pt columns will be identical

11. Display Plant Distribution Data
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select “Properties”
    c. Select “Symbology” tab
    d. On left side of dialog box under “Show:”, select “Categories – Unique Values, Many Fields”
    e. Value Fields should be “Comments”. Be sure to select the appropriate Comments field, as there may be two that appear similar.
    f. You will then choose additional Value Fields to display species information (i.e. If you want to display both EWM and CLP species information, then both EWM and CLP need to be chosen as Value Fields)
    g. Select “Add All Values”
        i. All possible values are now displayed, separated by a comma. Each position indicates the unique values for each Value Field you designated in steps e & f, in the order entered. That is, if you selected ‘comments’, ‘EWM’, and ‘CLP’ as your value fields, the first value might read: ‘ , , ‘ indicating points that were sampled, but had neither a comment, EWM, nor CLP present. The next value might read ‘ , ,1’, which includes points with no comments, no EWM, and fullness rating of 1 for CLP.
        ii. Points with information for the ‘comments’ value field were likely not sampled; the comment listed should clarify how to work with these points.
    h. Un-check <all other values> box
    i. Double-click on symbol next to each value to set symbology
        i. You must now choose appropriate symbols and colors for the different variables being expressed.
        ii. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2, 3), a small light green circle for visuals (V), a small black dot for sites sampled that had no relevant plant data, and a small “x” symbol for all sites not sampled
    j. You can change the label name of the symbol being represented by clicking on the respective space under “Label”. (e.g. change “ , ” to “No EWM”; “ ,1” to “1”; “ ,V” to “Visual”; “Deep, ” to “Not Sampled”)



    k. You can also group values together (e.g. No Information, Deep, Shallow, etc)
        i. Hold down the Shift key and highlight all rows that should be grouped

ii. Right click on highlighted rows and select “Group Values”
iii. The final Layer Properties dialog box should look similar to this: Note: If you want to change the order that these will appear in the legend, highlight a row and use the arrows on the right side to move.
iv. Click “Apply” then “OK” to update symbols on map



v. The polygon shapefile fill color and outline may also be modified similarly under the “Symbology” tab

12. Map Page Layout
    a. Verify that the coordinate system is defined correctly for the Data Frame
        i. Select View → Data Frame Properties → Coordinate System Tab
        ii. If the coordinate system is incorrectly defined, browse for the correct coordinate system
            1. Predefined → Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj
    b. View → Layout View
    c. File → Page and Print Setup → Select Landscape or Portrait
    d. Modify size/shape of data frame to fit on entire page and serve as map border
        i. Right click data frame, select Properties, under the ‘Frame’ tab, change border to a thickness of 2 and select OK.
    e. Insert → North Arrow
        i. Size and position appropriately
    f. Insert → Scale Bar
        i. Select “Alternating Scale Bar 1” and click “OK”
        ii. Double-click on Scale Bar in Layout view to edit properties
        iii. Set the following properties:
            1. Number of divisions: 2
            2. Number of subdivisions: 1
            3. Set units to kilometers

4. Click "OK"

g. Insert → Text
   i. Double-click on Text Box to edit information
      1. Create text box with the following information:
         a. Lake Name, County, Date Sampled, etc.
      2. Format text as appropriate using "Change Symbol…" button

h. Insert → Picture → Navigate to WDNR Logo (Black & White)
   i. Size and position appropriately

i. Legend
   i. In the table of contents, modify the displayed name of your shapefile as you would like it to appear in your legend by single clicking on the text
   ii. Insert → Legend
   iii. Choose which layers you want to include in your legend
      1. Include the layer that has the plant distribution symbology information
      2. You may have to remove the polygon layer by highlighting it under "Legend Items" and clicking the single left angle bracket (<), then select "Next"
   iv. Remove the word "Legend" from the Legend Title and select "Next"
   v. Continue selecting "Next" and then "Finish"
   vi. Format legend text
      1. Right click on Legend and select "Properties"
   vii. Size and position legend as appropriate

j. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as an ArcMap Template so you can use the same one each time
   i. File → Save As → Save As Type: ArcMap Template

k. Check printed map for color accuracy before you export (Step 13). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

13. Saving Map as JPEG
   a. File → Export Map
      i. Save as type: JPEG
      ii. Set Resolution: 300 dpi
      iii. Navigate to appropriate folder and Save

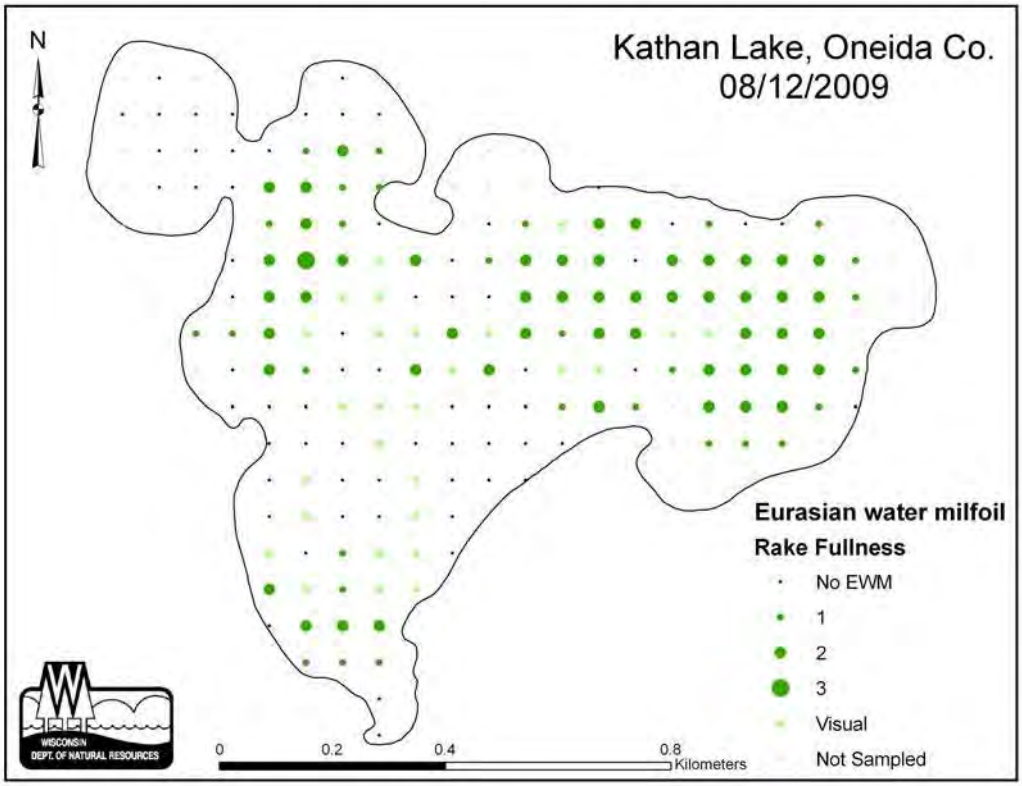


Figure 6: Example plant distribution map created using point-intercept data and ArcGIS 9.3 software for Kathan Lake, Oneida County.

Appendix 4

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 3.3

This is a protocol for making plant maps using ArcView GIS 3.3 and the Aquatic Plant Survey Data Workbook Excel file <Appendix-C.xls.>. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. Save the ArcView shapefiles (*.shp, *.dbf, *.sbn, *.shx, *.sbx, *.sbn) to a folder on a local drive.
    a. We'll refer to this folder as "MapFolder"

2. Open ArcView and create a new project with a new view.
    a. Click "yes" to add data

3. Add shapefiles from MapFolder
    a. You can add multiple files at once by holding down "shift" while you click the individual files

4. View window: select the point file
    a. Make sure both themes have the box checked in order to view them
    b. Click once on the point layer to activate that theme (raised box around that item)
    c. If necessary, drag the activated point layer above the polygon layer in order to see the sample points

5. Open theme table
    a. Theme > Table or
    b. The open theme table shortcut button

6. Start editing, add variable column
    a. Table > Start Editing
    b. Edit > Add Field
        i. Enter the name of the field (e.g. EWM_2009)
        ii. Specifications 'type', 'width', and 'decimal places' do not need to be changed
        iii. Click "OK"

7. Stop editing, save edits
    a. Table > Stop Editing, 'Yes' to save edits

8. Export point file

a. File > Export
b. Select 'dBASE'
c. Select MapFolder to save file
d. Default will be named <table1.dbf>
e. Close table

9. Set-working directory
    i. File > Set Working Directory
    ii. Change working directory to MapFolder

10. Save project, exit ArcView
    a. File > Save Project As > save in MapFolder (for ease of reference, lets call the file EWM_Map.apr)
    b. Exit ArcView

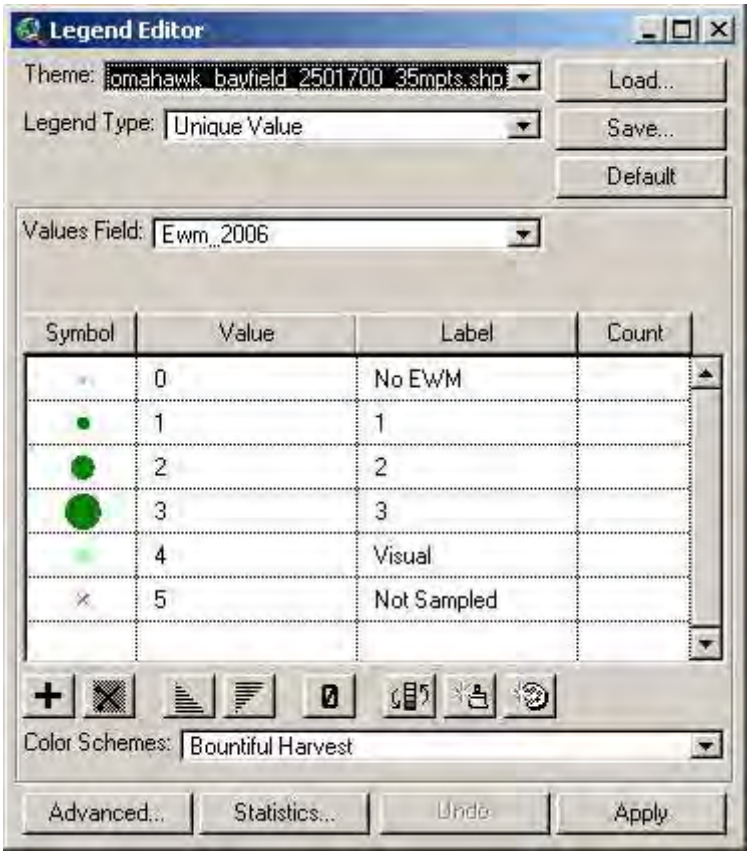
11. Open file saved in step 8 with Excel
    a. Open excel; Open a file, when prompted to find the file, navigate to MapFolder
    b. In "Files of type" option bar select "All files"
    c. Open <table1.dbf>

12. List information under data field created (EWM_2009)
    a. Open PI data entry excel file (WiAPMS.xls)
    b. Copy columns "Sample point, Depth, Comments, & EWM"
    c. Paste special "values" into new excel workbook
        i. Edit > Paste Special > Values
    d. Highlight all data, sort by comments
        i. Data > Sort > Comments
    e. Enter the number 5 into EWM column for all unsampled sites (deep, terrestrial, non-navigable, etc) (this is so the legend can code these sites)
    f. Highlight EWM data column and replace all blanks with 0 (zero), and V (visuals) with 4
        i. Edit > Replace, replace all
    g. Highlight all data, re-sort by sampling site
        i. Data > Sort > Sampling Point
    h. Copy EWM column, excluding header, paste into the .dbf file (already open, originally created in step 8)
    i. "Save as" this file as the **original dbf** file's name (the copy you placed in MapFolder, not the original file, obviously)
        i. i.e. overwrite the ISS original (e.g. Kathan_Oneida_1598300_65mpts.dbf) with the new file you just modified in excel. The name must be EXACTLY the same!!
        ii. Close excel

13. Reopen project in ArcView
    a. Open existing project

b. Open MapFolder and click on EWM_Map.apr (or whatever you chose to name it in step 9)

14. Create legend
    a. Double-click point symbol in the View frame to open the legend window
    b. In "Legend Type" option bar, choose "Unique Value"
    c. In "Values Field" option bar select "EWM_2009" column (or whatever column you want this map to show)
    d. Apply
    e. You must now choose appropriate symbols and colors for the different variables being expressed by the legend. You can change the symbol by double clicking on it
    f. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2 , 3), a small light green circle for visuals (value: 4), a small black dot for sites sampled, but without EWM, (value: 0), and a small "x" symbol for sites not sampled (value: 5).



    g. You can change the label name of the symbol being represented by clicking on the respective cell under "Label". (e.g. change "5" to "Not Sampled", change "4" to Visual)
    h. The color or shading of the polygon can also be changed by double clicking on the theme

15. Set units
    a. View > Properties
    b. Change map units to "meters" and distance units to "kilometers"

16. Layout
    a. View > Layout
    b. Select Landscape or Portrait
    c. Double-click 'View1' to change map title
    d. Double-click scale bar to adjust range or units
    e. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as a Template (Layout > Store as Template) so you can use the same one each time.

f. Check printed map for color accuracy before you export (step 17). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

17. Save as JPEG
    a. Have the final layout window active
    b. Select File > Export
    c. In "List Files of Type" option bar, select JPEG
    d. Click 'Options' button
        i. Set resolution to highest number
        ii. Likely 144 DPI and Quality = 100
    e. Type file name, choose location in which to save the JPEG
    f. Click OK

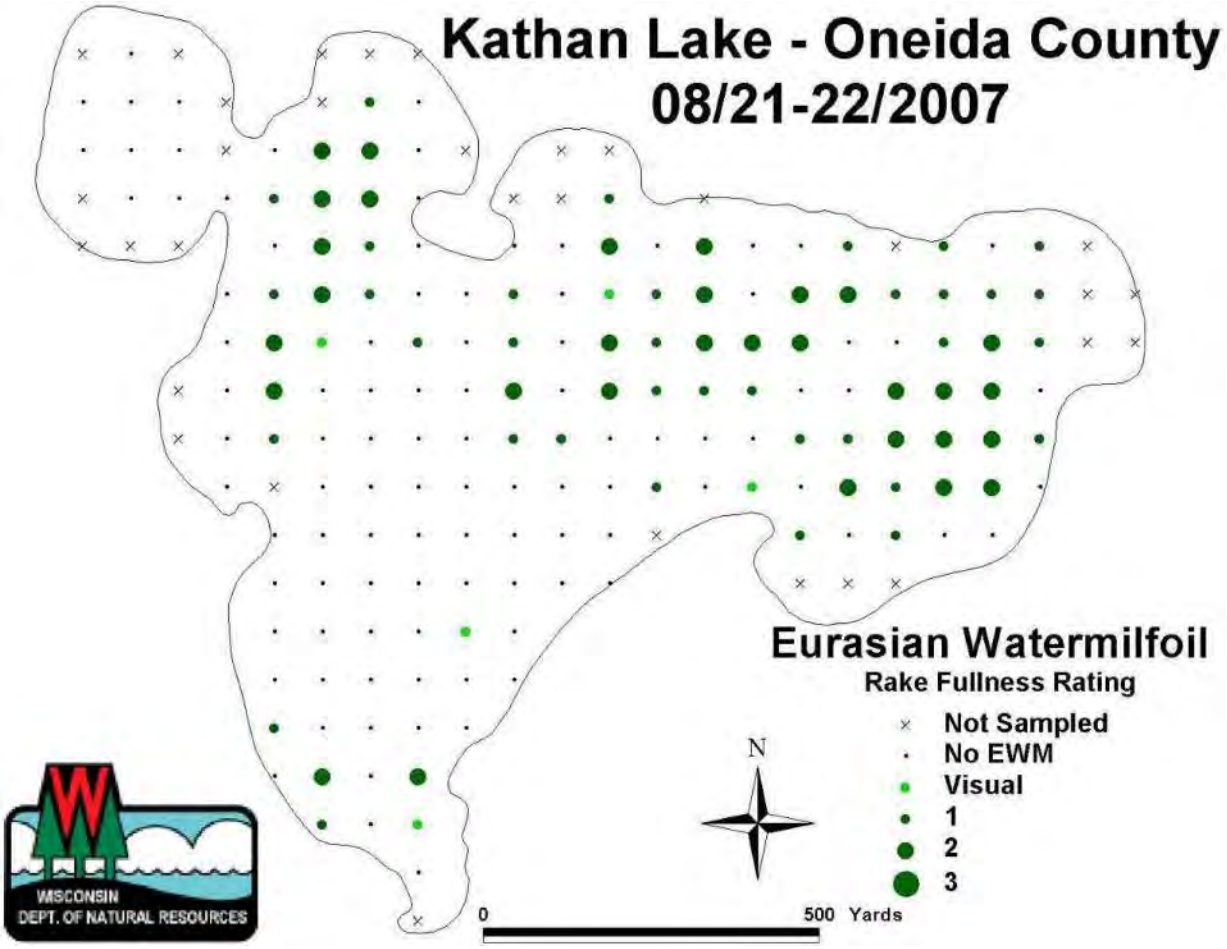


Figure 7: Example plant distribution map created using point-intercept data and ArcGIS 3.3 software for Kathan Lake, Oneida County.

Document citation:

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.


WISCONSIN
DEPT. OF NATURAL RESOURCES

Science Services

Center for Excellence –
providing expertise for science-based decision-making

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Our Mission: The Bureau of Science Services supports the Wisconsin Department of Natural Resources and its partners by:

- conducting research and acquiring original knowledge.
- analyzing new information and emerging technologies.
- synthesizing information for policy and management decisions.
- applying the scientific method to the solution of environmental and natural resources problems.
- providing science-based support services for department initiatives.
- collaborating with local, state, regional, and federal agencies and academic institutions in Wisconsin and around the world.

Appendix 3 – Aquatic Invasive Species Early Detector Handbook

WISCONSIN
AQUATIC INVASIVE SPECIES
EARLY DETECTOR
HANDBOOK

NOTES

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

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17 Carolina fanwort
18 Curly-leaf pondweed
19 Eurasian watermilfoil
21 European frog bit
22 Flowering rush
23 Narrow-leaf cattail / hybrid cattail
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32 Yellow Iris

ANIMAL ID

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Document Accession #: 20220421-5293 Filed Date: 04/21/2022

AIS EARLY DETECTORS

Early detection of aquatic invasive species (AIS) can be the difference between long-term management and potential eradication--the difference between $$$ and $. Once they become well-established, invasive species can be very difficult to control, and may be impossible to eradicate. Early detection and rapid response to new AIS populations in Wisconsin has resulted in some populations being eradicated from entire lakes, including notable invaders like Eurasian watermilfoil, flowering rush, and yellow floating heart (cover photo). The best possible option for a lake is to have trained eyes on the water often, so that a suspicious plant or animal can be detected early and quickly responded to.

Your Citizen Lake Monitoring Network staff and local Aquatic Invasive Species Coordinators are ready to help you! They can provide hands-on training workshops, assist with identification, suggest the best locations to monitor on your lake, and more. This is a team effort to stop invasive species from spreading to our favorite fishing spots, our cherished swimming holes, and the peaceful places where we love to observe native plants and animals. We can all do our part. Thank you for being a partner to protect the amazing lakes of Wisconsin.

This booklet is adapted from *Aquatic Invasive Species Early Detectors: A How-to Guide*, produced by the Minnehaha Creek Watershed District, Minnetonka, Minnesota, used with permission.

Produced by the Wisconsin Citizen Lake Monitoring Network, UW-Extension Lakes Program.
Photos by Paul Skawinski except the following:
Jeff Gunderson, Minnesota Sea Grant (top photo, p. 38);
Jeffrey Thompson, Minnesota Public Radio; (page 3)
Minnehaha Creek Watershed District; (pages 6, 10)
Tina Wolbers, Minnesota Department of Natural Resources (top photo, page 32)

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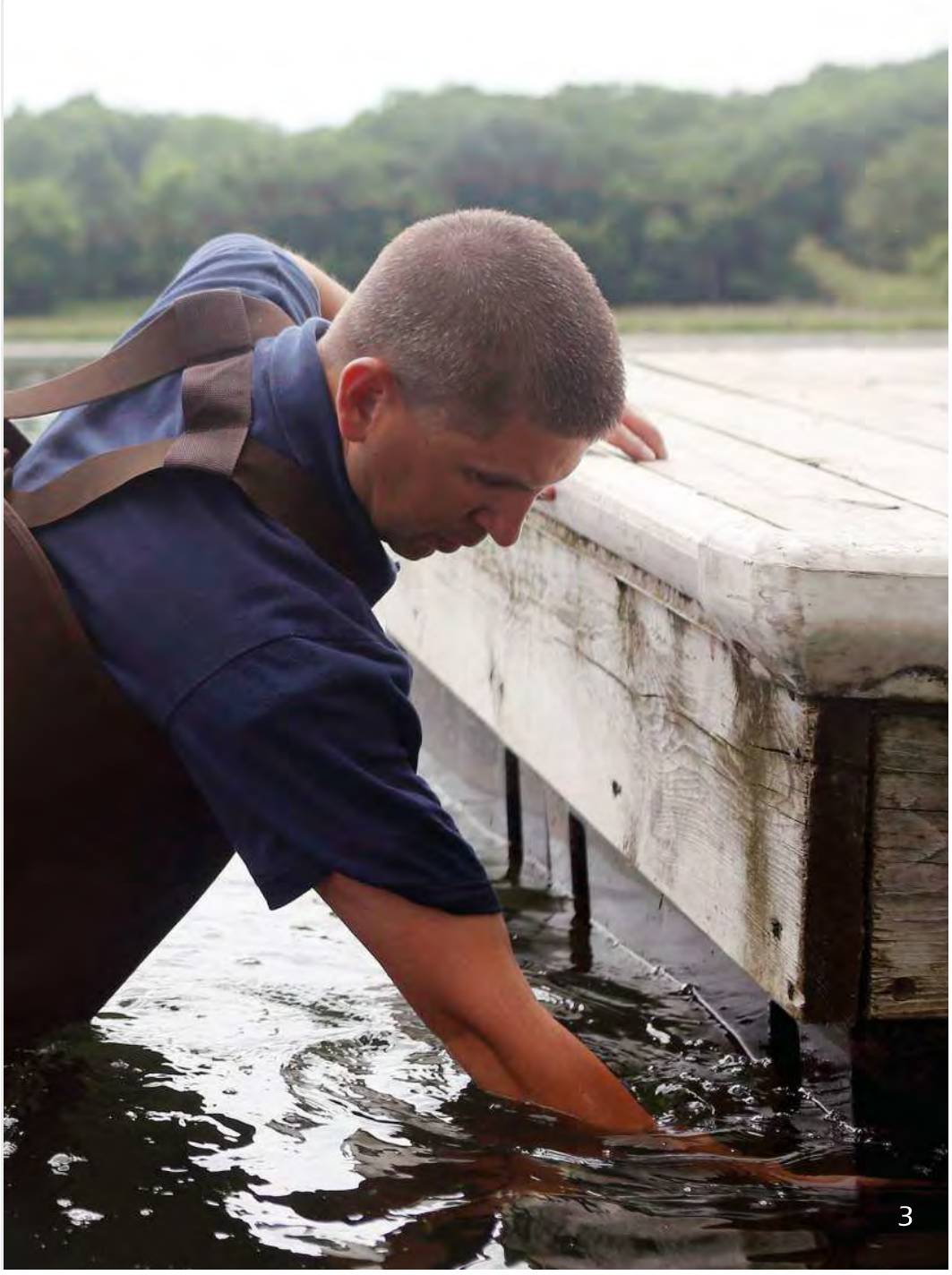
Wisconsin Lakes Partnership

UW Extension University of Wisconsin-Extension



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HOW TO PREPARE

1. Know which invasive species are already present in the lake or stream you are monitoring. Lists of invasive species in each water body can be found on the Wisconsin Department of Natural Resources website: dnr.wi.gov/lakes/invasives/AISbywaterbody.aspx

2. Determine several locations to sample. Be sure to target boat landings, inlets/outlets, public parks, developed shorelines, and a variety of sediment types (mucky, sandy, etc.). Your own shoreline is also a great place to keep an eye on. Mark these sampling locations on a map so that you can show others where you sampled or found a suspicious species.

3. Refer to the *Assembling a Monitoring Kit* section on page 6 to prepare for monitoring. If any of your gear has been used in another waterbody, be sure that it doesn't contain any plants, animals, or debris that could be holding invasive species.

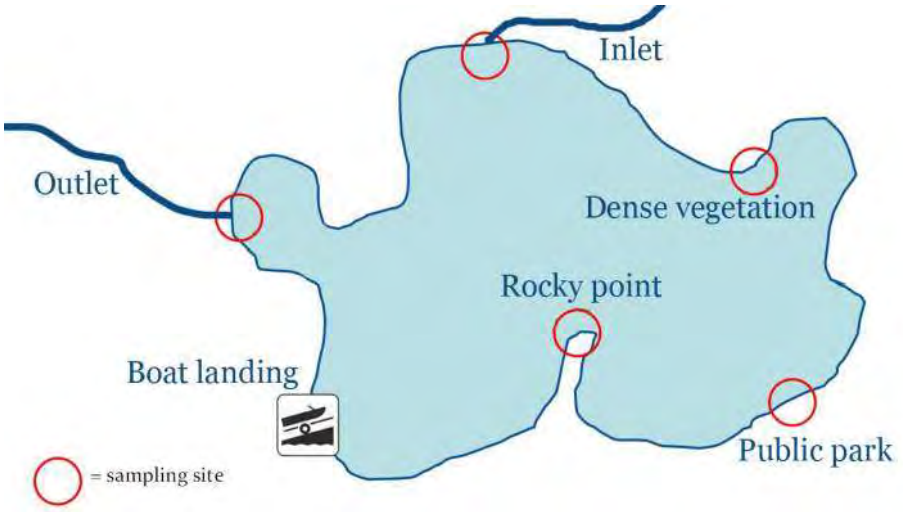
Inspect your equipment for any attached plants, animals, or mud

Remove all attached debris

Drain water from your boat, motor, live wells, bait buckets, and any other location that holds water

EXAMPLE MAP

Great maps can be found for public lakes across the state by searching dnr.wi.gov for “lake maps”.



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ASSEMBLING A MONITORING KIT

Use the checklist below to assemble an AIS monitoring kit. Items marked with an asterisk (*) can be provided by your Regional Citizen Lake Monitoring Network Coordinator or local Aquatic Invasive Species Coordinator.

1) Aquatic plant sampling rake*
2) Waterproof labels*
3) Ziploc bags*
4) Hand lens*
5) Pencil*
6) AIS monitoring forms*
7) Polarized sunglasses
8) Towel to dry your hands and equipment
9) Underwater viewing scope (optional)

Waders (10) and snorkeling gear (11) can also be very useful tools for AIS monitoring, but are not required. Volunteers wishing to do a very thorough check of an area may choose to use these items.

A steel rake head (usually with at least 30 feet of rope attached to it) is a very effective aquatic plant sampling tool. You can buy a rake head by itself, or simply cut the handle off of a rake and tie the rope to the head. If desired, a double-sided rake can be made by attaching two rake heads together with cable ties or welding.

1

7

Polarized sunglasses reduce glare and allow a person to see much more clearly into the water.

A towel is useful to wipe your hands and your gear!

8

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HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM SHORE

Identify the public boundaries of the site. Beginning at one of the boundaries, conduct the sampling steps outlined below, and repeat these steps at five points spaced about equally between the site boundaries.

1. Scan the area for at least 30 seconds, examining plants in the water and any plant fragments/shells that are washed up on shore.

2. Toss your sampling rake from shore into the water, aiming for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of your rope!

3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Continue tossing the rake until you feel that you have adequately sampled this location (usually 2-3 rake tosses). Use this handbook to help you identify suspicious plants and animals.

If there is a dock or pier, use it as one of your sampling locations. You can sample off of any side of the dock. If you are able to see or touch the legs of the dock, this is a good way to look for zebra mussels.

Place a sample of any suspected invasive species in a plastic bag with a waterproof label. Bags, labels, and pencils are included in your monitoring kit. Seal the bag tightly and place it somewhere secure until you can get it into a refrigerator or deliver it to an expert.

4. Report what you found. If you did not find any suspected invasive species, that's great! We want to know the good news! Please enter this information into the Surface Water Integrated Monitoring System (SWIMS) database, or email the *Aquatic Invasives Surveillance Monitoring* form to your local Aquatic Invasive Species Coordinator. This form can be used to record results from one day or from an entire season of monitoring, whichever is most convenient for you. Please enter or mail your results by November 1st so we can compile information from across the state.

If you found a suspected invasive species, please record that on the form. Then take digital photographs of the invasive species (please include the waterproof label in the photos) and email the photos to your local AIS Coordinator (DNR or county). Please save all suspicious plants and animals in the refrigerator or in a cooler until you hear back. Your AIS Coordinator may ask to see the actual specimen to confirm its identification.

Who is my local AIS Coordinator? Visit the Wisconsin DNR website at dnr.wi.gov and type "AIS Coordinator" into the search box. Then click on your county to find contact information for AIS staff that cover your area.

If you need help finding this information, please contact:

Paul Skawinski
Statewide Citizen Lake Monitoring Network Coordinator
Pskawins@uwsp.edu or 715-346-4853

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM A BOAT

Identify sites with a high risk of invasive species introductions, such as boat landings, public parks, bridges, and inlets. Conduct the sampling steps outlined below at each site you have identified around the lake. While motoring/paddling between sites, stay shallow enough that you can see aquatic plants, and watch for AIS as you go.

1. Scan the area for suspicious plants and animals, both in the water and along the shoreline. Scan for at least 30 seconds at each site.

2. Toss your sampling rake into the water, once from each side of the boat. Aim for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of the rope!

3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Continue tossing the rake until you feel that you have adequately sampled this location (usually 2-3 rake tosses). Use the identification resources provided to help you identify suspicious plants and animals.

Place a sample of any suspected invasive species in a plastic bag with a waterproof label. Bags, labels, and pencils are included in your monitoring kit. Seal the bag tightly and place it somewhere secure until you can get it into a refrigerator or deliver it to an expert.

4. Report what you found. If you did not find any suspected invasive species, that's great! We want to know the good news! Please enter this information into the Surface Water Integrated Monitoring System (SWIMS) database, or email the *Aquatic Invasives Surveillance Monitoring* form to your local Aquatic Invasive Species Coordinator. This form can be used to record results from one day or from an entire season of monitoring, whichever is most convenient for you. Please enter or mail your results by November 1st so we can compile information from across the state.

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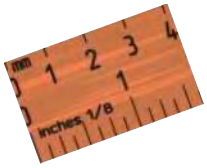
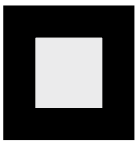
PHOTOGRAPHING AQUATIC INVASIVE SPECIES

Most aquatic invasive species can be readily identified from a good photograph. Here are some tips to make your specimen easy for your local AIS Coordinator to identify.

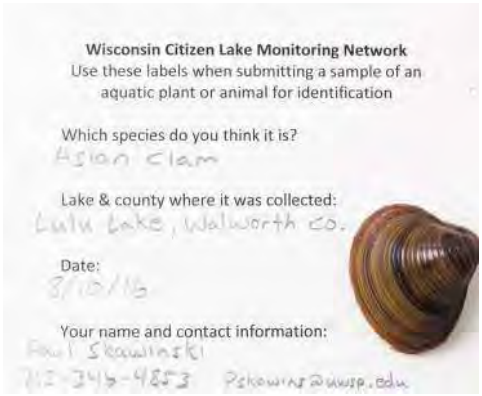
Light it up! Have the sun or other light source behind you, not behind the object. Shadows make it difficult to see colors and patterns.



Show scale. Some species can be differentiated based on size. Use a coin, hand, key, or the ruler at the front of this handbook to demonstrate size.



Have a contrasting background. Small features of plants and animals are tough to see against backgrounds that are busy or contain similar colors/textures.



PLANT ID

BRAZILIAN WATERWEED AND HYDRILLA

Plant type: Submergent
Status: Prohibited
Native look-alike: Common waterweed

INVASIVE

Brazilian waterweed
(*Egeria densa*)

- Rings (whorls) of 4-8 leaves around the stem
- Fine teeth on leaf edges. This usually requires a hand lens to see
- No teeth underneath the leaves

NATIVE	INVASIVE
Common waterweed (*Elodea canadensis*) • Rings (whorls) of 3 leaves around the stem • Smooth leaf edges • No teeth underneath the leaves	Hydrilla (*Hydrilla verticillata*) • Rings (whorls) of 4-8 leaves around the stem • Fine teeth on leaf edges • Teeth are also produced underneath the leaf, along the centerline

BRITTLE NAIAD

Plant type: Submergent
Status: Prohibited
Native look-alike: Slender naiad

INVASIVE	NATIVE
Brittle naiad (*Najas minor*)	Slender naiad (*Najas flexilis*)
• Noticeably toothed • Readily breaks into small fragments • Leaves curve strongly downward	• Teeth on edge of leaf require magnification to view • Flexible • Leaves straight or slightly curving

CAROLINA FANWORT

Plant type: Submergent
Status: Prohibited
Native look-alike: Water marigold

INVASIVE

Carolina fanwort
(*Cabomba caroliniana*)

- Leaves on short stalks, attaching on opposite sides of the stem
- Flower white with a yellow center
- May have tiny, floating leaves

NATIVE

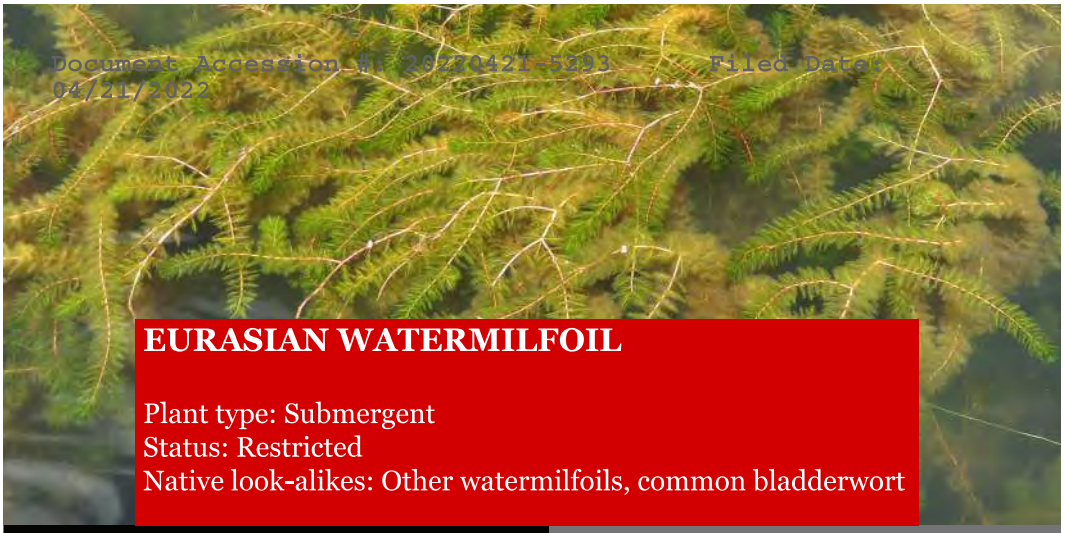
Water marigold
(*Bidens beckii*)

- Ring/whorl of leaves around the stem
- Leaves do not have stalks
- Yellow, daisy-like flower

CURLY-LEAF PONDWEED

Plant type: Submergent
Status: Restricted
Native look-alike: Clasping-leaf pondweed

INVASIVE	NATIVE
Curly-leaf pondweed (*Potamogeton crispus*)	Clasping-leaf pondweed (*Potamogeton richardsonii*)
• Leaves are usually very wavy • Finely toothed leaf edges • Leaf tips are blunt • Leaf base not wrapped around stem	• Leaves are gently wavy • Leaf edges smooth, no teeth • Leaf tips are pointed • Leaf base wraps around stem



EURASIAN WATERMILFOIL

Plant type: Submergent
Status: Restricted
Native look-alikes: Other watermilfoils, common bladderwort

INVASIVE	NATIVE
Eurasian watermilfoil (*Myriophyllum spicatum*)	Northern watermilfoil (*Myriophyllum sibiricum*)
• 12+ pairs of leaflets per leaf • Stems usually weak and limp, reddish-brown to pink • Leaves at tip of branches often red	• 5-10 pairs of leaflets per leaf • Stems tan to green, usually stiff, holding shape out of water • Leaves at tips of branches usually green

NATIVE

Whorled watermilfoil
(*Myriophyllum verticillatum*)

- 8-17 pairs of leaflets per leaf
- Stems brown or dark green
- Rings (whorls) of leaves packed closely together on the stem

NATIVE

Common bladderwort
(*Utricularia macrorhiza*)

- Leaves contain many small sacs (bladders) that trap invertebrates
- Stems are unrooted, usually tangled on other vegetation

EUROPEAN FROG-BIT

Plant type: Floating
Status: Prohibited
Native look-alike: White water lily

INVASIVE	NATIVE
European frog-bit (*Hydrocharis morsus-ranae*)	White water lily (*Nymphaea odorata*)
• Free-floating, roots hang below • Small, heart-shaped leaves (2-3") • Small, white flower, 3 petals	• Rooted to the bottom • Round leaves with a slit/notch • Large leaves up to 12" diameter • Large, white flower, many petals

FLOWERING RUSH

Plant type: Emergent/submergent
Status: Restricted
Native look-alike: Bur-reeds

INVASIVE

Flowering rush
(*Butomus umbellatus*)

- Cluster of pink/red flowers held above the plant
- Can be emergent or submergent
- Tall, dark green leaves are triangular in cross-section and often twisted near the top
- Produces small, onion-like growths on the roots called bulbils
- Usually 3-6 feet tall

NARROW-LEAF CATTAIL

Plant type: Emergent
Status: Restricted

INVASIVE

Narrow-leaf cattail
(*Typha angustifolia*)

- Leaves 4-10mm wide
- Male and female flowerheads separated by 1" or more
- Pollen is shed as single grains

NATIVE

Broad-leaf cattail
(*Typha latifolia*)

- Leaves >12mm (1/2") wide
- Male and female flowerheads touching, or nearly touching
- Pollen is shed in clusters of four grains

Note: Narrow-leaf and broad-leaf cattails can hybridize. Hybrid cattail (*Typha* x *glauca*) typically has a gap of 1/4" to 1" between the male and female flowerheads, sheds pollen mostly in single grains but also as clusters of two, three, and four, and grows in very dense stands.

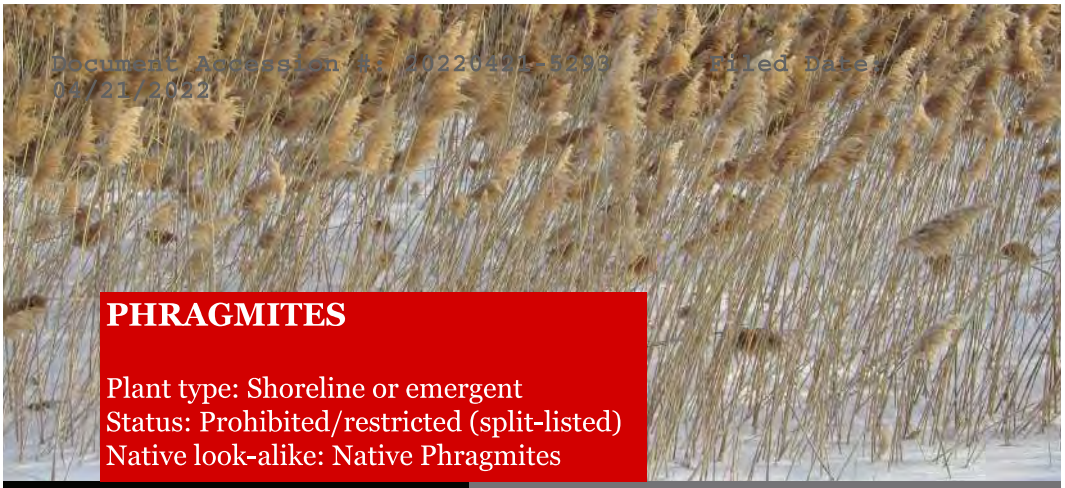
PARROT FEATHER

Plant type: Emergent/submergent
Status: Prohibited

INVASIVE

Parrot feather
(*Myriophyllum aquaticum*)

- 6-30 pairs of short leaflets
- Rings/whorls of 4-6 widely spaced leaves
- Can emerge up to 8” from the water



PHRAGMITES

Plant type: Shoreline or emergent
Status: Prohibited/restricted (split-listed)
Native look-alike: Native Phragmites

INVASIVE	NATIVE
Non-native Phragmites (*Phragmites australis* ssp. *australis*)	Native Phragmites (*Phragmites australis* ssp. *americanus*)
• Often more than 10 feet tall • Large, feathery seedheads • Dark green leaves • Dull, ridged stem	• Usually less than 8 feet tall • Sparse seedheads • Bright green leaves • Smooth, glossy stem, often reddish

PURPLE LOOSESTRIFE

Plant type: Emergent/shoreline
Status: Restricted
Native look-alike: Blue vervain

INVASIVE

Purple loosestrife
(*Lythrum salicaria*)

- Flowers pink-purple, with 6 petals, blooming in a tall spike
- Leaves have smooth edges and are opposite or in rings/whorls of 3,
- Square or 6-sided stem

NATIVE

Blue vervain
(*Verbena hastata*)

- Flowers blue, with 5 petals, blooming one ring/whorl at a time
- Leaves opposite with toothed edges
- Square stem

STARRY STONEWORT

Plant type: Submergent
Status: Prohibited
Native look-alike: Native stoneworts

INVASIVE

Starry stonewort
(*Nitellopsis obtusa*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Uneven forking near end of branchlets
- Produces star-shaped bulbils in sediments
- Stiff; holds shape out of water

NATIVE

Slender stonewort
(*Nitella flexilis*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Symmetrical forking near end of branchlets
- Does not produce bulbils in sediments
- Delicate; collapses out of water

WATER CHESTNUT

Plant type: Floating
Status: Prohibited

INVASIVE

Water chestnut
(*Trapa natans*)

- Triangular, toothed leaves
- Leaf bases are inflated
- Mostly free-floating
- Fruits with sharp spines formed underneath the leaves
- Entire plant may be over 1 foot in diameter

WATER HYACINTH

Plant type: Floating
Status: Prohibited

INVASIVE

Water hyacinth
(*Eichhornia crassipes*)

- Leaves are waxy and very shiny
- Leaf base is inflated
- Lavender flower with a purple/yellow spot
- Roots hang below the plant
- Forms interconnected colonies

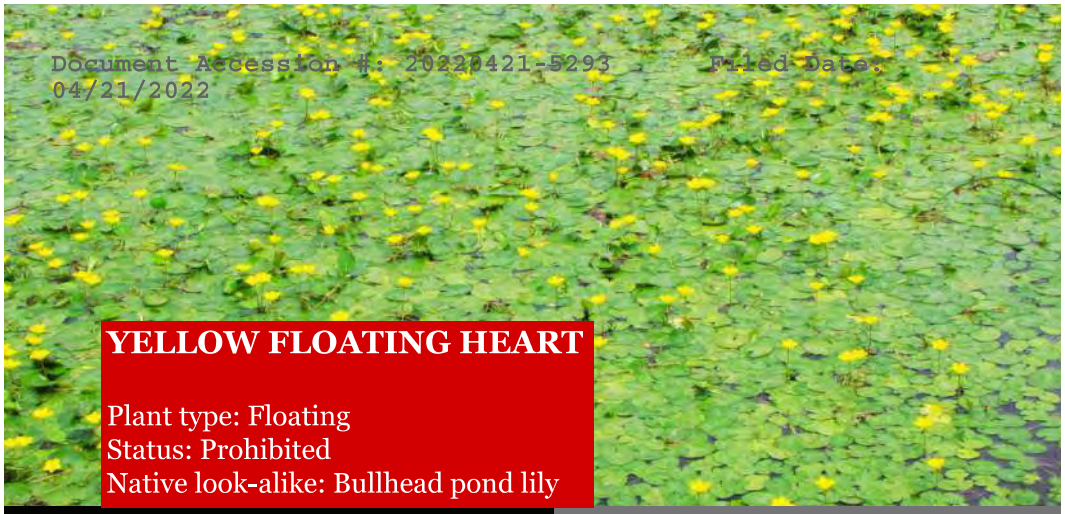
WATER LETTUCE

Plant type: Floating
Status: Prohibited

INVASIVE

Water lettuce
(*Pistia stratiotes*)

- Free-floating
- Roots hang below the plant
- Leaves are thick, ridged, fuzzy, and light green
- Forms dense, interconnected colonies
- Resembles a floating head of lettuce



YELLOW FLOATING HEART

Plant type: Floating
Status: Prohibited
Native look-alike: Bullhead pond lily

INVASIVE

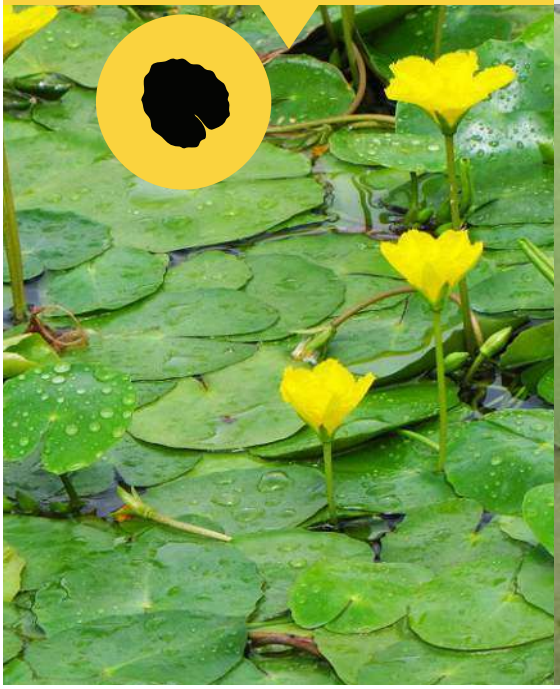
Yellow floating heart
(*Nymphoides peltata*)

- Heart-shaped leaves up to 4 inches long
- Leaves have wavy edges
- Yellow flowers have five fringed petals
- Plant is rooted to the bottom

NATIVE

Bullhead pond lily
(*Nuphar variegata*)

- Heart-shaped leaves up to 15 inches long
- Leaves do not have wavy edges
- Yellow flower is cup-shaped
- Plant is rooted to the bottom



YELLOW IRIS

Plant type: Emergent
Status: Restricted
Native look-alike: Blue-flag Iris

INVASIVE

Yellow Iris
(*Iris pseudacorus*)

- 3-5 feet tall
- Leaves are dark green or blue-green
- Flower is yellow
- Center of leaf is sharply thickened

NATIVE

Blue-flag Iris
(*Iris versicolor & Iris virginica*)

- 2-4 feet tall
- Leaves light green
- Flower is blue
- Center of leaf gradually thickened

ANIMAL ID

ASIAN CLAM

Status: Prohibited
Native look-alike: Fingernail clams

INVASIVE	NATIVE
Asian clam (*Corbicula fluminea*)	Fingernail clams (many species)
• Distinctly raised rings on shell • Up to 2 inches across • Shell yellow-brown, often blue inside, solid and opaque • Three large hinge teeth on each shell	• Rings of shell not distinctly raised • Under 1 inch across • Shell light to dark brown and white inside • Shell translucent and fragile • 1 or 2 teeth at the hinge

BANDED & CHINESE MYSTERY SNAILS

Status: Restricted

INVASIVE

Banded mystery snail
(*Viviparus georgianus*)

- 1-1.5 inches tall
- Horizontal brown bands on shell
- Bands may be hidden by algae or sediment

INVASIVE

Chinese mystery snail
(*Cipangopaludina chinensis*)

- Up to 3 inches tall
- Dark brown shell, often with short ridges near the shell opening

FAUCET SNAIL

Status: Prohibited
Native look-alike: Several other small snails. Consult an expert for verification.

INVASIVE

Faucet snail
(*Bithynia tentaculata*)

- Small, 12-15mm long (1/2 inch)
- Light brown to black
- 5-6 spirals
- Shell opening is on right side and teardrop-shaped

NEW ZEALAND MUDSNAIL

Status: Prohibited
Native look-alike: Several other small snails. Consult an expert for verification.

INVASIVE

New Zealand mudsnail
(*Potamopyrgus antipodarum*)

- Very small, 4-6mm long (1/8-1/4 inch)
- 7-8 spirals separated by deep grooves
- Gray to brown
- Shell opening is on right side
- Typically found in cold streams

ROUND GOBY

Status: Restricted
Native look-alike: Sculpins

INVASIVE

Round goby
(*Neogobius melanostomus*)

- Commonly 3-6 inches long
- Round head with bulging eyes
- Pelvic fins on underside are fused into one circular fin
- Dark spot on back of dorsal fin

RUSTY CRAYFISH

Status: Restricted
Native look-alike: Several native crayfishes

INVASIVE

Rusty crayfish
(*Orconectes rusticus*)

- Rusty brown spot on each side
- Body is mostly light brown
- Up to 5 inches long
- Claws have black and orange bands

SPINY WATER FLEA

Status: Prohibited

INVASIVE

Spiny waterflea
(*Bythotrephes longimanus*)

- About 1cm (3/8”) in length
- Very long tail spine
- Often seen as clumps on fishing line, anchor lines. downriggers

ZEBRA AND QUAGGA MUSSEL

Status: Restricted (Zebra), Prohibited (Quagga)

INVASIVE

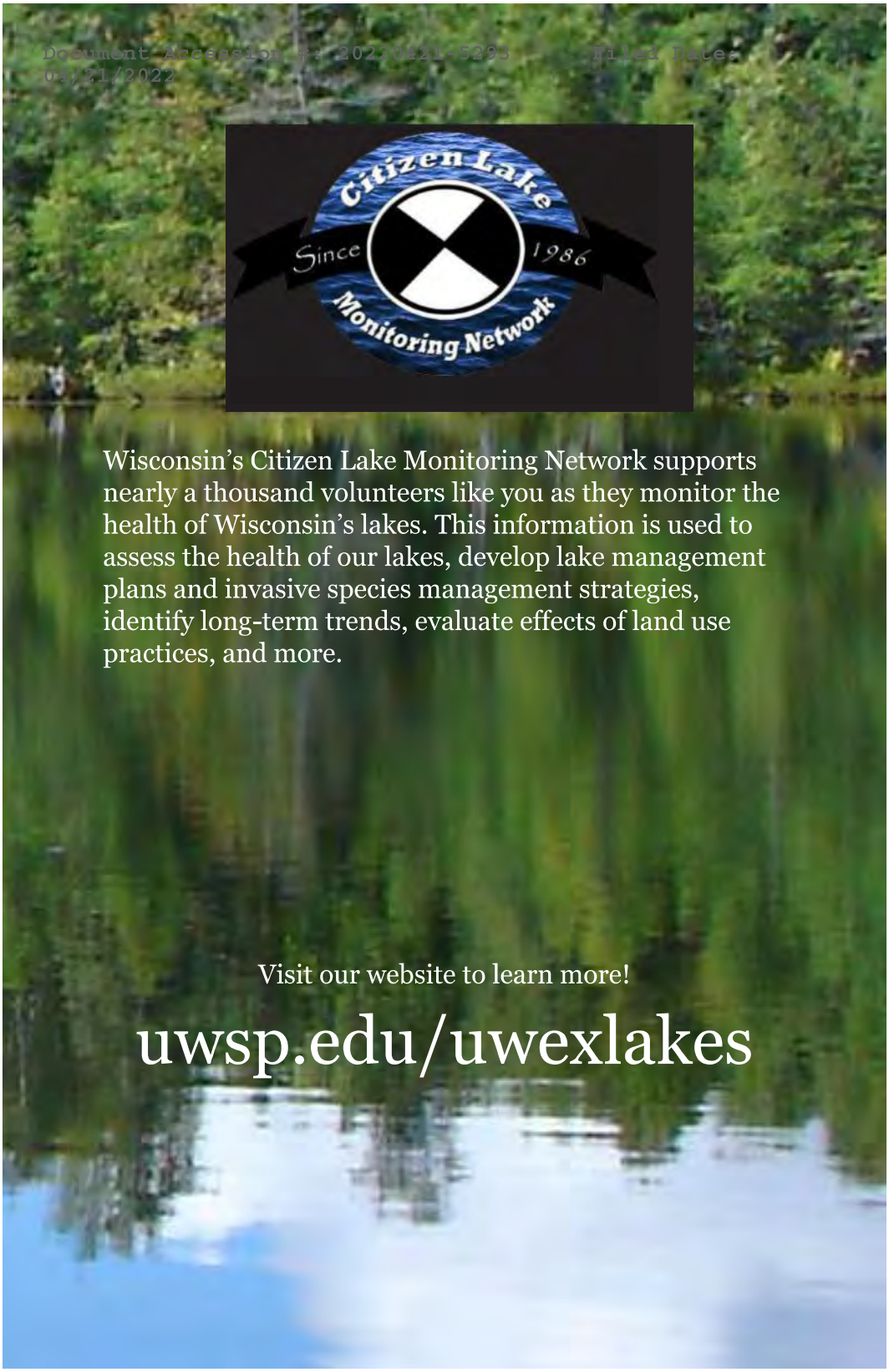
Zebra mussel
(*Dreissena polymorpha*)

- D-shaped shell
- Sits flat on its side
- Color varies but is usually light brown to white with brown-black stripes
- Up to 1.25” in length
- Usually attached to hard surfaces

INVASIVE

Quagga mussel
(*Dreissena bugensis*)

- Teardrop-shaped shell
- Does not sit flat on its side
- Color varies but is usually light brown to white with brown stripes
- Can grow up to 1.5” in length
- Usually attached to hard surfaces



Wisconsin's Citizen Lake Monitoring Network supports nearly a thousand volunteers like you as they monitor the health of Wisconsin's lakes. This information is used to assess the health of our lakes, develop lake management plans and invasive species management strategies, identify long-term trends, evaluate effects of land use practices, and more.

Visit our website to learn more!

uwsp.edu/uwexlakes

Appendix 4 – Terrestrial Invasive Species Monitoring Form

See also separate Excel File

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Terrestrial Invasive Species Montoring Form

Project	
County	
Date	
Field Crew	

Site #	Latitude Coordinates	Longitude Coordinates		Japanese honeysuckle	Multiflora rose	Purple loosestrife	Common buckthorn	Glossy buckthorn	Saw-toothed buckthorn	Dahurian buckthorn	Japanese buckthorn	Chinese buckthorn	Dahrian buckthorn	Kudzu-vine	Exotic bush honeysuckles	Exotic olives	Salt cedars	Poison hemlock	Giant hogweed	Oriental bittersweet	Lesser celandine	Tessel	Japanese knotweed	Giant knotweed	Bohemian knotweed
1			Relative Abundance																						
			Length of Shoreline																						
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Appendix 5 – Documentation of Consultation

Shawn Puzen

From: Shawn Puzen
Sent: Thursday, January 13, 2022 4:52 PM
To: cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; jharn@nps.gov; cjpetersen@msn.com
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject: Hayward and Trego Invasive Species DRAFT Monitoring Plan
Attachments: Appendix 3 Reduced.pdf; Appendix 2 Invasive Study Point Intercept Protocol.pdf; Appendix 4 Wisconsin Point Intercept Worksheet with addtl substrate info.xls; 20220113 Hayward Trego Draft ATIS Study Plan.pdf

Categories: Filed by Newforma

Good Afternoon,

Attached is a draft Hayward and Trego Invasive Species Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete an invasive species survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than February 11, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

February 8, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Aquatic and Terrestrial Invasive Species Study Plan, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) appreciates the opportunity to provide comments on the *Hayward and Trego Hydroelectric Projects Draft Aquatic and Terrestrial Invasive Species Study Plan*. This study plan was prepared by Mead & Hunt for Xcel Energy for the Hayward and Trego hydroelectric projects on the Namekagon River, within the St. Croix National Scenic Riverway (Riverway) administered by the NPS. The NPS is interested in the protection of native species and limiting the spread of invasive species throughout the Riverway. The NPS requested to review this study plan in our initial comments because Xcel/NSPW is using this study to fulfill some of the information the NPS recommended for inclusion in other study plans and because of our interest in wild rice, which Xcel/NSPW also proposed to include in this study.

We received this proposed study plan by email dated January 13, 2022. We understand you intend to complete field work by the end of August 2022 and the draft study report will be available by October 31, 2022.

Please Note: The report will be provided to NSPW by October 31, 2022 not to the NPS

1. Introduction

We concur and are pleased that this study plan responds to the request from the Wisconsin Department of Natural Resources (WDNR), using WDNR protocols. We note that some elements of this study relate to components that NPS recommended for inclusion in other studies. We offer the following comments.

2.1 Study Goals and Objectives

Although the objective of the Aquatic and Terrestrial Invasives Species (ATIS) study is to provide baseline data, the NPS encourages including analysis and description of changes that have occurred under the existing license, when information is available. The NPS 08/31/2021 comment letter highlighted the need to include analysis of change from previous surveys associated with sediment deposition, aquatic plant growth, and recreation access (including flooding) as part of the ATIS and Recreation studies. This will help inform the development of protection, mitigation, and enhancement measures in the subsequent license.

An analysis of the effects of the proposed project operation will be included in the license application.

2.2 Background and Existing Information

The NPS requests analysis of change from annual purple loosestrife surveys conducted under the existing license.

NSPW will analyze the effect of the proposed project operations on invasive species as appropriate in the license application.

2.3 Nexus between Project Operations and Effects on Resources

Please describe conditions, including sediment and substrate conditions, under which invasive species become established after introduction to better understand how inundation and sedimentation capture due to the dam contribute to establishment.

Based upon existing information provided by the USACE the accumulation of the reservoir is due to sedimentation upstream of the reservoir and is not due to project operations-FERC Order Modifying and Approving Drawdown Needs Analysis issued October 31, 1995 for the Trego Hydroelectric Project.

2.4 Study Area

The NPS concurs with the proposed study area.

2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas

The plan notes that water depth information collected for all survey points will be used to develop a bathymetric map for each reservoir. The NPS raised concerns about this method in our comments on 08/31/2021.

The NPS continues to remain concerned about whether the new bathymetric map will be of sufficient detail to detect changes from the previous map as well as evaluate changes over time through the license period. The NPS requests that additional points be included in the survey, particularly in the area recommended for removal from the boundary at the upper end of the Trego reservoir. Please consider adding detailed information as requested in the WDNR sediment study. In addition, the NPS recommends that the study report include a description of changes that have been seen in the bathymetry and aquatic vegetation since the last map cited in the Preliminary Application Document (PAD).

NSPW requested additional information from WDNR including detailed maps from their 1989 evaluation report for the relicensing record and the WDNR does not have any mapping information for a comparison. Therefore, no comparisons with current conditions could be completed. Lastly, existing information from the USACE indicates sedimentation is not due to the current and proposed run-of-river operation.

The initial study plan summary indicated that information about aquatic vegetation, including wild rice, would be part of the ATIS study. There is no specific mention of wild rice in this study plan, however. Section 4.10.3.6 of the PAD acknowledges the relationship of Ojibwe Tribes and the wild rice beds of Northern Wisconsin. The same section acknowledges that Ojibwe Tribes retained the right to hunt, fish, and gather in ceded lands in the Treaty of 1837 and that the Hayward and Trego Projects are both located within the 1837 Ceded Territory.

The current study plan is designed to gather information on all aquatic plants encountered as part of the survey. Therefore, information on wild rice will be collected as part of the survey. Additional information has been added to the plan to allow for the mapping of any wild rice beds encountered as part of the point intercept survey.

In an 08/11/20 email, WDNR expressed to the Licensee that Trego Lake enjoys ASNRI Outstanding and Exceptional Status due, in part, to the presence of wild rice. In a 04/27/21 letter, our agency requested a study documenting the presence/extent/type of aquatic vegetation, including "highly valued wild rice." The NPS has responsibility to review water resources projects under Section 7 of the Wild and Scenic Rivers Act to ensure the project will not have a direct and adverse effect on the values for which the river was designated. The Hayward and Trego Projects are in segments of the Riverway that possess outstandingly remarkable cultural values based on the presence of resources related to American Indian heritage. Wild rice is a resource of particular importance, given its cultural significance to Ojibwe Tribes.

For these reasons, NPS suggests the special importance of wild rice be reflected in the study plan and that the presence and extent of wild rice be mapped within the Study Area.

Also of note, the scientific name for zebra mussel is misspelled in the second to last paragraph on page 3.

2.5.2 Upland Shorelines Not Owned by the Licensee and 2.5.3 Upland Shorelines Owned by the Licensee and Recreation Sites

The plan notes that observed locations of terrestrial invasive plants listed in NR40 will be recorded via Global Positioning System (GPS), with provisions for future mapping. To ensure that this information is useful for NPS management, please provide shapefiles and metadata.

Please cite the source of the protocol to be used for the meander terrestrial surveys included in section 2.5.3.

The plan does not reference a specific source of the protocol for the meander survey. The meander survey is not a timed survey, but requires the survey person to meander until they belive they have adequately covered the area subject to survey.

What source(s) will be used to identify early detection terrestrial species?

As stated in Section 2.5.5-The Wisconsin Aquatic Species Invasive Species Early Detector Handbook.

2.5.4 Personnel Qualifications

The NPS appreciates recognition of the need for obtaining all necessary local, state, and federal permits required for completing the work.

The NPS requests that Xcel (or contractors working on Xcel's behalf) apply for and receive a NPS scientific research and collecting permit to conduct the work outlined in this proposal. Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov for next steps regarding this permit requirement.

The contact information has been added to the plan.

2.7 Project Schedule and Deliverables

The NPS requests that the Analysis and Discussion report include a description of how ATIS have changed over the life of the current license. Special attention should be given to the years of data collected under existing license articles for surveys of purple loosestrife and any other aquatic vegetation that has been monitored during the license. Special attention should also be given to bathymetric changes.

See responses to comments 2.2, 2.3 and 2.5.1.

The NPS requests that the following additional individual maps be developed and presented:

1. For the reasons included in our agency's comments on Section 2.5.1, a map documenting the presence and extent of wild rice should be included as a deliverable of the study.

   The plan has been amended accordingly.

2. A map series showing how the presence of purple loosestrife has changed over the life of the current license, given that this has been the subject of monitoring under the current Hayward license.

   See response to comment 2.2.

The NPS also requests a copy of the GIS shapefiles with Metadata for all maps.

The GIS shapefiles can be provided upon request.

Conclusion

Thank you for your consideration of these additional comments as you develop your final study plan. The NPS looks forward to the results of this study as well as the opportunity to continue to collaborate with you throughout the licensing process. Please include the following contacts in all future communication and distribution of study plans and reports:

- Lisa Yager, NPS, St. Croix National Scenic Riverway – lisa_yager@nps.gov
- Jonathan Moore, NPS, St. Croix National Scenic Riverway – jonathan_moore@nps.gov
- Susan Rosebrough-Jones, NPS Hydropower Program – susan_rosebrough@nps.gov
- Joan Harn, consultant working with NPS – jharn.nps@gmail.com
- Angie Tornes, consultant working with NPS – angietornes@gmail.com

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

THERESA HOGAN Digitally signed by THERESA HOGAN
Date: 2022.02.08 08:22:49 -06'00'

Theresa Hogan
Acting Superintendent

The contacts have been added to the relicensing participant list. However, NSPW will consider Lisa Yager the main point of contact for the NPS on this project.

The Wisconsin Department of Natural Resources and the Trego Lake District did not respond with comments.

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Final Mussel Study Plan Work Scope 22 MHT

Prepared for

Northern States Power Company, a Wisconsin corporation

Prepared by

Mead & Hunt

meadhunt.com

March 2022

1. Introduction

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 and 2711 respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a final license application to FERC no later than November 30, 2023. The final license application, in part, must include a review of freshwater mussel data in the vicinity of the Projects.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. Wisconsin Department of Natural Resources (WDNR) requested that mussel surveys be completed.

The WDNR recommended that the Licensee conduct a mussel study using the WDNR Guidelines for Sampling Freshwater Mussels in Wadable Streams and the WDNR Quantitative Habitat Assessment Methodology. This study plan is consistent with the WDNR request.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this mussel study is to provide baseline data determine freshwater mussel regarding the general density and diversity of freshwater mussels, including characterizing mussel habitat within the Project area. The study will provide a better understanding of baseline conditions for the Project area.

2.2 Background and Existing Information

No federally or state threatened/endangered or special concern mussel species are known to occur in the impounded sections of the reservoirs; however, listed species may occur downstream from the dams or further upstream from the impounded reaches of the reservoirs (WDNR, 2021).

2.3 Nexus between project operations and effects on resources

The operations of the Projects could influence the freshwater mussel populations located within the Project boundary.

2.4 Study Area

The mussel study will include the sampling of two riverine reaches in each Project vicinity, one upstream of the dam in a riverine area of the impoundment and one downstream of the Project powerhouse outside of the mixing zone. The study areas are depicted in Appendix 1.

2.5 Methodology

2.5.1 Mussel Survey

The 2015 Wisconsin Department of Natural Resources (WDNR) Guidelines for Sampling Freshwater Mussels in Wadable Streams (Guidelines) and other standard survey methodologies were used to develop the mussel survey parameters (Piette, 2015). The Guidelines provide information on minimum survey efforts for wadable conditions and have been modified for non-wadable conditions. The objective of this mussel study is to provide baseline data regarding mussel diversity within the vicinity of the Projects including a general characterization of mussel habitat within the Project boundary. *Aquatic Habitat Classification on the St. Croix National Scenic Riverway,* by Haibo Wan et.al., shall be referenced when assessing and characterizing mussel habitat.

Two river reaches will be surveyed at each Project. At the Hayward Project, Reach 1 will begin approximately 430 meters above the Highway 77 Bridge and extend 1,000 meters upstream. Reach 2 will begin at the canoe portage put-in and extend 1,000 meters downstream. At the Trego Project, Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 meters downstream. Reach 2 will begin 45 meters below the Trego Dam and extend 1,000 meters downstream.

Surveys will consist of sampling transects extending bank to bank that will be spaced every 100 meters in each reach creating a series of 10 transects per reach. Transects will be numbered 1-10 from downstream to upstream, and a random number selector will be utilized to select five transects for survey in each reach.

Searches along each transect will be conducted in 10-meter-long segments and will extend 0.5 meters on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within the segment. The rapid visual search entails an initial search of 0.2 minutes per square meter along each 10-meter segment to determine if mussels are present. If mussels are present within a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 minute per square meter. If mussels are absent, a semi-quantitative search will not be conducted. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.

General stream conditions and morphology within the study area will be recorded, including bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only when visibility at depth is at least 20 inches.

In addition to the mussel sampling within the transects, a general description of mussel habitat within the Project boundary will be provided.

2.5.2 Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead < 1 year; lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded. A station location data sheet will also be populated per the Guidelines. Data will be recorded using the forms in Appendix 2 to allow distinction between searches. Mussel taxonomy will follow the names presented by Williams et al., 2017.

If any federally or state-listed species is observed, dead or alive, the Licensee will be notified immediately. WDNR (Lisie.Kitchel@wisconsin.gov), U.S. Fish and Wildlife Service (USFWS) (Darin_Simpkins@fws.gov) , and the National Park Service (Lisa_Yager@nps.gov) will be notified per surveyor collection permit requirements. No live mussels will be harmed or taken during the study. Any federally or state-listed species that are encountered will be individually hand placed into their places of origin.

2.5.3 Personnel Qualifications

All surveys will be conducted by individuals with prior mussel identification training and experience with aquatic and mussel surveys.[1]

2.5.4 Survey Report

A draft report will be developed within 30 days of completion of field work for agency review and comment. A final report will be completed within two weeks of receiving agency comments. The report shall include a description of mussel survey activities and provide summary tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. The report shall also describe general mussel density and diversity within the vicinity of the two Projects.

A general description of mussel habitat within the Project boundaries, including the reservoirs, bypass reaches and tailwater areas, will also be provided. GIS-based mapping will provide a visual representation of the findings. The report will include completed survey sheets.

2.6 Consistency with generally accepted scientific practice

The Mussel Study follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been used in other FERC relicensing studies.

[1] Consultant(s) selected to complete the work will be responsible for obtaining any NPS or WDNR scientific collectors permits required.

2.7 Project Schedule and Deliverables

The study will be completed in 2022. Scientific collector's permits will be obtained, as appropriate, from the WDNR and National Park Service (NPS) prior to the field work commencing. To minimize thermal stress to the mussel specimens, field work will generally be completed between June and mid-September when water temperatures exceed 50 degrees Fahrenheit. Normal to low water conditions and good underwater visibility must be present to effectively conduct field work; therefore, project activities will be planned accordingly.

NSPW anticipates that all field work will be completed by mid-September with a draft report available by October 1, 2022.

3. Consultation

The mussel study was requested by WDNR. The Licensee consulted with WDNR and NPS as follows.

3.1 Wisconsin Department of Natural Resources

On February 2, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Mussel Study plan to the WDNR for comment. On February 16, 2022, the WDNR provided comments which were subsequently accepted and incorporated into the plan. Documentation of consultation is included in Appendix 3.

3.2 National Park Service

On February 2, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Mussel Study plan to the NPS for comment. The NPS provided comments via their March 4, 2022 letter, which licensee subsequently addressed as detailed in Appendix 3.

4. References

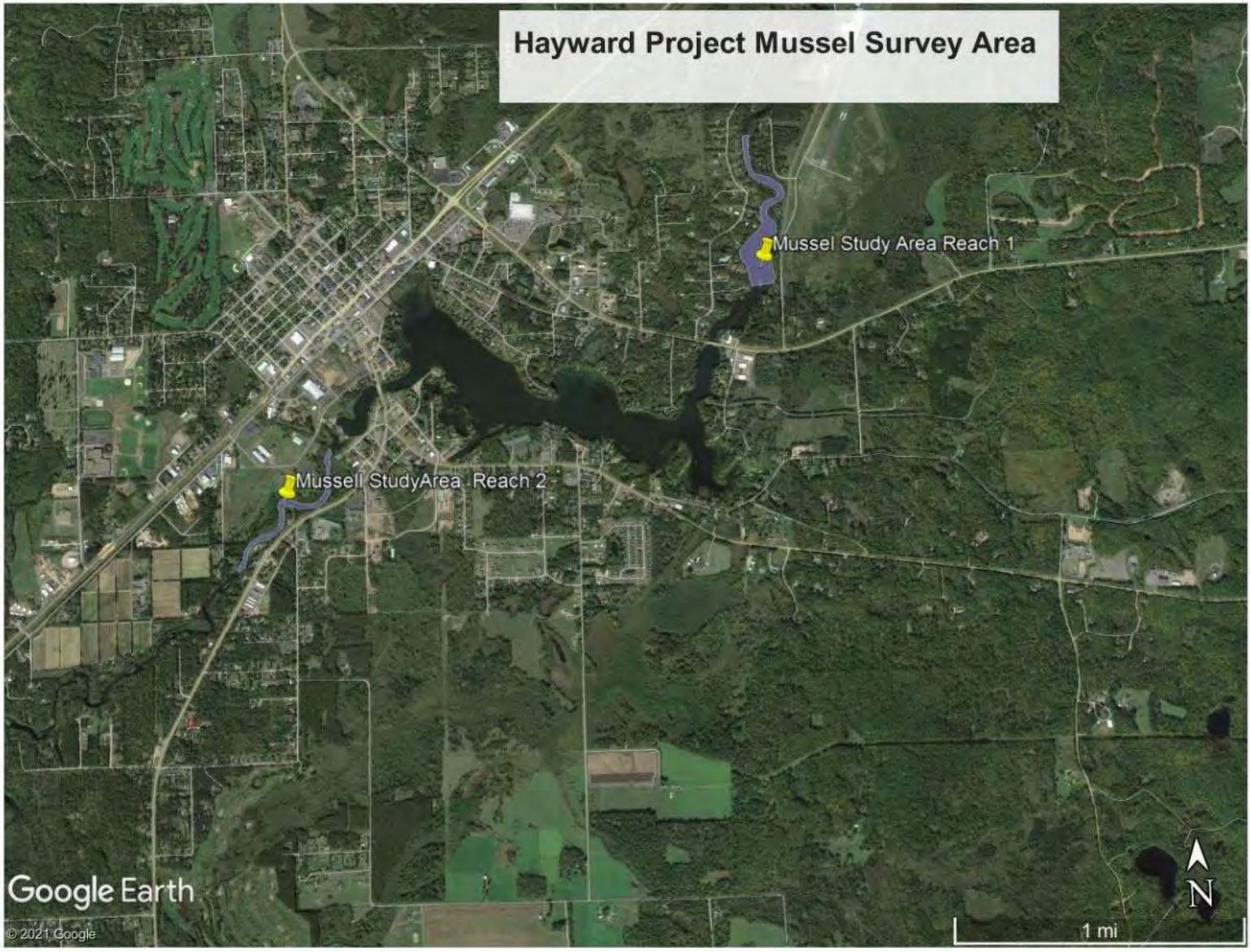
Piette, R.R. 2015. Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50 pp.

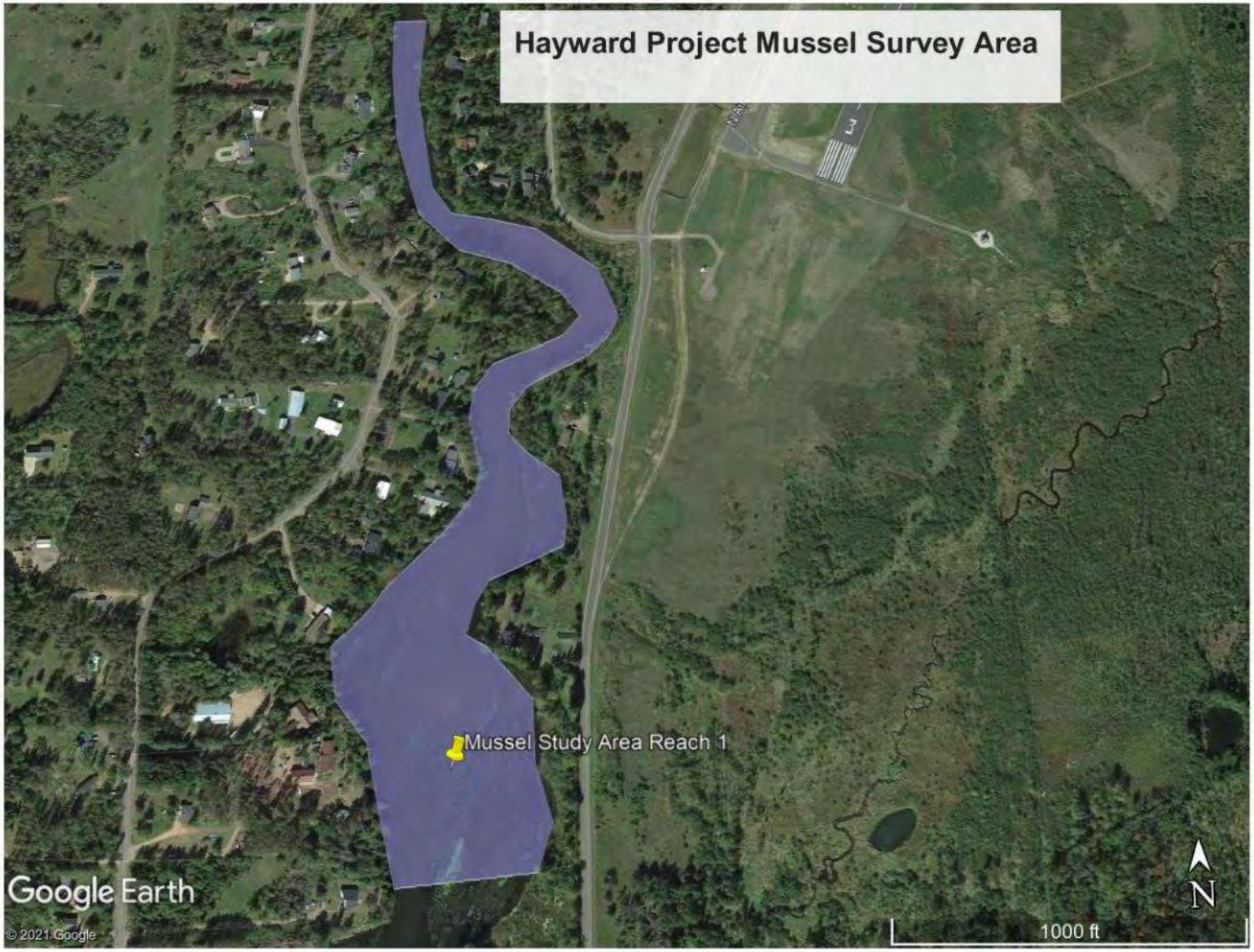
Smith, D.R. 2006. Survey design for detecting rare freshwater mussel species. Journal of the North American Benthological Society 25:701-711.

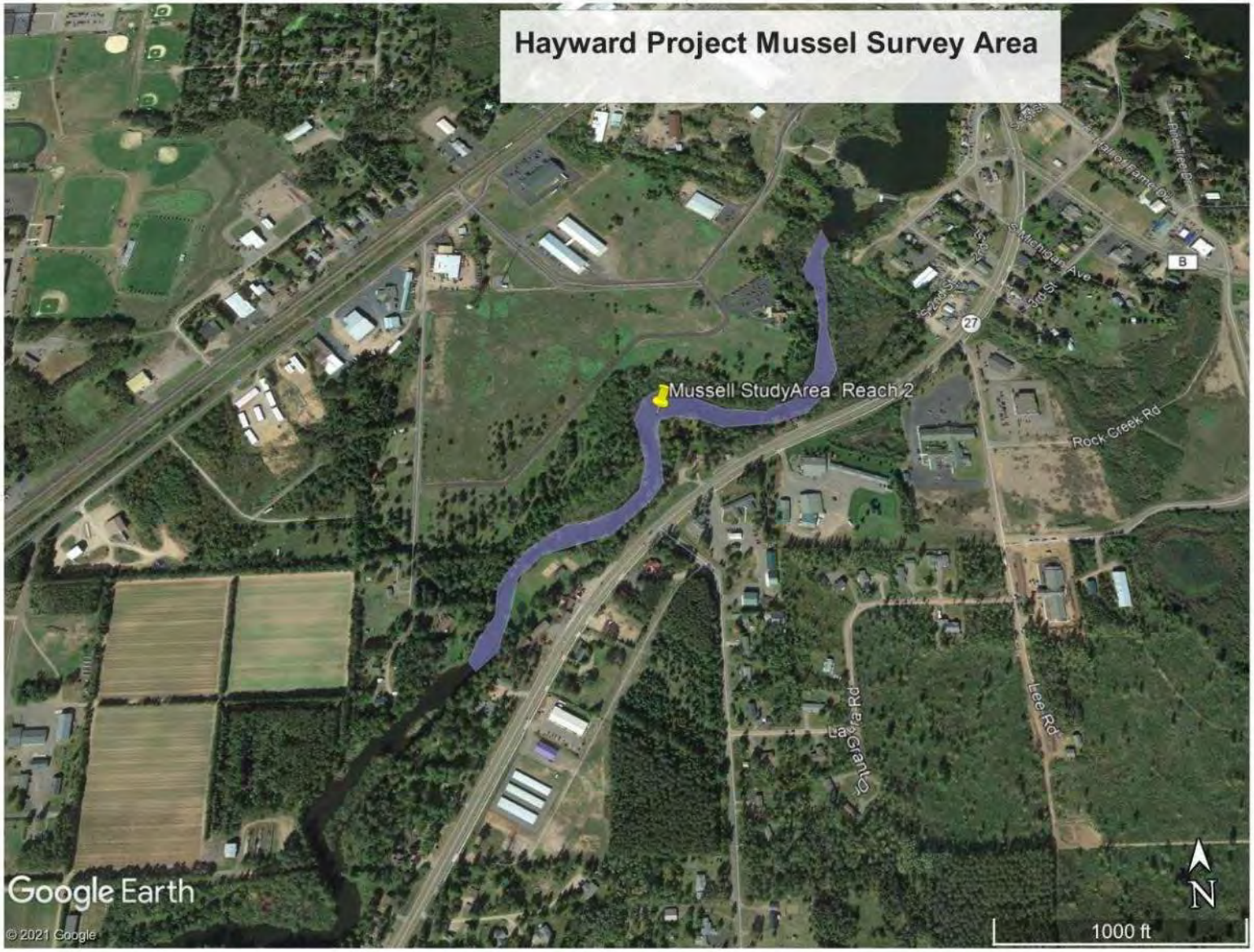
Williams, J.D et. al. 2017. A revised list of the freshwater mussels (Mullusca: Bibalvia Unionida) of the United States and Canada. Freshwater Mollusk Biology and Conservation, 20(2), 33-58.

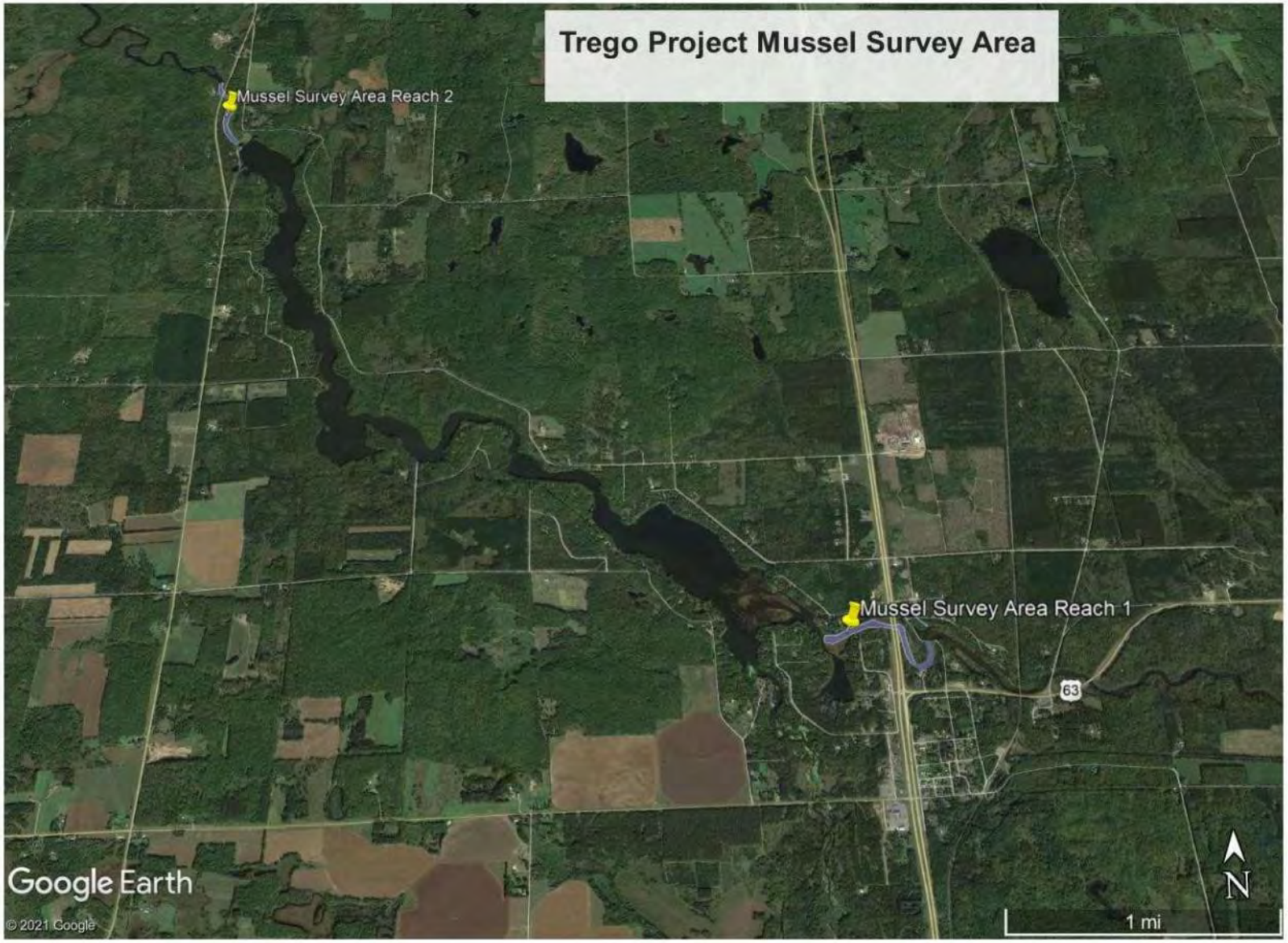
Wisconsin Department of Natural Resources. 2020. Study Requests Relicensing of Hayward (P-2417) and Trego (P-2711) Projects. May 7, 2021.

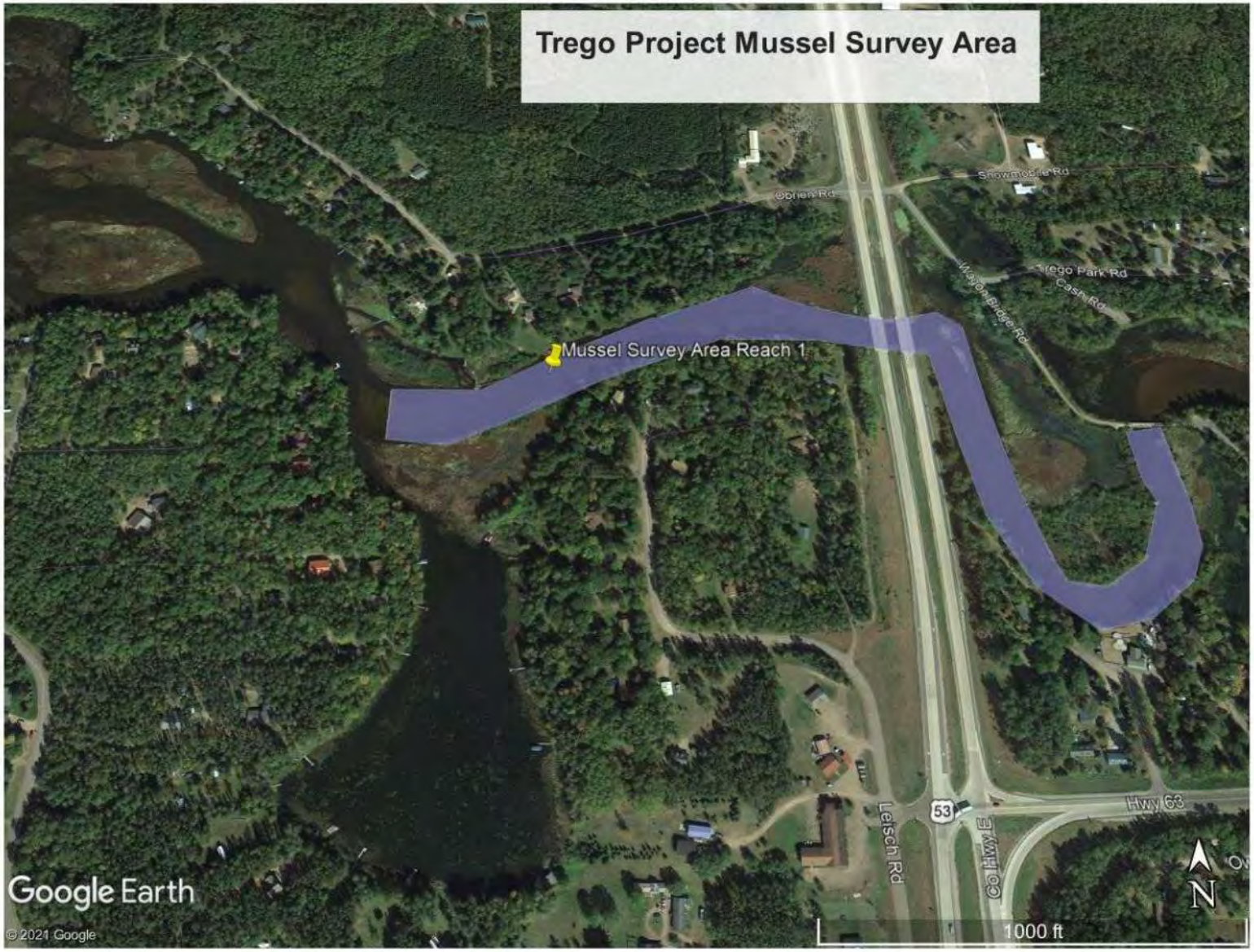
Appendix 1 – Mussel Survey Locations


Hayward Project Mussel Survey Area
Mussel Study Area Reach 1
Mussel StudyArea Reach 2
Google Earth
© 2021 Google
1 mi
N


Hayward Project Mussel Survey Area
Mussel Study Area Reach 1
Google Earth
© 2021 Google
N
1000 ft


Hayward Project Mussel Survey Area
Mussell StudyArea Reach 2
Rock Creek Rd
Lee Rd
La Grand Rd
E Michigan Ave
27
B
Google Earth
© 2021 Google
N
1000 ft


Trego Project Mussel Survey Area
Mussel Survey Area Reach 2
Mussel Survey Area Reach 1
63
Google Earth
© 2021 Google
N
1 mi


Trego Project Mussel Survey Area
Mussel Survey Area Reach 1
Snowmobile Rd
Trego Park Rd
Cash Rd
Wagon Bridge Rd
Leisch Rd
53
Hwy 63
CO HWY E
N
1000 ft
Google Earth
© 2021 Google


Trego Project Mussel Survey Area
Mussel Survey Area Reach 2
Bull Creek Rd
River Rd
Google Earth
© 2021 Google
N
1000 ft

Appendix 2 – Mussel Survey Data Forms

Substrate and Water Depth Per Segment											
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)							
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 1	T1	10								
	T1	20								
	T1	30								
	T1	40								
	T1	50								
	T1	60								
	T1	70								
	T1	80								
	T1	90								
	T1	100								
	T1	110								
	T1	120								
	T1	130								
	T1	140								
	T1	150								
	T1	160								
	T1	170								
	T1	180								
Reach 1	T2	10								
	T2	20								
	T2	30								
	T2	40								
	T2	50								
	T2	60								
	T2	70								
	T2	80								
	T2	90								
	T2	100								
	T2	110								
	T2	120								
	T2	130								
	T2	140								
	T2	150								
	T2	160								
	T2	170								
	T2	180								
Reach 1	T3	10								
	T3	20								
	T3	30								
	T3	40								
	T3	50								
	T3	60								
	T3	70								
	T3	80								
	T3	90								
	T3	100								
	T3	110								
	T3	120								
	T3	130								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
	T3	140								
	T3	150								
	T3	160								
	T3	170								
	T3	180								
Reach 1	T4	10								
	T4	20								
	T4	30								
	T4	40								
	T4	50								
	T4	60								
	T4	70								
	T4	80								
	T4	90								
	T4	100								
	T4	110								
	T4	120								
	T4	130								
	T4	140								
	T4	150								
	T4	160								
	T4	170								
	T4	180								
Reach 1	T5	10								
	T5	20								
	T5	30								
	T5	40								
	T5	50								
	T5	60								
	T5	70								
	T5	80								
	T5	90								
	T5	100								
	T5	110								
	T5	120								
	T5	130								
	T5	140								
	T5	150								
	T5	160								
	T5	170								
	T5	180								
	T1	10								
	T1	20								
	T1	30								
	T1	40								
	T1	50								
	T1	60								
	T1	70								
	T1	80								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 2	T1	90								
	T1	100								
	T1	110								
	T1	120								
	T1	130								
	T1	140								
	T1	150								
	T1	160								
	T1	170								
	T1	180								
Reach 2	T2	10								
	T2	20								
	T2	30								
	T2	40								
	T2	50								
	T2	60								
	T2	70								
	T2	80								
	T2	90								
	T2	100								
	T2	110								
	T2	120								
	T2	130								
	T2	140								
	T2	150								
	T2	160								
	T2	170								
	T2	180								
Reach 2	T3	10								
	T3	20								
	T3	30								
	T3	40								
	T3	50								
	T3	60								
	T3	70								
	T3	80								
	T3	90								
	T3	100								
	T3	110								
	T3	120								
	T3	130								
	T3	140								
	T3	150								
	T3	160								
	T3	170								
	T3	180								
	T4	10								
	T4	20								
	T4	30								

Substrate and Water Depth Per Segment										
Reach	Transect	Segment	Water Depth (ft)	Substrate Characteristic (%)						
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	LWD
Reach 2	T4	40								
	T4	50								
	T4	60								
	T4	70								
	T4	80								
	T4	90								
	T4	100								
	T4	110								
	T4	120								
	T4	130								
	T4	140								
	T4	150								
	T4	160								
	T4	170								
	T4	180								
Reach 2	T5	10								
	T5	20								
	T5	30								
	T5	40								
	T5	50								
	T5	60								
	T5	70								
	T5	80								
	T5	90								
	T5	100								
	T5	110								
	T5	120								
	T5	130								
	T5	140								
	T5	150								
	T5	160								
	T5	170								
	T5	180								

PROJECT:																							
Mussels Observed within Namekagon River, 2022																							
Species		Reach 1							Reach 2							Reach 3 (if applicable)							Overall (All Reaches Together)	
Common Name	Scientific Name	T1	T2	T3	T4	T5	Total Number Reach 1	Relative Abundance (% of total-Reach 1)	T1	T2	T3	T4	T5	Total Number Reach 2	Relative Abundance (% of total-Reach 2)	T1	T2	T3	T4	T5	Total Number Reach 3	Relative Abundance (% of total-Reach 3)	Total Number	Relative Abundance (% of total)
Abundance (total number of mussels)																								
Number of Species (Live)																								
Effort (size of transect, m^2)																								
Surface Density (# per m^2)																								

Appendix 3 – Documentation of Consultation

Shawn Puzen

From:	Shawn Puzen
Sent:	Wednesday, February 2, 2022 2:55 PM
To:	cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn
Cc:	Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject:	Hayward and Trego Mussel DRAFT Monitoring Plan
Attachments:	20220202 Hayward-Trego Mussel Study Plan sent to Agencies.pdf

Good Afternoon,

Attached is a draft Hayward and Trego Mussel Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete a mussel survey.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 4, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Shawn Puzen

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, February 16, 2022 12:16 PM
To: Darrin Johnson; Shawn Puzen
Cc: Miller, Matthew J
Subject: FW: Hayward and Trego Mussel DRAFT Monitoring Plan

Categories: Filed by Newforma

See comments below. I confirmed to Jesse that all study reports will be provided to the DNR.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov


dnr.wi.gov

From: Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Sent: Wednesday, February 16, 2022 12:10 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>
Subject: RE: Hayward and Trego Mussel DRAFT Monitoring Plan

Overall, I fully support the study plan and have two comments:

1. Can the author briefly describe what happens at individual 10-meter segments where no evidence of mussels occur. Are segments omitted from semi-quantitative searches?
2. We'd like to obtain a copy of the completed datasheets for use in comparing the current mussel bed to an historical dataset (Heath & Rasmussen 1990). Author mentions, *"The report, including completed survey sheets, will be summarized and appended to the DLA."* So I just want to clarify these datasheets will be available.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Jesse Weinzinger
Conservation Biologist - NHC
Wisconsin Mussel Monitoring Program
Wisconsin Department of Natural Resources
Phone: (608) 576-8631 **(New)**
Jesse.Weinzinger@Wisconsin.gov

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, February 02, 2022 2:58 PM
To: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Subject: FW: Hayward and Trego Mussel DRAFT Monitoring Plan
Importance: High

Please review and let me know if you have comments or we need to set up a conf call.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
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Cheryl.laatsch@wisconsin.gov


dnr.wi.gov

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Wednesday, February 2, 2022 2:55 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Harn <jharn.nps@gmail.com>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; brey.j.maurer@xcelenergy.com; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: Hayward and Trego Mussel DRAFT Monitoring Plan

Good Afternoon,

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Please provide your comments as soon as possible, but no later than March 4, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L A)

March 4, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Study Plans for Mussels, Water Quality, and Wood and Blanding's Turtle Nesting Habitat, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) is consolidating our comments for the three aforementioned studies received by email dated February 2 and 3, 2022.

The NPS reiterates our request for information reflected in our original study requests on April 27, 2021 for shoreline surveys and hydraulics, sedimentation, and channel change, and our August 31, 2021 comments on your draft Study Summary and Responses. The study plans reviewed here have components that would contribute important information relating to our original study requests.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System, as established by Congress in 1968 (Public Law 90-542). Under this law, the NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and its tributary, the Namekagon River, in a natural condition; to protect and enhance the exceptional natural, scenic, and cultural resources of the Riverway; and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic, cultural, recreation, and scenic/aesthetic resources. The Namekagon River is managed as part of the St. Croix National Scenic Riverway and is protected under the Organic Act.

Prior to the FERC issuing a new license, the NPS will need to evaluate the proposed license under Section 7(a) of the Wild and Scenic Rivers Act and to determine whether it will have direct and adverse effects on the values for which the river was designated. If the NPS identifies direct and adverse effects, the license/project will need to be modified to ensure that park resources are protected. The NPS study requests are needed to provide information to enable timely completion of this NPS review as well as the FERC NEPA analysis. Continuing impacts on resource values must be identified so that protection and enhancement measures can be incorporated into a new license.

Comments on Draft Study Plans

Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov to obtain all required NPS scientific research and collecting permits prior to implementing the study plans.

1. **Mussels**

- Mussels are a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. It is our agency's understanding that drawdowns may be necessary during the proposed forty-year license period for maintenance and other purposes. Drawdowns have the potential to affect mussels that are present in the portion of riverbed that emerges during the drawdown. To better understand potential effects to mussels, additional reaches will need to be included within the impoundments, especially in the areas near the shoreline that would become exposed during a drawdown event. The study area as currently proposed includes only two riverine reaches at either end of the Project boundaries, which is inadequate to understand the presence, species, and density of mussels in the areas of the impoundments that would be most affected by a drawdown. Please add additional reaches within each impoundment to the study area. The NPS is available to consult further on identifying and prioritizing additional reaches for the purposes of this study.
- The NPS concurs with the use of WDNR guidelines.
- On page 3, include the NPS in the notification list, along with WDNR and USFWS, if any federally or state-listed species is observed, dead or alive. This will also be specified within the required NPS research and collecting permits.
- When assessing and characterizing mussel habitat, researchers should reference *Aquatic Habitat Classification on the St. Croix National Scenic Riverway* by Haibo Wan et al.

NSPW does not propose to change the operation of the Project from its current run-of-river operating mode and there is no need for routine or scheduled drawdowns. Any future drawdowns that "may" be needed during the subsequent license period will be required by the Commission to completed in consultation with the resource agencies to assure any adverse impacts are avoided or mitigated at the time of the drawdown. The data being requested for a future event that "could" happen is better collected, if needed, once the scope of the proposed action is proposed and collected as needed and analyzed at that time. Therefore, the study being requested for the purpose of a potential future drawdown is not being conducted at this time as part of the relicensing process.

The plan has been amended.

The plan has been amended

2. **Water Quality Study**

- Water quality is a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. The Wild and Scenic Rivers Act directs the NPS to protect water quality of the Namekagon (Sec. 1(b)) and work with the Environmental Protection Agency and the WDNR to eliminate or diminish water pollution of the river (Sec. 12(c)).
- The NPS concurs with the use of WDNR protocols and the rationale for not monitoring cyanobacteria.
- The NPS requests that sediment accumulation also be monitored. Results would provide needful baseline information and facilitate better understanding of sedimentation within the project boundaries.

Based upon existing information provided by the USACE, the accumulation of sediment in the upper end of the reservoir is due to sedimentation upstream and not due to operation of the Project-FERC Order Modifying and Approving Drawdown Needs Analysis issued October 31, 1995.

3. **Wood and Blanding's Turtle Nesting Habitat Study**

- This is another example, like the Aquatic and Terrestrial Invasive Plant study, where the effort that goes into the study could provide shoreline survey information outlined in the NPS study request; however, the draft plan does not provide enough detail on shoreline survey methods to determine if NPS needs would be met through this work.
- The NPS-requested shoreline study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license. The NPS has responsibility to review shoreline alteration activities such as bank stabilization and small boat docks as water resources projects under Section 7 of the Wild and Scenic Rivers Act.
- The NPS Shoreline Survey request Method 1[1] recommended a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still) and cited the High-

[1] NPS comments on the Pre-Application Document and Study Requests, dated 4/28/21, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CF9CB-66E2-5005-8110-C31FAFC91712

The HDSS method described by NPS was only used at the RL Harris Hydroelectric Project (FERC No. 2628), a 135 MW peaking facility, to determine the impacts of project operations (peaking) in a 44 mile stretch of the Tallapoosa River downstream of the dam. This method was not used to evaluate erosion or sedimentation within the RL Harris Project Reservoir. Erosion and sedimentation sites within the reservoir were identified by stakeholders and by examining available aerial photography and LIDAR data. Only sites identified by this analysis were then surveyed in the field during the fall/winter pool drawdown. Since the Trego Project is operated in a run-of-river mode that does not conduct seasonal drawdowns, this survey method is not possible at the Project. The Licensee has proposed to evaluate the entire shoreline, and document all erosion sites within the Project rather than just in pre-determined locations. The HDDS study is not necessary to evaluate the Namekagon River downstream of the Project since all inflow is passed downstream of the Project. Project operation does not cause flow fluctuations downstream.

Definition Stream Survey (HDSS) method (Trutta, 2019)[2] used in recent FERC hydropower licensing proceedings, which enables mapping, a visual record of stream and shoreline characteristics, and data collection from multiple sensors. For any planned boat surveys of the shoreline (e.g., turtle, cultural resources, vegetation), please reconsider adopting study Method 1 proposed in the NPS shoreline survey study request to systematically evaluate, quantify, and photograph shoreline conditions including streambank conditions, bank stabilization types and conditions, docks/piers, and public access locations.

The Section 7(a) evaluation to evaluate the effects of the proposed operation of the Project on the Wild and Scenic River. NSPW has proposed studies that provide the data that is not already available to assess the impact of the proposed operation of the Project. The question of 4(e) authority for the Project was previously addressed in the issuance of the current license by order dated June 3, 1994.

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27,2021 letter, including the shoreline survey and hydraulics, sedimentation, and channel change. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Conclusion

Thank you for your consideration of our agency's comments as you develop your final study plan. The NPS looks forward to the results of the three studies reviewed in this letter, as well as the opportunity to continue to collaborate with you throughout the licensing process. Please distribute future communications through Lisa Yager, chief of resource stewardship and education at the St. Croix National Scenic Riverway. Information will be distributed to the NPS team as appropriate through Lisa.

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

CRAIG HANSEN Digitally signed by CRAIG HANSEN Date: 2022.03.04 13:13:56 -06'00'

Craig Hansen
Superintendent

[2] Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021: https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850581&accessionnumber=20200410-5091

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Hayward and Trego Hydroelectric Projects FERC Project Nos. 2417 and 2711

Recreation Study Plan

Prepared for

Xcel Energy®

Prepared by

Mead & Hunt

meadhunt.com

December 2021

1. Introduction

Northern States Power Company – Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 (Hayward) and 2711 (Trego), expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit final license applications to FERC no later than November 30, 2023. The final license applications, in part, must include an evaluation of the existing recreational facilities associated with each Project along with proposed recreation enhancements.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The National Park Service (NPS) and Wisconsin Department of Natural Resources (WDNR) requested a study of recreation facilities and an investigation of recreation enhancements as part of the relicensing process.

NPS requested that the Licensee conduct an inventory of recreation opportunities and facilities including determining recreation demand using field observations, user surveys, and focus groups and estimating recreation needs based on the data gathered.

WDNR requested that the Licensee evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing, with consideration for the different seasonal uses.

This study plan is consistent with the NPS and WDNR requests.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to provide a subjective assessment of existing recreation facility conditions as well as recommended enhancements. The study will also determine the capacity of existing facilities to help assess current and future user demand, produce sufficient information to evaluate such impacts, and provide the rationale for recommended recreation enhancements.

2.2 Background and Existing Information

Recreation in the vicinity of the Projects is dominated by activity near the Projects' facilities. The existing recreational facilities within the Projects will be evaluated for recreational use and improvements.

The last recreation studies for the Projects were completed in 2020 and filed with FERC on February 24, 2021. The Hayward report indicated that "...the Lake Hayward area offers a sufficient amount of recreational opportunities for both land and water-based activities. The recreational facilities, while limited in number, are in good condition and receive regular maintenance and upgrades when required.

The number and size/capacity of the facilities appear sufficient to accommodate the current amount of use on all but the busiest of days" (NSPW, 2021).

The Trego report indicated that "…the Trego Flowage area offers reasonable opportunities for both water and land-based recreational activities, including opportunities for overnight recreation (i.e., camping, night fishing, etc.). Although the number of recreational facilities is limited, most are in good condition and receive routine maintenance. The number and capacity of the facilities appear sufficient to accommodate current recreational use on all but the busiest days, despite the apparent observed increase in recreational activity related to COVID-19."

In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP identifies recreation needs by region rather than specific sites or Project areas.

The SCORP places an emphasis on nature-based recreational opportunities including hiking, fishing, and boating. For both Projects, the Licensee currently provides a carry-in access on the reservoir, a tailrace fishing area downstream of the powerhouse, and a canoe portage that helps fulfill recreation needs. These recreational opportunities are consistent with the SCORP.

2.3 Nexus between Project Operations and Effects on Resources

Hydro operations, including fluctuations in reservoir elevation, and insufficient public access can limit recreational opportunities. Adequate information is necessary to determine what impacts may be occurring from hydro operations as well as which recreational opportunities may be enhanced.

2.4 Study Area

Since it is believed no additional recreation sites are necessary, the inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1.

Table 2.4-1. Recreation Sites to be Inventoried and Surveyed for Existing Use

Hayward Canoe Portage Take-Out and Carry-In Reservoir Access
Hayward Canoe Portage Trail and Put-In
Hayward Informal Tailwater Bank Fishing Area
Hayward City Boat Landing
Hayward City Beach & Barrier-Free Fishing Pier
Hayward Bartz's Bay Informal Ice Fishing Access[1]
Town of Trego Park Boat Landing
Town of Trego Boat Landing
Trego North Tailwater Access (Canoe Portage)
Trego South Tailwater Access

[1] Bartz's Bay Informal Ice Fishing Access will only be surveyed during the January and February survey periods.

2.5 Methodology[2]

2.5.1 Recreation Inventory

Each of the recreation sites listed in Table 2.4-1 will be inventoried during the summer using the forms attached as Appendix 1 to collect information on recreation amenities and capacity. The following types of information will be recorded:

1) The primary type(s) of recreation provided at the site.
2) Existing sanitation facilities (if any).
3) Type of vehicle access and parking capacity (if any).
4) The presence and type (if any) of barrier-free facilities.
5) The GPS location of the facility.
6) Signage.
7) Photographs of the recreation site, amenities, signage, and entryways to the site from the main road(s), including photographs of any adverse impacts the site may have on environmental resources including shoreline erosion.

2.5.2 Facility Condition Assessment

During at least one visit to each of the recreation sites listed in Table 2.4-1, the condition of each amenity or feature (including recreational wayfinding signs and interpretive signs) and its immediate vicinity will be assessed. A rating for each site will be made according to the following scale:

1) Missing and Needs Replacement
2) Not Usable and Needs Replacement
3) Needs Repair
4) Needs Maintenance or cleaning
5) Good Working Condition (does not need any attention)

If a rating is assigned indicating that additional attention is required, the specific item that needs additional attention will be noted on the form.

2.5.3 Recreation Use Survey

Recreation use surveys will be conducted during visits to each of the recreation sites listed in Table 2.4-1. The surveys will last at least one hour per site between the hours of 7:00 a.m. and 7:00 p.m. Surveying will be completed on a rotating schedule to avoid surveys from repeatedly being conducted at the same time of day and will also account for time-of-day use patterns. The recreation use survey form included in Appendix 2 will be administered to users to gather their opinion about the existing recreation facilities and opportunities. The survey will record the number of people in a party, their primary reason for visiting the site, their perception of level of

[2] Please note: The methodology does not include regional demand assessment or recreation needs assessment. These analyses will be completed as part of the License Application.

use, and their opinions regarding the amount and types of recreation opportunities offered within the proposed Project vicinity. The recreation use surveys will be conducted according to the following schedule in Table 2.5.3-1

Table 2.5.3-1. Recreation Use Survey Schedule

Survey Month	Recurrence Interval
January	One randomly selected weekend day and one randomly selected weekday.
February	One randomly selected weekend day and one randomly selected weekday
April	One randomly selected weekend day.
May	One randomly selected weekend day. One day during Memorial Day weekend.
June	One randomly selected weekday. Two randomly selected weekend day.
July	One randomly selected weekday. Two randomly selected weekend day.
August	One randomly selected weekday. Two randomly selected weekend day.
September	One weekend day the weekend following Labor Day weekend.

2.5.4 Spot Counts

When first arriving at each recreation site where recreation use surveys will be collected, a spot count will be conducted using the recreation use spot count form enclosed in Appendix 3. This information will be statistically analyzed to develop recreational use figures for the Projects. This information will be summarized by season and activity for each type of use in the study report.

2.5.5 Future and Potential Recreation

To assess future recreation needs within the Project vicinity, the questionnaire enclosed in Appendix 4 will be sent to municipalities and other entities responsible for existing recreation within the Project vicinity. Specifically, the questionnaire will be sent to the City of Hayward, Hayward Area Chamber of Commerce, and Sawyer County for the Hayward Project and the Town of Trego, Trego Lake District, and Washburn County for the Trego Project. It will also be sent to the NPS St. Croix National Scenic Riverway for the Hayward and Trego Projects. Each entity will be allowed 30 days to respond to the questionnaire and their responses will be incorporated into the license application. The type of maps of the recreation sites that will be included in the questionnaires have been included in Appendix 5.

2.6 Consistency with Generally Accepted Scientific Practice

The overall design of the recreational survey is similar to that commonly used in relicensing proceedings and is consistent with generally accepted methods for recreation studies.

2.7 Project Schedule and Deliverables

NSPW anticipates that field work will begin in January 2022 (for winter surveys) and be completed by mid-September. The study results will be incorporated into a draft report by October 31, 2022. A final report is expected to be completed by January 31, 2023.

3. Consultation

The Recreation study was requested by the NPS and WDNR. As a result, the Licensee consulted with the NPS and WDNR on the study plan as discussed in the following sections.

3.1 National Park Service

On November 5, 2021, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the NPS for comment. Comments were received from the NPS on December 4, 2021. NSP made the changes requested by the NPS except for the following:

1) NSP did not mention the fact that the Town of Trego Boat Landing is not within the proposed Project boundary because there is no discussion in the plan about the Project boundary.
2) NSP changed the reference in the text and form from “Facility Lacking; need to install facility or otherwise add enhancement (identify item).” to “Missing-Needs Replacement” because the inventory and condition assessment is not designed to provide input on what amenities should be added. It is intended to determine what amenities are present, the condition or if they are missing.
3) NSP changed the form in Appendix 2 to insert the text regarding a “40 to 50-year license.”
4) NSP did not include the following language in Appendix 2: “to be included in the license” because not all recommendations automatically become part of the license.
5) NSP added a blank line to allow the interviewee to specify the reason for “Unsatisfactory facilities or conditions of land or water” to Appendix 2.

All Documentation of Consultation is included in Appendix 6.

3.2 Wisconsin Department of Natural Resources

On November 5, 2021, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the WDNR for comment. The WDNR did not respond with comments. Documentation of Consultation is included in Appendix 6.

4. References

EA Engineering. 2021a. Recreation Report for the Hayward Hydroelectric Project (FERC Project No. 2417). February 2021.

EA Engineering. 2021b. Recreation Report for the Trego Hydroelectric Project (FERC Project No. 2417). February 2021.

Appendix 1 – Recreation Site Inventory Form

Recreation Inventory and Condition Assessment

Location: | Date:

Hayward Hydroelectric Project P-2417

Survey Person:

GPS Location:

Amenity Photo Numbers:

Shoreline Photo Numbers:

Entryway Photo Number:

Type of Amenity:	Quanitity of Amenities:	Condition of Amenity: -Missing-Needs Replacement (NR) -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)	Notes:	Barrier Free? (Y or N)
Boat Launch	Lanes: 1 Launches: 1	NR N R M G		
Scenic Overlook		NR N R M G		
Tailwater Access		NR N R M G		
Restroom		NR N R M G		
Trash Receptacles		NR N R M G		NA
Other (picnic units, informal trails, camping, etc.)		NR N R M G		

Parking	No. Spaces (each type):				Condition:	Notes:
	Standard:	Barrier-Free:	Trailer:	Other (specify):		
					N R M G	Gravel?

Signage:	Number:	Condition:	Comments: Provide Details on which signs need attention.
FERC Project Sign		NR N R M G	
Regulations Signs		NR N R M G	
Directional		NR N R M G	
Interpretive		NR N R M G	

Additional Comments:

Describe any signs of overuse or anything observed that is not already documented above.

Recreation Inventory and Condition Assessment

Location:		Date:	
Trego Hydroelectric Project P-2711			
Survey Person:			
GPS Location:			
Amenity Photo Numbers:			
Shoreline Photo Numbers:			
Entryway Photo Number:			

Type of Amenity:	Quanitity of Amenities:	Condition of Amenity: -Missing-Needs Replacement (NR) -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)	Notes:	Barrier Free? (Y or N)
Boat Launch	Lanes: 1 Launches: 1	NR N R M G		
Scenic Overlook		NR N R M G		
Tailwater Access		NR N R M G		
Restroom		NR N R M G		
Trash Receptacles		NR N R M G		NA
Other (picnic units, informal trails, camping, etc.)		NR N R M G		

Parking	No. Spaces (each type):				Condition:		Notes:
	Standard:	Barrier-Free:	Trailer:	Other (specify):			
					N R M G		Gravel?

Signage:	Number:	Condition:	Comments: Provide Details on which signs need attention.
FERC Project Sign		NR N R M G	
Regulations Signs		NR N R M G	
Directional		NR N R M G	
Interpretive		NR N R M G	

Additional Comments:

Describe any signs of overuse or anything observed that is not already documented above.

Appendix 2 – Recreation Use Survey Form

ON-SITE/IN-PERSON RECREATION INTERVIEW

Hayward & Trego Hydroelectric Projects (FERC Nos. 2417 and 2711)

NPS Recreation Survey Questionnaire

Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of applying for subsequent 40 to 50-year licenses from the Federal Energy Regulatory Commission (FERC) to continue to operate and maintain the existing Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by NSPW. To obtain a license for the Projects, NSPW must submit a final license application to FERC no later than November 30, 2023. As part of the relicensing process, NSPW is conducting several environmental studies which will enable FERC to prepare an environmental report. The purpose of this survey is to collect information about recreational use and visitors' experiences at public recreation facilities around the Hayward and Trego Project reservoirs so that we may better assess existing and future recreational.

1. Check the box on the location where you received this survey:

Hayward Project:

- ☐ Hayward Canoe Portage Take-out and Carry-In Access
- ☐ Hayward Canoe Portage Trail and Put-in
- ☐ Informal Tailwater Bank Fishing Access
- ☐ City of Hayward Boat Landing
- ☐ City of Hayward Beach/Fishing Pier
- ☐ Bartz's Bay Informal Ice Fishing Access

Trego Project:

- ☐ Town of Trego Park Boat Landing
- ☐ Town of Trego Boat Landing
- ☐ Trego North Tailwater Access/Canoe Portage
- ☐ Trego South Tailwater Access

2. Below is a list of activities available. Please indicate:
   (A) Which of these activities have you participated in **on your current visit** to the area.
   (B) Which **ONE** of these activities is your **PRIMARY ACTIVITY** on this trip to the area?

ACTIVITY	(A) Participated in ON THIS TRIP (Check all that apply)	(B) PRIMARY ACTIVITY (Check only one)
Shoreline/tailwater fishing		
Fishing from a boat		
Motorized boating		
Non-motorized boating		
Swimming		
Picnicking		
Wildlife Viewing		
Ice Fishing		
Other (specify)		

3. (A): Were there any activities that you and your group wanted to do on this visit to (AREA) that you were not able to?

   ☐ YES ☐ NO

   (B): If YES: What was it? _____

(C): Which of the following reasons, if any, explain why you did not engage in the activity?

- ☐ Rules or regulations did not allow for activity
- ☐ Area was temporarily closed to the public
- ☐ Not enough time
- ☐ Safety concerns
- ☐ Not enough information about the activity
- ☐ Too crowded
- ☐ Difficult road or trail access
- ☐ No road or trail access
- ☐ Unsatisfactory facilities or conditions of land or water (please specify)_____
- ☐ Resource damage due to overuse
- ☐ No facilities or services
- ☐ Bad weather
- ☐ Flooding or other natural hazard
- ☐ Other (please specify) _____

4. Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services?

☐ YES ☐ NO

If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in?

(Please describe): _____

5. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir?

[Select one number for each or indicate it was not applicable to your visit.]

LOCATION / AREA	Not at all crowded	Slightly crowded	Moderately crowded	Very crowded	Extremely crowded	Not applicable
In parking areas	1	2	3	4	5	☐
On the trails	1	2	3	4	5	☐
At a developed campground	1	2	3	4	5	☐
At a boat-in campsite	1	2	3	4	5	☐
While fishing from the shoreline	1	2	3	4	5	☐
While boating/fishing from a boat	1	2	3	4	5	☐

(B) If you felt crowded, did you modify your recreation plans because you felt crowded?

☐ YES ☐ NO

(C) If YES, what did you do?

- ☐ Moved to a new location
- ☐ Changed the time of day
- ☐ Changed your activity
- ☐ Chose not to recreate
- ☐ Continued with current plans
- ☐ Other: _____

6. During the planning process for your visit, how did the possibility of crowds affect your trip plans?

(Please select one response)

- ☐ It did not affect my plans
- ☐ I visited at a time of day I thought would be less crowded
- ☐ I visited on a day of the week I thought would be less crowded
- ☐ I avoided places here I thought would be crowded today
- ☐ Other (please specify) _____

7. Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ YES ☐ NO

If yes, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)			
	Proximity	Loudness	Other (please specify)	
Motorized boaters	☐	☐	☐	_____
Non-motorized watercraft	☐	☐	☐	_____
Vehicles	☐	☐	☐	_____

8. How satisfied were you with the following amenities at this recreation facility/reservoir today.
***Important**: Please only circle a number for the items **that you used during your current visit** to this specific recreation facility/reservoir. Also, please **check** the "Did Not Use" box, if you did not use the item or it does not exist at the specific recreation facility.*

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied	Did Not Use	If you were dissatisfied for any reason, please explain why:
	Restroom	1	2	3	4	5	☐	
	Picnic sites	1	2	3	4	5	☐	
	Trash receptacles	1	2	3	4	5	☐	
	Vehicle parking areas	1	2	3	4	5	☐	
	Boat launch parking area	1	2	3	4	5	☐	
	Boat launch	1	2	3	4	5	☐	
	Boat dock	1	2	3	4	5	☐	
	Other:	1	2	3	4	5	☐	
	Roads to facility	1	2	3	4	5	☐	
	Signage to the facility	1	2	3	4	5	☐	
	Signage within the facility	1	2	3	4	5	☐	
	Other:	1	2	3	4	5	☐	

9. How did you obtain information to plan your current trip? (Please select all that apply)

- ☐ Federal or State website
- ☐ City, local, or municipal website
- ☐ Xcel website
- ☐ Other websites
- ☐ Maps, brochures, pamphlets
- ☐ Visitor bureaus/centers
- ☐ Previous visits
- ☐ Word of mouth
- ☐ Social media (e.g., Facebook, Twitter, etc.)
- ☐ Travel guides and tour books
- ☐ Newspaper/magazine article
- ☐ Radio/TV broadcasts
- ☐ Other (specify): _____

What is the ZIP code where you live or country if not in the United States?

ZIP code: _____ or, country (if not the United States): _____

What is your age: _____

What is your gender? ☐ Male ☐ Female ☐ Non-binary

Which of these categories best indicates your race and ethnicity? Answer only for yourself.

Please select one or more.

- ☐ American Indian/Alaskan
- ☐ Native Hawaiian/other Pacific
- ☐ Black/African-American
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ Not Hispanic or Latino
- ☐ White
- ☐ Don't know

Please let us know if you have any additional comments regarding your recreation experience during your visit: (contact information)

_____

_____

_____

_____

Appendix 3 – Recreation Use Spot Count Form

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Recreation Observation (Spot Count) Form

Date:				Time:	
Hayward Project P-2417					
Survey Person:					Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.
Temperature:		Weather:		Wind Speed:	

Recreation Site	Number of People	Recreation Activities												Notes
		Shoreline Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	ATV/Snowmobile	Other (specify)	
Canoe Portage Take-Out & Carry-In Reservoir Access														
Canoe Portage Trail and Put-In														
Informal Tailwater Bank Fishing Area														
Hayward City Boat Landing														
Hayward City Beach/Barrier-Free Fishing Pier														
Bartz's Bay Informal Ice Fishing Access (Jan & Feb only)														

Additional Comments:

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Recreation Observation (Spot Count) Form																	
Date:													Time:				
Trego Project P-2711																	
Survey Person:														Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.			
Temperature:		Weather:				Wind Speed:											
			Recreation Activities														
Recreation Site	Number of People	Shoreline Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	ATV/Snowmobile	Other (specify)	Notes			
Town of Trego Park Boat Landing																	
Town of Trego Boat Landing																	
Trego North Tailwater Access (Canoe Portage)																	
Trego South Tailwater Access																	
Additional Comments:																	

Appendix 4 – Future and Potential Recreation Questionnaire

Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of relicensing the Hayward and Trego Hydroelectric projects (Projects) located on the Namekagon River in Sawyer and Washburn Counties, respectively. The Projects are owned, operated, and maintained by NSPW and currently operate under licenses issued by the Federal Energy Regulatory Commission (FERC). In order to continue to operate and maintain the Projects, NSPW must apply for subsequent licenses from the FERC. A final license application must be submitted to FERC no later than November 30, 2023. As part of the relicensing process, NSPW is gathering information about potential recreation needs in the vicinity of Projects.

The Hayward Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream and 2 ½ miles upstream of the Hayward Dam. The Trego Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream and 5 ¾ mile upstream of the Trego Dam.

If you have any questions, please contact Matthew Miller at matthew.j.miller@xcelenergy.com or 715-737-1353.

1. Information about person completing the questionnaire:

Name & Title: _____

Organization: _____

Address: _____

_____

Phone: _____

Email Address: _____

2. Is your organization responsible for or interested in recreation sites, amenities, formal access sites, or planning for recreation sites within the Project vicinity as defined above?

☐ Yes ***(Please proceed to 2a below)*** ☐ No ***(No additional information is needed and thank you for your input)***

a. Please describe your primary function pertaining to recreation and list any recreation sites or access sites (formal or informal) in the Project vicinity you are responsible for or have interest in the space provided below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

_____

_____

_____

_____

_____

_____

_____

Please proceed to question 2b on the next page.

b. Please list all recreation amenities available at each recreation site or access site you manage or have an interest in (e.g. docks, restrooms, parking areas, interpretive signage, picnic tables, trails, etc.) below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

c. Please provide the location of each site listed above using a the enclosed map, street address, or GPS location: ***(Additional information may be provided on the final sheet of this questionnaire.)***

d. Have any of the sites or amenities listed in 2a and 2b exceeded capacity or not had sufficient parking? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, amenity and when capacity is exceeded.)*** ☐ No

Recreation Site/Amenity	**Event(s) Exceeding Capacity**

Please proceed to question 2e on the next page.

e. Do you have any planned improvements for the recreation sites listed in 2a and amenities listed in 2b or any plans for development of new recreation sites? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, planned improvement, and anticipated opening date below.)*** ☐ No

Planned Improvements/Locations	**Anticipated Opening Date**

f. Do you believe additional recreation sites/amenities are needed, or any enhancements are needed at existing recreation sites, within the Project vicinity? **(Additional information may be provided on the final sheet of this questionnaire.)**

☐ Yes ***(Please list reasoning below.)*** ☐ No

Additional Recreation Sites/Amenities Reasoning

g. Please indicate if there is a specific representative you wish to designate as a follow-up contact to be used by Xcel Energy or their representative ***(Additional information may be provided on the final sheet of this questionnaire.)***

Representative Contact Information

Name: _____

Address: _____

_____

Phone: _____

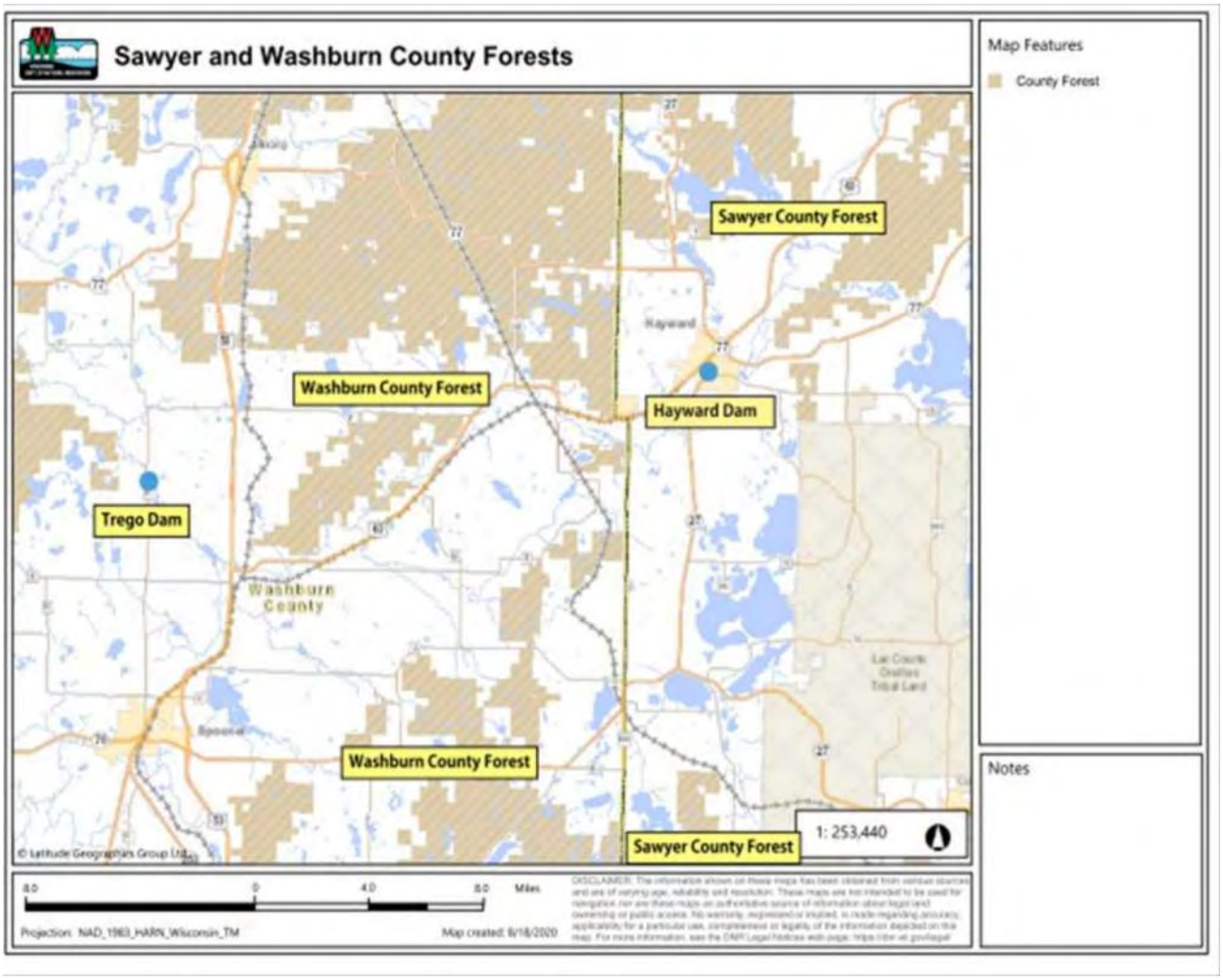
Email: _____

Additional Information or Comments:
(***Please indicate applicable section***)

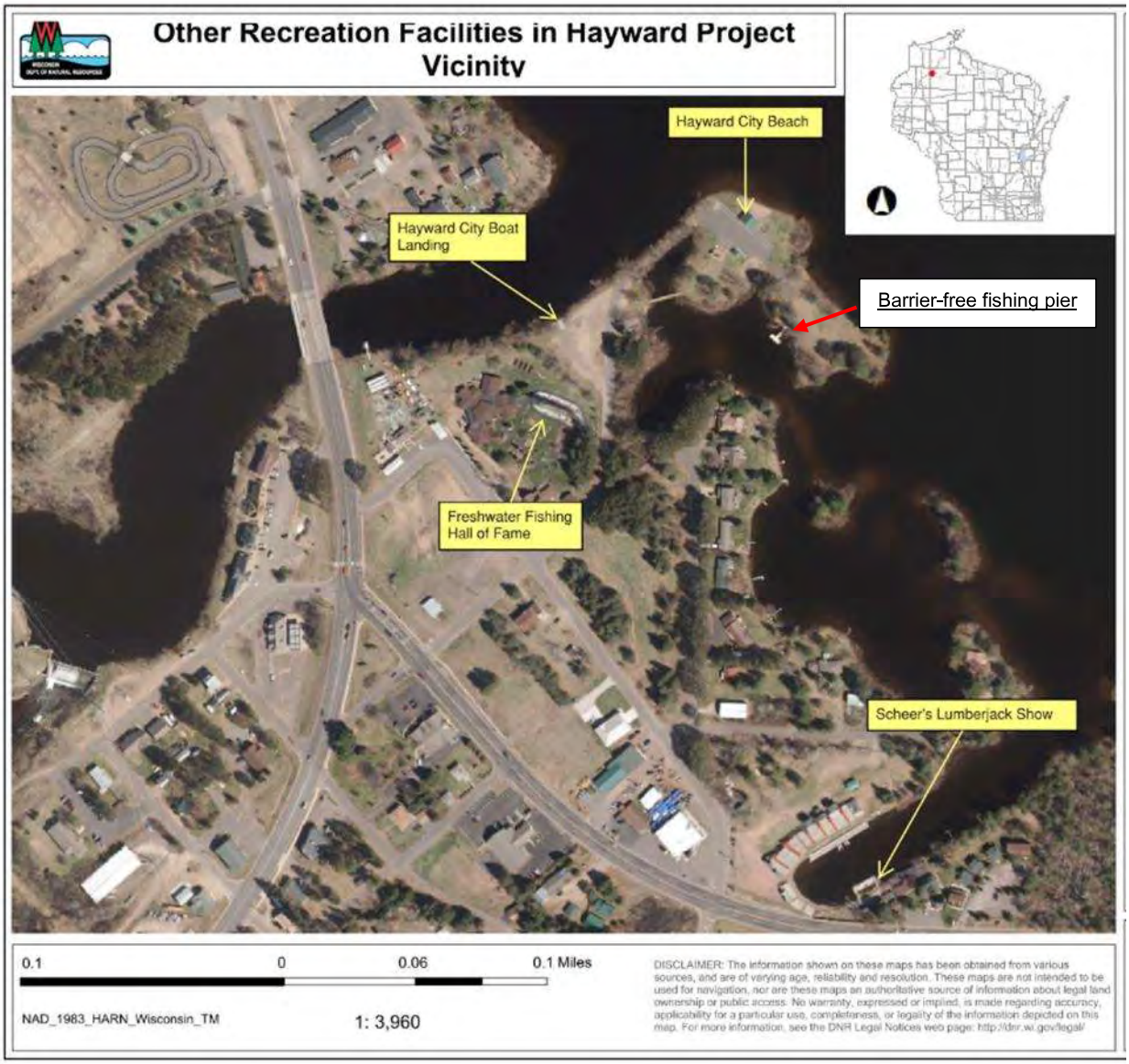
Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope or via email at the email address below within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed. *Not responding within 30 days will indicate you or your agency are not aware of any relevant information regarding potential recreation needs in the vicinity of the Hayward or Trego Hydroelectric Projects.*

Comments, questions, and/or this completed questionnaire may also be sent via email to: Matthew.J.Miller@XcelEnergy.com

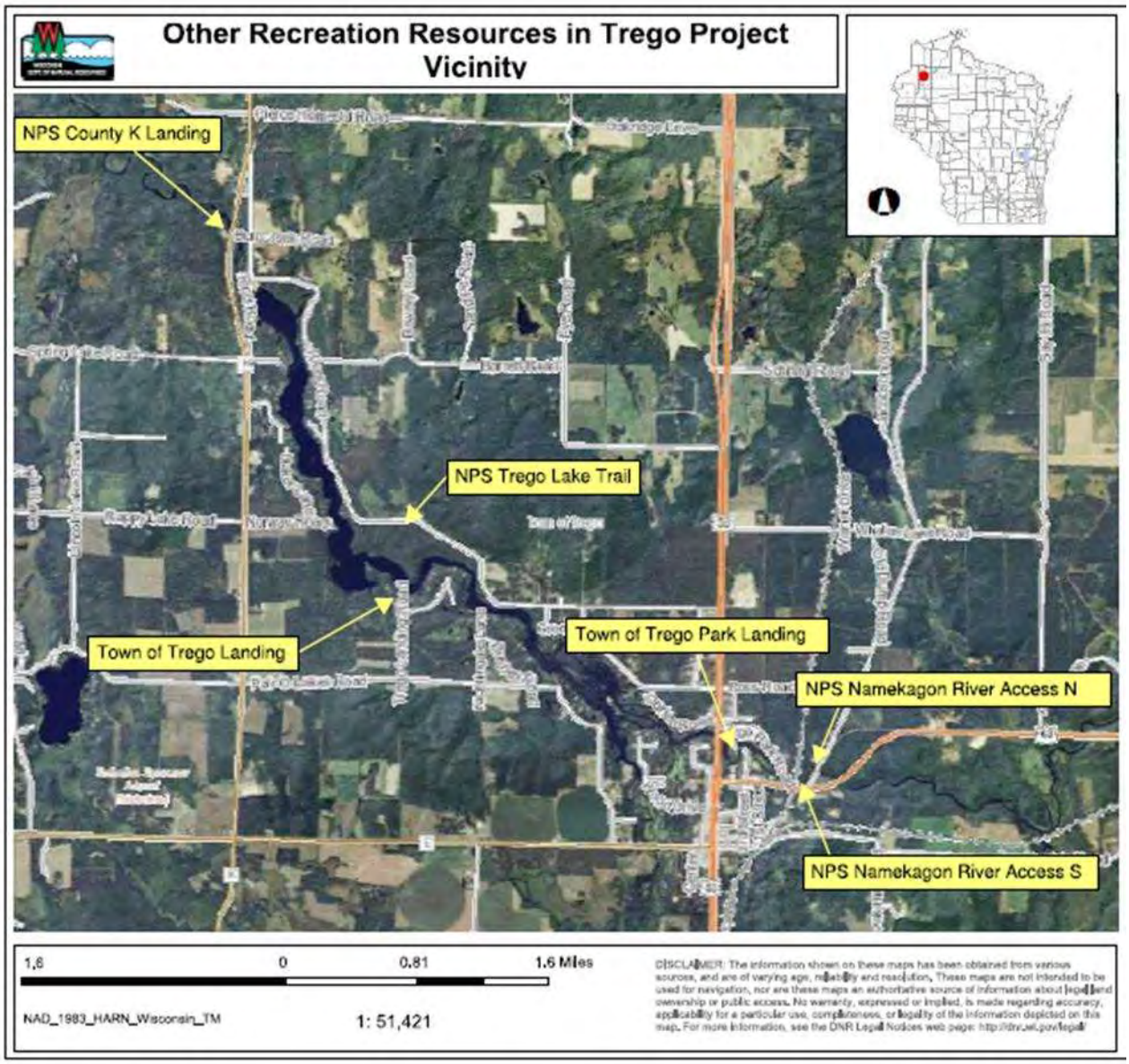
Appendix 5 – Maps of Recreation Sites


Sawyer and Washburn County Forests
Map Features
County Forest
Sawyer County Forest
Washburn County Forest
Hayward Dam
Trego Dam
Washburn County Forest
Sawyer County Forest
Notes
1: 253,440
Miles
Projection: NAD_1983_HARN_Wisconsin_TM
Map created: 6/18/2020

Hayward Hydroelectric Project


Other Recreation Facilities in Hayward Project Vicinity
Hayward City Beach
Hayward City Boat Landing
Barrier-free fishing pier
Freshwater Fishing Hall of Fame
Scheer's Lumberjack Show
0.1
0
0.06
0.1 Miles
NAD_1983_HARN_Wisconsin_TM
1: 3,960
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

Trego Hydroelectric Project


Other Recreation Resources in Trego Project Vicinity
NPS County K Landing
NPS Trego Lake Trail
Town of Trego Landing
Town of Trego Park Landing
NPS Namekagon River Access N
NPS Namekagon River Access S
1.6
0
0.81
1.6 Miles
NAD_1983_HARN_Wisconsin_TM
1: 51,421
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

Appendix 6 – Documentation of Consultation

The Wisconsin Department of Natural Resources did not respond with comments.

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L.A.1

December 3, 2021

Mr. Shawn Puzen
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Recreation Study Plan, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) appreciates the opportunity to provide comments on the *Hayward and Trego Hydroelectric Projects Draft Recreation Study Plan* prepared by Mead & Hunt for Xcel Energy. The Recreation Study Plan is being developed for the Hayward and Trego hydroelectric projects, hereinafter (Projects), on the Namekagon River within the St. Croix National Scenic Riverway that is administered by the NPS. We received this proposed study plan by email dated November 5th, 2021. We understand that you will review and address these comments prior to study plan execution starting in January 2021.

1. Introduction

We concur and are pleased that this study plan is mostly consistent with the study request delineation and guidance the NPS submitted to Mead and Hunt on April 27, 2021. We offer the following comments to further enhance the study plan and survey instruments.

2. Study Plan Elements

2.1 Study Goals and Objectives

We concur that the objectives of this study include 1) provision of a subjective assessment of existing recreation facility conditions as well as recommended enhancements; and 2) determination of the capacity of existing facilities to help assess current and future user demand, produce sufficient information to evaluate such impacts, and provide the rationale for recommended recreation enhancements.

2.2 Background and Existing Information

We are pleased that the study plan allows for evaluation of the existing recreational facilities within the Projects for recreational use and improvements. These study plans address our April 27th, 2021, comment letter in which we disagreed with the findings in the Projects' recreation study reports completed in 2020 that "The number and size/capacity of the facilities appear

sufficient to accommodate the current amount of use on all but the busiest of days." (NSPW, 2021)

We note in the draft study plan a statement that "In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP did not identify any specific recreation needs in the immediate vicinity of the Projects." The SCORPS, by definition, do not identify specific recreation needs in immediate vicinities of specific targeted areas such as these Projects. We suggest deleting this sentence or clarifying by inserting the following:

> The SCORP identifies recreation needs by region rather than specific sites or project areas.

2.3 Nexus between Project Operations and Effects on Resources

We are pleased to see a discussion of hydro operations and insufficient public access noted in this section as well as the need for adequate information about impacts. In addition to highlighting fluctuations in reservoir elevation, it is also necessary to consider water depths. Additional studies recommended by the NPS about bathymetry and sedimentation will help inform this nexus. We look forward to reviewing your other study plans and how the results will be integrated with recreational issues.

2.4 Study Area

We recommend revising the first sentence in this section as follows:

> The need for additional recreation sites and/or enhancements are not clear given the problematic informal ice fishing on Hayward Lake's Bartz's Bay and recent closure of two access areas in the upstream area of the Trego Flowage. These closures may cause additional demand on existing sites within the project area. The inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1.

We are pleased to see inclusion of each site the NPS recommended for study including the Town of Trego Park Boat Landing and the Informal Ice Fishing Access site at Bartz's Bay. We concur that the Bartz's Bay site need only be surveyed during the January and February survey periods to capture ice fishing activity.

The proposed Recreation Study Plan and the resultant Recreation Study Report should state that the Town of Trego Park Boat Landing on the headwaters of Trego Lake would be omitted from Trego's revised project boundaries if Xcel's proposed project boundaries were approved.

2.5 Methodology

2 2.5.1 Recreation Inventory

We are pleased that the Recreation Site Inventory Form (Appendix 1) includes all amenity types we recommended. In the interest of consistency, please add "signage" to the list of items to be inventoried under this section since signage is included on the inventory form in the Appendix.

2.5.2 Facility Condition Assessment

We concur with your rating categories (see below) to evaluate condition of each site and documentation of the need for further attention (enhancement) to the facility if warranted.

1) Not Usable and Needs Replacement 2) Needs Repair 3) Needs Maintenance or cleaning 4) Good Working Condition (does not need any attention) 5) Facility Lacking; need to install facility or otherwise add enhancement (identify item).

We note an inconsistency between the list provided in the text above and the list on the forms found in Appendix 1. The latter lacks item Number 5, "Facility Lacking; need to install facility or otherwise add enhancement (identify item)." We recommend that Number 5 be restored to the list of the other four condition types on the forms under both "Type of Amenity" and "Signage." This option, for example, would be essential for evaluating Hayward's Bartz's Bay Informal Ice Fishing Access and identifying if other amenities, including signage, exist.

2.5.3 Recreation Use Survey

We are generally pleased with the sampling days per site during the peak season and appreciate inclusion of our suggestion to include measures to balance timing of interviews. We are concerned that one weekend day a month does not adequately cover the non-peak season use and recommend that at least two sampling days, one weekday and one weekend, be included per month at each surveyed site.

In addition, we are pleased that the Recreation Use Survey Interview Form (Appendix 2) is almost verbatim with the one NPS included in our study request. We suggest a few revisions. So that interviewees may fully understand the importance of providing input, please insert the following clarifying language into the introductory paragraph of the survey form:

> First sentence: rephrase to read "Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of applying for *40-year* subsequent licenses…" (Italics indicate inserted text.)
>
> Last sentence: rephrase to read "The purpose of this survey is to collect information about recreational use and visitors' experiences at public recreation facilities around the Hayward and Trego Project reservoirs *so that we may better assess existing and future recreational needs to be included in the licenses*." (Italics indicate inserted text.)

Under Question 2 insert among the list of activities "Ice fishing."

Revise the ninth response option under Question 3.(C) "Which of the following reasons, if any, explain why you did not engage in the activity?" The ninth item currently states "Unsatisfactory

conditions or facilities." We recommend revising this response to read "Unsatisfactory *facilities or conditions of land or water* (for example, navigability upon launching)." (Italics indicate inserted or reordered text.)

To provide a more amenable interview experience, we suggest following the order of questions recommended in our study guidance and returning the section regarding interviewee's demographic details (zip code/country of origin; age; gender; ethnicity; additional comments question) to the end of the interview after item Number 9. This ordering of items allows initial focus on site specifics such as location, recreational use, etc., rather than a person's demographics.

2.5.4 Recreation Use Spot Count

We appreciate the thoroughness of the Spot Count Form (Appendix 3) and recommend one change, moving "ATV/snowmobiling" next to "motorboating" so that motorized use is grouped together.

2.5.5 Future and Potential Recreation

We concur with the list of entities to which this questionnaire will be sent, including Trego Lake District. Please include the National Park Service St. Croix National Scenic Riverway in your list of recipients for both Hayward and Trego projects.

We recommend using the same introductory paragraph, including our suggested edits, found on the Recreation Use Survey Form (Section 2.5.3, above) as an introductory paragraph for the Future and Potential Recreation Questionnaire (Appendix 4). This would help readers understand the importance and context of the questionnaire.

We recommend adding to the questionnaire a map of each project with physical landmarks such as roads and recreation facilities so that participants are better able to focus their comments. In addition, respondents would be able to comply with one of the options for providing site location listed in Question 2.c., "Please provide the location of each site listed above using a map…"

As written, the questionnaire is targeted solely at land managing entities. However, this excludes important partners that help manage resources and/or have extensive knowledge about recreation use, trends, and potential enhancements. We recommend rewording questions to better suit the target audience. For example, Question 2 would read "Is your organization responsible for *or interested in* recreation sites, amenities, …." (Italics indicate inserted text.)

We recommend editing Question 2.f. so that respondents can suggest enhancements to an existing amenity, "Do you believe additional recreation sites/amenities are needed o*r are any enhancements needed at existing* recreation sites/amenities within the Project vicinity? (Additional information may be provided on the final sheet of this questionnaire.) …"

We recommend rewording the directions for returning completed questionnaires to "Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope *or via*

email at the email address below within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed." (Italics indicate inserted text.)

Lastly, we disagree with the conclusion found in Footnote 3, page 4, of this section that a separate Recreation Study Report is not necessary. While including all proposed mitigation and enhancement measures in the body of the license application provides a succinct summary, a separate Recreation Study Report provides a comprehensive review of the study plan, survey instruments, data, analysis, and resultant proposed mitigation and enhancement measures. Such a report is invaluable in providing clear access to the information above not only for license application review but also for review and use during the life of the license.

Conclusion

Thank you for your consideration of these additional comments as you develop your final study plan. The NPS looks forward to the results of this study as well as the opportunity to continue to collaborate with you throughout the licensing process. If you have any questions about our response, please contact Susan Rosebrough at susan_rosebrough@nps.gov or (206) 220-4121.

Sincerely,

THERESA HOGAN

Digitally signed by THERESA HOGAN
Date: 2021.12.04 09:06:56 -06'00'

Theresa L. Hogan
Acting Superintendent

Shawn Puzen

From:	Shawn Puzen
Sent:	Friday, November 5, 2021 8:07 AM
To:	angietomes@gmail.com; cheryl.laatsch@wisconsin.gov
Cc:	Darrin Johnson; Miller, Matthew J; Crotty, Scott A; Maurer, Brey J; Shawn Puzen
Subject:	Draft Hayward-Trego Recreation Study Plan for your Review
Attachments:	20211104 Draft Hayward-Trego Recreation Use Study Plan Complete.pdf

Good Morning,

Attached for your review is the proposed Recreation Study Plan.

We are sending this study plan for your review right now because it requires the surveys to begin in January of 2022. Therefore, we need to move this plan through the review ahead of the other plans.

Please provide your comments as soon as possible, but no later than December 5, 2021.

Please do not hesitate to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

Hayward and Rege Hydroelectric Projects FERC Nos. 2417 and 2711

Draft Study Plan

Recreation Study

Prepared for

Xcel Energy®

Prepared by

Mead & Hunt

meadhunt.com

November 2021

1. Introduction

Northern States Power Company – Wisconsin (NSPW or Licensee), d/b/a Xcel Energy, currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 (Hayward) and 2711 (Trego), expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit final license applications to FERC no later than November 30, 2023. The final license applications, in part, must include an evaluation of the existing recreational facilities associated with each Project along with proposed recreation enhancements.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The National Park Service (NPS) and Wisconsin Department of Natural Resources (WDNR) requested a study of recreation facilities and an investigation of recreation enhancements as part of the relicensing process.

NPS requested that the Licensee conduct an inventory of recreation opportunities and facilities including determining recreation demand using field observations, user surveys, and focus groups and estimating recreation needs based on the data gathered.

WDNR requested that the Licensee evaluate current recreational uses, including opportunities for low flow and high flow events, public access, natural scenic beauty, trails, water sports, and fishing, with consideration for the different seasonal uses.

This study plan is consistent with the NPS and WDNR requests.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to provide a subjective assessment of existing recreation facility conditions as well as recommended enhancements. The study will also determine the capacity of existing facilities to help assess current and future user demand, produce sufficient information to evaluate such impacts, and provide the rationale for recommended recreation enhancements.

2.2 Background and Existing Information

Recreation in the vicinity of the Projects is dominated by activity near the Projects' facilities. The existing recreational facilities within the Projects will be evaluated for recreational use and improvements.

The last recreation studies for the Projects were completed in 2020 and filed with FERC on February 24, 2021. The Hayward report indicated that "...the Lake Hayward area offers a sufficient amount of recreational opportunities for both land and water-based activities. The recreational facilities, while limited in number, are in good condition and receive regular maintenance and upgrades when required.

The number and size/capacity of the facilities appear sufficient to accommodate the current amount of use on all but the busiest of days" (NSPW, 2021).

The Trego report indicated that "…the Trego Flowage area offers reasonable opportunities for both water and land-based recreational activities, including opportunities for overnight recreation (i.e., camping, night fishing, etc.). Although the number of recreational facilities is limited, most are in good condition and receive routine maintenance. The number and capacity of the facilities appear sufficient to accommodate current recreational use on all but the busiest days, despite the apparent observed increase in recreational activity related to COVID-19."

In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP did not identify any specific recreation needs in the immediate vicinity of the Projects.

The SCORP places an emphasis on nature-based recreational opportunities including hiking, fishing, and boating. For both Projects, the Licensee currently provides a carry-in access on the reservoir, a tailrace fishing area downstream of the powerhouse, and a canoe portage that helps fulfill recreation needs. These recreational opportunities are consistent with the SCORP.

2.3 Nexus between Project Operations and Effects on Resources

Hydro operations, including fluctuations in reservoir elevation, and insufficient public access can limit recreational opportunities. Adequate information is necessary to determine what impacts may be occurring from hydro operations as well as which recreational opportunities may be enhanced.

2.4 Study Area

Since it is believed no additional recreation sites are necessary, the inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1.

Table 2.4-1. Recreation Sites to be Inventoried and Surveyed for Existing Use

Hayward Canoe Portage Take-Out and Carry-In Reservoir Access
Hayward Canoe Portage Trail and Put-In
Hayward Informal Tailwater Bank Fishing Area
Hayward City Boat Landing
Hayward City Beach & Barrier-Free Fishing Pier
Hayward Bartz's Bay Informal Ice Fishing Access[1]
Town of Trego Park Boat Landing
Town of Trego Boat Landing
Trego North Tailwater Access (Canoe Portage)
Trego South Tailwater Access

[1] Bartz's Bay Informal Ice Fishing Access will only be surveyed during the January and February survey periods.

2.5 Methodology[2]

2.5.1 Recreation Inventory

Each of the recreation sites listed in Table 2.4-1 will be inventoried during the summer using the forms attached as Appendix 1 to collect information on recreation amenities and capacity. The following types of information will be recorded:

1) The primary type(s) of recreation provided at the site.
2) Existing sanitation facilities (if any).
3) Type of vehicle access and parking capacity (if any).
4) The presence and type (if any) of barrier-free facilities.
5) The GPS location of the facility.
6) Photographs of the recreation site, amenities, signage, and entryways to the site from the main road(s), including photographs of any adverse impacts the site may have on environmental resources including shoreline erosion.

2.5.2 Facility Condition Assessment

During at least one visit to each of the recreation sites listed in Table 2.4-1, the condition of each amenity or feature (including recreational wayfinding signs and interpretive signs) and its immediate vicinity will be assessed. A rating for each site will be made according to the following scale:

1) Not Usable and Needs Replacement
2) Needs Repair
3) Needs Maintenance or cleaning
4) Good Working Condition (does not need any attention)
5) Facility Lacking; need to install facility or otherwise add enhancement (identify item).

If a rating is assigned indicating that additional attention is required, the specific item that needs additional attention will be noted on the form.

2.5.3 Recreation Use Survey

Recreation use surveys will be conducted during visits to each of the recreation sites listed in Table 2.4-1. The surveys will last at least one hour per site between the hours of 7:00 a.m. and 7:00 p.m. Surveying will be completed on a rotating schedule to avoid surveys from repeatedly being conducted at the same time of day and will also account for time-of-day use patterns. The recreation use survey form included in Appendix 2 will be administered to users to gather their opinion about the existing recreation facilities and opportunities. The survey will record the number of people in a party, their primary reason for visiting the site, their perception of level of use, and their opinions regarding the amount and types of recreation opportunities offered within

[2] Please note: The methodology does not include regional demand assessment or recreation needs assessment. These analyses will be completed as part of the License Application.

the proposed Project vicinity. The recreation use surveys will be conducted according to the following schedule in Table 2.5.3-1

Table 2.5.3-1. Recreation Use Survey Schedule

Survey Month	Recurrence Interval
January	One randomly selected weekend day.
February	One randomly selected weekend day.
April	One randomly selected weekend day.
May	One randomly selected weekend day. One day during Memorial Day weekend.
June	One randomly selected weekday. Two randomly selected weekend day.
July	One randomly selected weekday. Two randomly selected weekend day.
August	One randomly selected weekday. Two randomly selected weekend day.
September	One weekend day the weekend following Labor Day weekend.

2.5.4 Spot Counts

When first arriving at each recreation site where recreation use surveys will be collected, a spot count will be conducted using the recreation use spot count form enclosed in Appendix 3. This information will be statistically analyzed to develop recreational use figures for the Projects. This information will be summarized by season and activity for each type of use in the study report.

2.5.5 Future and Potential Recreation

To assess future recreation needs within the Project vicinity, the questionnaire enclosed in Appendix 4 will be sent to municipalities and other entities responsible for existing recreation within the Project vicinity. Specifically, the questionnaire will be sent to the City of Hayward, Hayward Area Chamber of Commerce, and Sawyer County for the Hayward Project and the Town of Trego, Trego Lake District, and Washburn County for the Trego Project.
Each entity will be allowed 30 days to respond to the questionnaire and their responses will be incorporated into the license application[3].

2.6 Consistency with Generally Accepted Scientific Practice

The overall design of the recreational survey is similar to that commonly used in relicensing proceedings and is consistent with generally accepted methods for recreation studies.

[3] Even though the original study summary indicated a report would be developed, NSPW has found the most-efficient way to display the data is in the license application because it can provide the full picture of proposed recreational mitigation and enhancement measures in context with all other proposed mitigation and enhancement measures included in the license application. Therefore, no study report will be developed for the recreation study.

2.7 Project Schedule and Deliverables

NSPW anticipates that field work will begin in January 2022 (for winter surveys) and be completed by mid-September. The study results will be incorporated into the license application along with additional recreational mitigation and enhancement recommendations (if any).

3. Consultation

The Recreation study was requested by the NPS and WDNR. As a result, the Licensee consulted with the NPS and WDNR on the study plan as discussed in the following sections.

3.1 National Park Service

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the NPS for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

3.2 Wisconsin Department of Natural Resources

On DATE, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Recreation Study Plan to the WDNR for comment. ADDRESS COMMENTS HERE ONCE RECEIVED. Documentation of Consultation is included in Appendix 5.

4. References

EA Engineering. 2021a. Recreation Report for the Hayward Hydroelectric Project (FERC Project No. 2417). February 2021.

EA Engineering. 2021b. Recreation Report for the Trego Hydroelectric Project (FERC Project No. 2417). February 2021.

Appendix 1 – Recreation Site Inventory Form

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Recreation Inventory and Condition Assessment

Location:		Date:	
Hayward Hydroelectric Project P-2417			
Survey Person:			
GPS Location:			
Amenity Photo Numbers:			
Shoreline Photo Numbers:			
Entryway Photo Number:			

Type of Amenity:	Quanitity of Amenities:	Condition of Amenity: -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)	Notes:	Barrier Free? (Y or N)
Boat Launch	Lanes: 1 Launches: 1	N R M G		
Scenic Overlook		N R M G		
Tailwater Access		N R M G		
Restroom		N R M G		
Trash Receptacles		N R M G		NA
Other (picnic units, informal trails, camping, etc.)		N R M G		

Parking	No. Spaces (each type): Standard:	Barrier-Free:	Trailer:	Other (specify):	Condition:	Notes:
					N R M G	Gravel?

Signage:	Number:	Condition:	Comments: Provide Details on which signs need attention.
FERC Project Sign		N R M G	
Regulations Signs		N R M G	
Directional		N R M G	
Interpretive		N R M G	

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

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Recreation Inventory and Condition Assessment

Location:		Date:	
Trego Hydroelectric Project P-2711			
Survey Person:			
GPS Location:			
Amenity Photo Numbers:			
Shoreline Photo Numbers:			
Entryway Photo Number:			

Type of Amenity:	Quanitity of Amenitie	Condition of Amenity: -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)	Notes:	Barrier Free? (Y or N)
Boat Launch	Lanes: 1 Launches: 1	N R M G		
Scenic Overlook		N R M G		
Tailwater Access		N R M G		
Restroom		N R M G		
Trash Receptacles		N R M G		NA
Other (picnic units, informal trails, camping, etc.)		N R M G		

Parking	No. Spaces (each type):				Condition:		Notes:
	Standard:	Barrier Free:	Trailer:	Other (specify):			
					N R M G		Gravel?

Signage:	Number:	Condition:	Comments: Provide Details on which signs need attention.
FERC Project Sign		N R M G	
Regulations Signs		N R M G	
Directional		N R M G	
Interpretive		N R M G	

Additional Comments:

Describe any signs of overuse or anything observed that is not already documented above.

Appendix C – Recreation Use Survey Form

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ON-SITE/IN-PERSON RECREATION INTERVIEW

Hayward & Trego Hydroelectric Projects (FERC Nos. 2417 and 2711)

NPS Recreation Survey Questionnaire

Northern States Power Company – Wisconsin (NSPW or Applicant), d/b/a Xcel Energy, is in the process of applying for subsequent licenses from the Federal Energy Regulatory Commission (FERC) to continue to operate and maintain the existing Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by NSPW. To obtain a license for the Projects, NSPW must submit a final license application to FERC no later than November 30, 2023. As part of the relicensing process, NSPW is conducting several environmental studies which will enable FERC to prepare an environmental report. The purpose of this survey is to collect information about recreational use and visitors' experiences at public recreation facilities around the Hayward and Trego Project reservoirs.

What is the ZIP code where you live or country if not in the United States?

ZIP code: _____ or, country (if not the United States): _____

What is your age: _____

What is your gender? ☐ Male ☐ Female ☐ Non-binary

Which of these categories best indicates your race and ethnicity? Answer only for yourself.

Please select one or more.

☐ American Indian/Alaskan ☐ Asian ☐ White
☐ Native Hawaiian/other Pacific ☐ Hispanic or Latino ☐ Don't know
☐ Black/African-American ☐ Not Hispanic or Latino

Please let us know if you have any additional comments regarding your recreation experience during your visit: (contact information)

_____

_____

_____

_____

1. Check the box on the location where you received this survey:

Hayward Project:

☐ Hayward Canoe Portage Take-out and Carry-In Access
☐ Hayward Canoe Portage Trail and Put-in
☐ Informal Tailwater Bank Fishing Access
☐ City of Hayward Boat Landing
☐ City of Hayward Beach/Fishing Pier
☐ Bartz's Bay Informal Ice Fishing Access

Trego Project:

☐ Town of Trego Park Boat Landing
☐ Town of Trego Boat Landing
☐ Trego North Tailwater Access/Canoe Portage
☐ Trego South Tailwater Access

2. Below is a list of activities available. Please indicate:

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(A) Which of these activities have you participated in **on your current visit** to the area.

(B) Which **ONE** of these activities is your **PRIMARY ACTIVITY** on this trip to the area?

ACTIVITY	(A) Participated in ON THIS TRIP (Check all that apply)	(B) PRIMARY ACTIVITY (Check only one)
Shoreline/tailwater fishing		
Fishing from a boat		
Motorized boating		
Non-motorized boating		
Swimming		
Picnicking		
Wildlife Viewing		
Other (specify)		

3. (A): Were there any activities that you and your group wanted to do on this visit to (AREA) that you were not able to?

☐ YES ☐ NO

(B): If YES: What was it? _____

(C): Which of the following reasons, if any, explain why you did not engage in the activity?

☐ Rules or regulations did not allow for activity
☐ Area was temporarily closed to the public
☐ Not enough time
☐ Safety concerns
☐ Not enough information about the activity
☐ Too crowded
☐ Difficult road or trail access
☐ No road or trail access
☐ Unsatisfactory conditions of facilities
☐ Resource damage due to overuse
☐ No facilities or services
☐ Bad weather
☐ Flooding or other natural hazard
☐ Other (please specify) _____

4. Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services?

☐ YES ☐ NO

If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in?

(Please describe): _____

5. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir?

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[Select one number for each or indicate it was not applicable to your visit.]

LOCATION / AREA	Not at all crowded	Slightly crowded	Moderately crowded	Very crowded	Extremely crowded	Not applicable
In parking areas	1	2	3	4	5	☐
On the trails	1	2	3	4	5	☐
At a developed campground	1	2	3	4	5	☐
At a boat-in campsite	1	2	3	4	5	☐
While fishing from the shoreline	1	2	3	4	5	☐
While boating/fishing from a boat	1	2	3	4	5	☐

(B) If you felt crowded, did you modify your recreation plans because you felt crowded?

☐ YES ☐ NO

(C) If YES, what did you do?

☐ Moved to a new location
☐ Changed the time of day
☐ Changed your activity
☐ Chose not to recreate
☐ Continued with current plans
☐ Other: _____

6. During the planning process for your visit, how did the possibility of crowds affect your trip plans?

(Please select one response)

☐ It did not affect my plans
☐ I visited at a time of day I thought would be less crowded
☐ I visited on a day of the week I thought would be less crowded
☐ I avoided places here I thought would be crowded today
☐ Other (please specify) _____

7. Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ YES ☐ NO

If yes, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)		
	Proximity	Loudness	Other (please specify)
Motorized boaters	☐	☐	☐ _____
Non-motorized watercraft	☐	☐	☐ _____
Vehicles	☐	☐	☐ _____

8. How satisfied were you with the following amenities at this recreation facility/reservoir today.

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***Important**: Please only circle a number for the items **that you used during your current visit** to this specific recreation facility/reservoir. Also, please **check** the "Did Not Use" box, if you did not use the item or it does not exist at the specific recreation facility.*

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied	Did Not Use	If you were dissatisfied for any reason, please explain why:
	Restroom	1	2	3	4	5	☐	
	Picnic sites	1	2	3	4	5	☐	
	Trash receptacles	1	2	3	4	5	☐	
	Vehicle parking areas	1	2	3	4	5	☐	
	Boat launch parking area	1	2	3	4	5	☐	
	Boat launch	1	2	3	4	5	☐	
	Boat dock	1	2	3	4	5	☐	
	Other:	1	2	3	4	5	☐	
	Roads to facility	1	2	3	4	5	☐	
	Signage to the facility	1	2	3	4	5	☐	
	Signage within the facility	1	2	3	4	5	☐	
	Other:	1	2	3	4	5	☐	

9. How did you obtain information to plan your current trip? (Please select all that apply)

- ☐ Federal or State website
- ☐ City, local, or municipal website
- ☐ Xcel website
- ☐ Other websites
- ☐ Maps, brochures, pamphlets
- ☐ Visitor bureaus/centers
- ☐ Previous visits
- ☐ Word of mouth
- ☐ Social media (e.g., Facebook, Twitter, etc.)
- ☐ Travel guides and tour books
- ☐ Newspaper/magazine article
- ☐ Radio/TV broadcasts
- ☐ Other (specify): _____

Appendix 3 – Recreation Use Spot Count Form

Agency Version

Recreation Observation (Spot Count) Form

Date:		Time:	
Hayward Project P-2417			
Survey Person:			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities
Temperature:	Weather:	Wind Speed:	

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shoreline Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Canoe Portage Take-Out & Carry-In Reservoir Access														
Canoe Portage Trail and Put-In														
Informal Tailwater Bank Fishing Area														
Hayward City Boat Landing														
Hayward City Beach/Barrier-Free Fishing Pier														
Bartz's Bay Informal Ice Fishing Access (Jan & Feb only)														

Additional Comments:

Recreation Observation (Spot Count) Form

Date: Time:

Trego Project P-2711

Survey Person:

Temperature: Weather: Wind Speed:

Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.

Recreation Site	Number of People	Recreation Activities: ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking / Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	Notes
Town of Trego Park Boat Landing														
Town of Trego Boat Landing														
Trego North Tailwater Access (Canoe Portage)														
Trego South Tailwater Access														

Additional Comments:

Appendix A – Future and Potential Recreation Questionnaire

Xcel Energy is in the process of relicensing the Hayward and Trego Hydroelectric Projects (Projects) located on the Namekagon River in Sawyer and Washburn Counties, Wisconsin, respectively. Xcel Energy is gathering information about potential recreation needs in the vicinity of Projects.

The Hayward Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream of the Hayward Dam and 2 ½ miles upstream of the Hayward Dam. The Trego Project vicinity is defined as the area within ¼ mile of the shoreline between ½ mile downstream of the Trego Dam and 5 ¼ mile upstream of the Trego Dam.

If you have any questions, please contact Matthew Miller at matthew.j.miller@xcelenergy.com or 715-737-1353.

1. Information about person completing the questionnaire:

Name & Title: _____

Organization: _____

Address: _____

_____

Phone: _____

Email Address: _____

2. Is your organization responsible for recreation sites, amenities, formal access sites, or planning for recreation sites within the Project vicinity as defined above?

☐ Yes ***(Please proceed to 2a below)*** ☐ No ***(No additional information is needed and thank you for your input)***

a. Please describe your primary function pertaining to recreation and list any recreation sites or access sites (formal or informal) in the Project vicinity you are responsible for in the space provided below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please proceed to question 2b on the next page.

b. Please list all recreation amenities available at each recreation site or access site you manage (e.g. docks, restrooms, parking areas, interpretive signage, picnic tables, trails, etc.) below: ***(Additional information may be provided on the final sheet of this questionnaire.)***

c. Please provide the location of each site listed above using a map, street address, or GPS location: ***(Additional information may be provided on the final sheet of this questionnaire.)***

d. Have any of the sites or amenities listed in 2a and 2b exceeded capacity or not had sufficient parking? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, amenity and when capacity is exceeded.)*** ☐ No

Recreation Site/Amenity	Event(s) Exceeding Capacity

Please proceed to question 2e on the next page.

e. Do you have any planned improvements for the recreation sites listed in 2a and amenities listed in 2b or any plans for development of new recreation sites? ***(Additional information may be provided on the final sheet of this questionnaire.)***

☐ Yes ***(Please list location, planned improvement, and anticipated opening date below.)*** ☐ No

Planned Improvements/Locations	Anticipated Opening Date

f. Do you believe additional recreation sites/amenities are needed within the Project vicinity? **(Additional information may be provided on the final sheet of this questionnaire.)**

☐ Yes ***(Please list reasoning below.)*** ☐ No

Additional Recreation Sites/Amenities Reasoning

g. Please indicate if there is a specific representative you wish to designate as a follow-up contact to be used by Xcel Energy or their representative ***(Additional information may be provided on the final sheet of this questionnaire.)***

Representative Contact Information

Name: _____

Address: _____

_____

Phone: _____

Email: _____

Additional Information or Comments:
(*Please indicate applicable section*)

Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed. *Not responding within 30 days will indicate you or your agency are not aware of any relevant information regarding potential recreation needs in the vicinity of the Hayward or Trego Hydroelectric Projects.*

Comments, questions, and/or this completed questionnaire may also be sent via email to:
Matthew.J.Miller@XcelEnergy.com

Document Accession #: 20220421-5293 Filed Date: 04/21/2022

Hayward and Trego Hydroelectric Projects FERC Nos. 2417 and 2711

Study Plan
Work Plan 22 THT
Wood and Blanding's Turtle Nesting Habitat Study

Prepared for

Northern States Power Company,
a Wisconsin Corporation

Prepared by

Mead & Hunt
meadhunt.com

March 2022

1. Introduction

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the existing Hayward and Trego Hydroelectric Projects (Project or Projects). The current licenses, which designate the Projects as FERC Nos. P-2417 and P-2711, respectively, expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit a final license application to FERC no later than November 30, 2025. The final license application, in part, must include an evaluation of rare species within the Project vicinity.

On March 11, 2021, the Licensee held a Joint Agency Meeting to present information about the Projects. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that the Licensee conduct wood turtle and Blanding's turtle studies as part of the relicensing process.

The WDNR requested that a wood turtle study be conducted to "determine whether any wood turtle nest sites occur within the Project boundary at either Hayward or Trego (WDNR, 2021)". The WDNR requested that a Blanding's turtle study be conducted to "…determine whether any Blanding's turtle nest sites occur within the Project boundaries (WNDR, 2021)".

Licensee is proposing to conduct a Wood and Blanding's Turtle Nesting Habitat Study to identify areas with suitable wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries for both Projects.

2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to identify areas with suitable wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries.

2.2 Resource Management Goals

The resource management goal is to ensure compliance with Wisconsin Endangered Species Act of 1972 and the federal Endangered Species Act of 1973.

2.3 Public Interest

WDNR expressed interest in this study.

2.4 Background and Existing Information

WDNR indicated in their wood turtle study request that wood turtles are "known to be present within this Project boundary, however survey data is limited". WDNR indicated in their Blanding's turtle study request that Blanding's turtles were "known to be present near these Project boundaries but that survey data is limited (WDNR, 2021)".

The WDNR issued ER Review Log # 20-683 (ER Review) for the Hayward Project vicinity on September 10, 2020. The ER Review indicated that there was suitable habitat for state-threatened wood turtle and state special concerned Blanding's turtle in the Project vicinity (WDNR, 2020a).

The WDNR issued ER Review Log # 20-684 for the Trego Project vicinity on September 10, 2020. The ER Review indicated that there was suitable habitat for the wood turtle and Blanding's turtle in the Project vicinity (WDNR 2020b).

2.5 Project Nexus

The operations of the Hayward and Trego Dams may affect nesting wood and Blanding's turtles in areas with suitable habitat. Identifying areas with suitable wood and Blanding's turtle nesting habitat will help determine whether mitigation measures are necessary as part of relicensing.

2.6 Study Area

The study area will include all shorelines upstream and downstream of the Hayward and Trego Dams within both the existing and proposed Project boundaries as shown in Appendix 1.

Study results will be filed as privileged information as requested by WDNR to avoid disclosing specific threatened or endangered species location information.

2.7 Methodology

2.7.1 Nesting Habitat Survey, Nesting Survey & Presence/Absence Surveys

NSPW will survey all shorelines for the presence of wood and Blanding's turtle nesting habitat within the existing and proposed Project boundaries as shown in Appendix 1. The reservoir shoreline will be surveyed by boat or on foot as necessary. The bypassed reach (at Hayward) and Namekagon River downstream of both dams will be surveyed by boat, or on foot for those areas not accessible by boat. The surveys will take place during the month of June (preferably on a sunny day) when the air temperature is between 50-80 degrees Fahrenheit.

The surveyors will identify all areas with suitable nesting habitat. Suitable nesting habitat for both turtle species includes areas with a sand or gravel substrate that is either unvegetated or sparsely vegetated, receives sun exposure for most of the day during late spring or summer, and is within 200 feet of the river's edge for wood turtle and at least 984 feet for Blanding's turtle. Note that this can include gravel parking areas, roads, or shoulders of paved roads. GIS locations of all suitable nesting habitat identified will be collected to develop a map of suitable nesting sites within the study area.

In addition to identifying areas with suitable nesting habitat, the surveyors will conduct visual searches for the presence of any wood or Blanding's turtles or evidence of wood or Blanding's turtle activity within the survey area. GIS locations of any basking or nesting wood or Blanding's turtles or evidence of wood or Blanding's turtle nesting sites identified will also be recorded.

Since the wood and Blanding's turtles are known to be present within the vicinity of both Projects, it is assumed that the species are also present within the Project boundaries. Therefore, the presence/absence surveys (identifying individual turtles) and nesting surveys (identifying evidence of turtle nesting) will only be conducted once, concurrent with the nesting habitat surveys

The information provided by the study will help inform FERC in identifying any enhancement and mitigation measures necessary to minimize or avoid impacts to the species. The study also meets the WDNR's goals of determining whether there are suitable wood and Blanding's turtle nesting sites within the Project boundaries.

2.7.2 Personnel Qualifications

All surveys will be conducted by individuals qualified and approved by WDNR to identify wood and Blanding's turtles and their nesting habitat. The survey may require special permits from the WDNR and the National Park Service (NPS).

2.8 Consistency with Generally Accepted Scientific Practice

This Wood and Blanding's Turtle Nesting Habitat Study follows generally accepted scientific practice regarding field data collection and reporting.

2.9 Project Schedule and Deliverables

Results of this study will be summarized in a study report. The report will include the following elements:

- Project Information and Background
- Study Area
- Methodology
- Study Results
- Mapping
- Analysis and Discussion
- Agency Correspondence and/or Consultation
- Literature Cited

NSPW anticipates that field work will be completed in June 2022. The draft study report will be completed by August 30, 2022. Any information identifying the specific locations of wood and Blanding's turtles will be filed as privileged, non-public information per WDNR guidelines.

3. Consultation

Wood and Blanding's turtle studies were requested by the WDNR. As a result, the Licensee consulted with the WDNR and the NPS as discussed below.

3.1 Wisconsin Department of Natural Resources

On February 3, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Wood and Blanding's Turtle Study plan to the WDNR for comment. The WDNR provided their comments verbally on February 21, 2022. The WDNR comments have been incorporated into the plan. Documentation of Consultation is included in Appendix 2.

3.1 National Park Service

On February 3, 2022, the Licensee, through its consultant Mead & Hunt, provided a draft copy of the Wood and Blanding's Turtle Study plan to the NPS for comment. The NPS provided comments on March 4, 2022. The NPS comments have been addressed in Appendix 2.

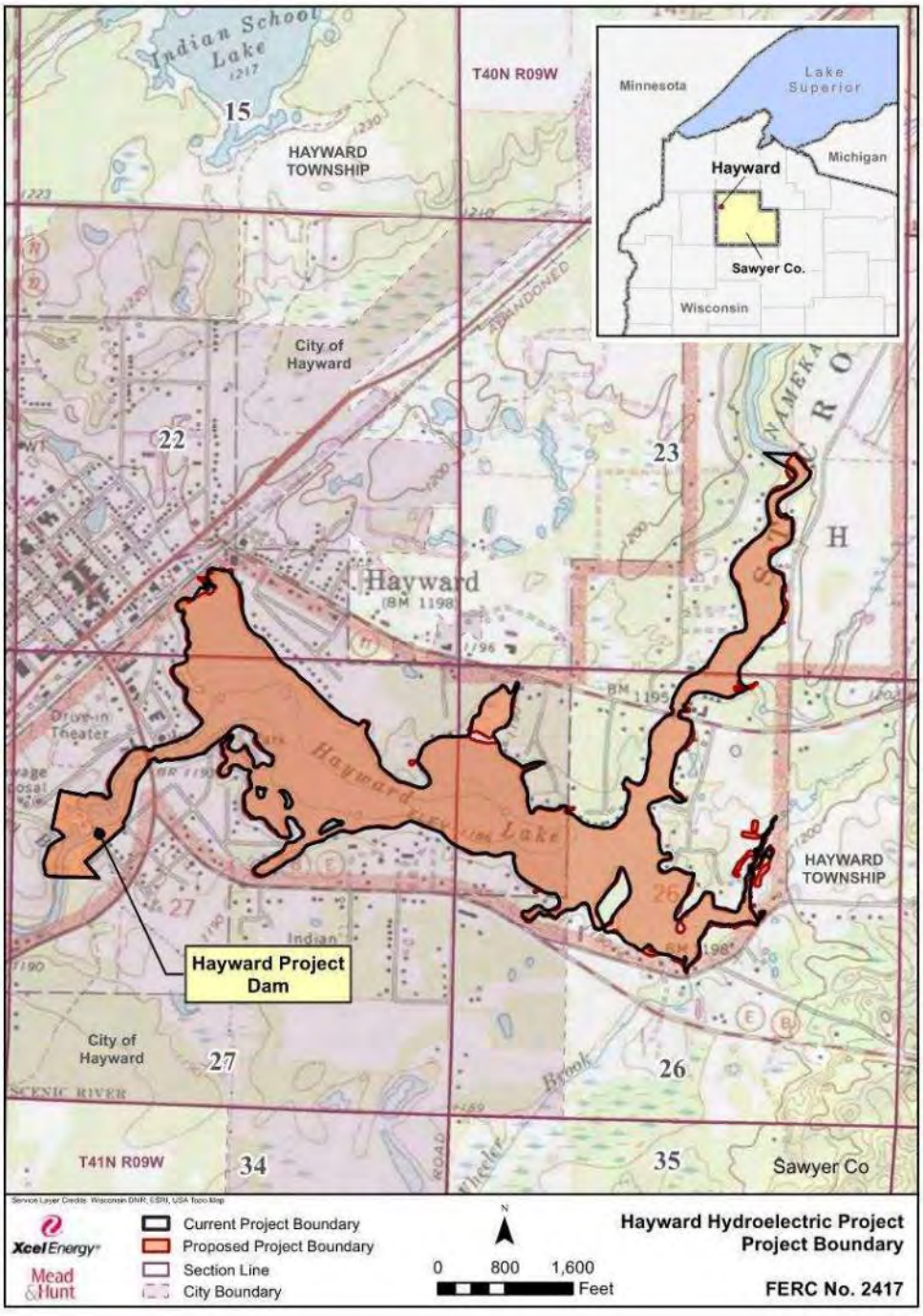
4. References

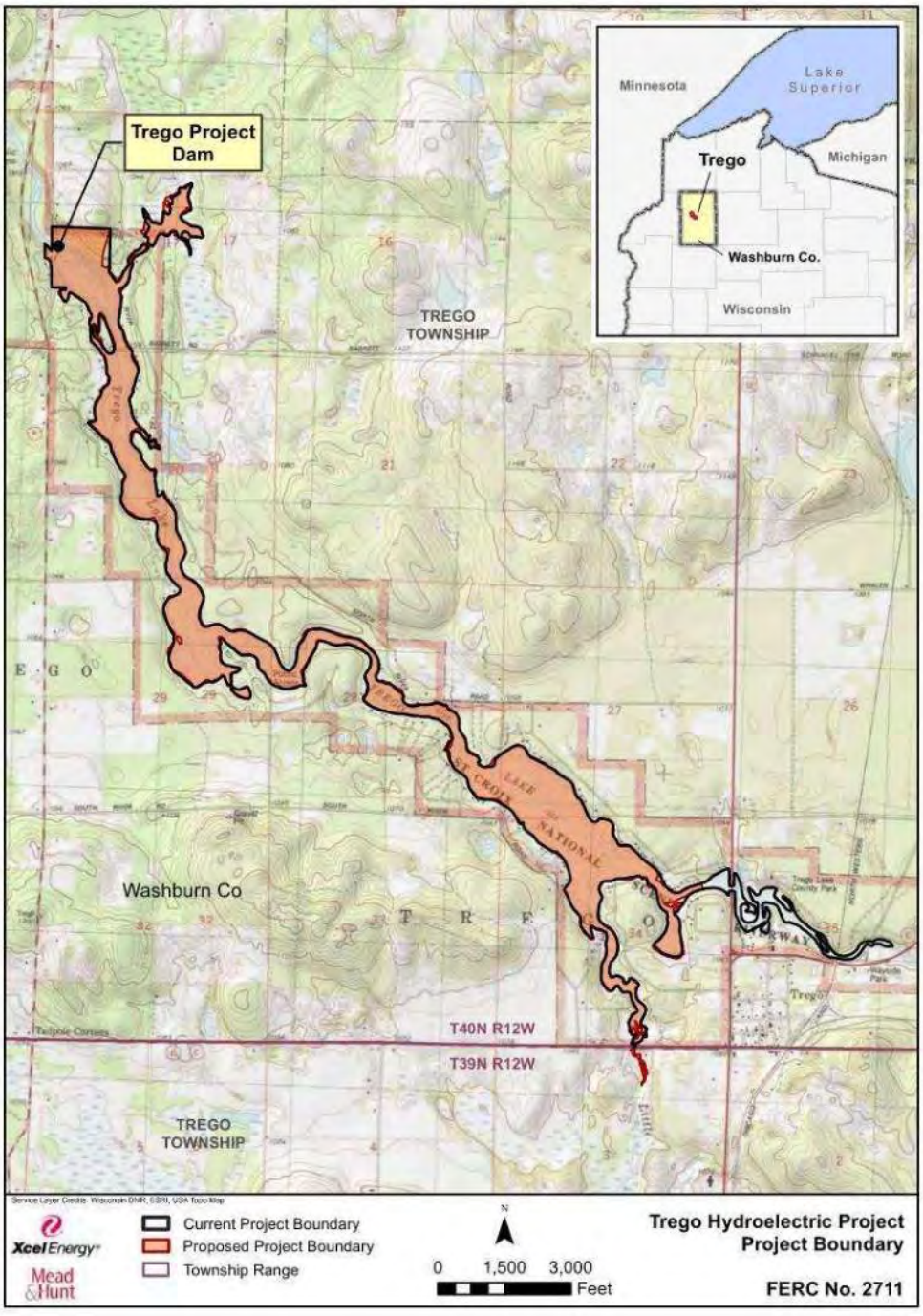
Endangered Resources Review (ERR Log # 20-683). 2020a. Proposed Hayward Hydroelectric Project Relicensing, Sawyer County, WI (ER Log # 20-683). September 10, 2020.

Endangered Resources Review (ERR Log # 20-684). 2020b. Proposed Trego Hydroelectric Project Relicensing, Washburn County, WI (ER Log # 20-683). September 10, 2020.

Wisconsin Department of Natural Resources. 2021. Study Requests- Relicensing of Hayward (P-2417) and Trego (P-2711) Projects. May 7, 2021

Appendix 1 – Wood Turtle Survey Area


Indian School Lake
T40N R09W
15
HAYWARD TOWNSHIP
Minnesota
Lake Superior
Michigan
Hayward
Sawyer Co.
Wisconsin
City of Hayward
22
23
Hayward
BM 1198
Drive-in Theater
Hayward Flowage
Lake
HAYWARD TOWNSHIP
Hayward Project Dam
City of Hayward
27
26
SCENIC RIVER
T41N R09W
34
35
Sawyer Co
Current Project Boundary
Proposed Project Boundary
Section Line
City Boundary
0 800 1,600
Feet
Hayward Hydroelectric Project
Project Boundary
FERC No. 2417


Trego Project Dam
Minnesota
Lake Superior
Michigan
Trego
Washburn Co.
Wisconsin
TREGO TOWNSHIP
Washburn Co
T40N R12W
T39N R12W
TREGO TOWNSHIP
Current Project Boundary
Proposed Project Boundary
Township Range
0 1,500 3,000
Feet
Trego Hydroelectric Project
Project Boundary
FERC No. 2711
Xcel Energy
Mead & Hunt

Appendix 2 – Documentation of Consultation

Shawn Puzen

From:	Shawn Puzen
Sent:	Thursday, February 3, 2022 10:45 AM
To:	cheryl.laatsch@wisconsin.gov; angietornes@gmail.com; susan_rosebrough@nps.gov; Lisa_Yager@nps.gov; Joan Ham
Cc:	Darrin Johnson; Miller, Matthew J; Shawn Puzen; brey.j.maurer@xcelenergy.com; Crotty, Scott A
Subject:	Hayward and Trego DRAFT Wood and Blanding's Turtle Nesting Habitat Study Plan
Attachments:	20220203 Hayward-Trego Wood-Blandings Nesting Habitat DRAFT sent to Agencies.pdf

Good Morning,

Attached is a draft Hayward and Trego Wood and Blanding's Turtle Nesting Habitat Monitoring Plan for your review and comment. The intent is to complete this study during this field season.

By your initial comments on the relicensing of the Hayward and Trego Hydroelectric Project, you requested NSPW complete Wood and Blanding's Turtle Nesting Habitat monitoring.

Prior to executing the study, NSPW is requesting your comments on the enclosed draft study plan.

Please provide your comments as soon as possible, but no later than March 7, 2022.

Please feel free to contact me if you have any questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

United States Department of the Interior
National Park Service
St. Croix National Scenic Riverway
401 N. Hamilton Street
St. Croix Falls, Wisconsin 54024

IN REPLY REFER TO:
L A)

March 4, 2022

Mr. Shawn Puzen
Shawn.Puzen@meadhunt.com
Mead & Hunt
2440 Deming Way
Middleton, Wisconsin 53562

Re: Hayward and Trego Hydroelectric Projects Draft Study Plans for Mussels, Water Quality, and Wood and Blanding's Turtle Nesting Habitat, FERC Nos. p-2417 and p-2711, Namekagon River

Dear Mr. Puzen:

The National Park Service (NPS) is consolidating our comments for the three aforementioned studies received by email dated February 2 and 3, 2022.

The NPS reiterates our request for information reflected in our original study requests on April 27, 2021 for shoreline surveys and hydraulics, sedimentation, and channel change, and our August 31, 2021 comments on your draft Study Summary and Responses. The study plans reviewed here have components that would contribute important information relating to our original study requests.

The NPS administers the Namekagon River as part of the National Wild and Scenic Rivers System (NWSRS) and the National Park System, as established by Congress in 1968 (Public Law 90-542). Under this law, the NPS is required by the Wild and Scenic Rivers Act to preserve the St. Croix River and its tributary, the Namekagon River, in a natural condition; to protect and enhance the exceptional natural, scenic, and cultural resources of the Riverway; and to provide high-quality recreational opportunities. River values identified in the hydropower project areas include aquatic, cultural, recreation, and scenic/aesthetic resources. The Namekagon River is managed as part of the St. Croix National Scenic Riverway and is protected under the Organic Act.

Prior to the FERC issuing a new license, the NPS will need to evaluate the proposed license under Section 7(a) of the Wild and Scenic Rivers Act and to determine whether it will have direct and adverse effects on the values for which the river was designated. If the NPS identifies direct and adverse effects, the license/project will need to be modified to ensure that park resources are protected. The NPS study requests are needed to provide information to enable timely completion of this NPS review as well as the FERC NEPA analysis. Continuing impacts on resource values must be identified so that protection and enhancement measures can be incorporated into a new license.

Comments on Draft Study Plans

Please contact Caitlin Nagorka, natural resources program manager, St. Croix National Scenic Riverway at caitlin_nagorka@nps.gov to obtain all required NPS scientific research and collecting permits prior to implementing the study plans.

1. **Mussels**

- Mussels are a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. It is our agency's understanding that drawdowns may be necessary during the proposed forty-year license period for maintenance and other purposes. Drawdowns have the potential to affect mussels that are present in the portion of riverbed that emerges during the drawdown. To better understand potential effects to mussels, additional reaches will need to be included within the impoundments, especially in the areas near the shoreline that would become exposed during a drawdown event. The study area as currently proposed includes only two riverine reaches at either end of the Project boundaries, which is inadequate to understand the presence, species, and density of mussels in the areas of the impoundments that would be most affected by a drawdown. Please add additional reaches within each impoundment to the study area. The NPS is available to consult further on identifying and prioritizing additional reaches for the purposes of this study.
- The NPS concurs with the use of WDNR guidelines.
- On page 3, include the NPS in the notification list, along with WDNR and USFWS, if any federally or state-listed species is observed, dead or alive. This will also be specified within the required NPS research and collecting permits.
- When assessing and characterizing mussel habitat, researchers should reference *Aquatic Habitat Classification on the St. Croix National Scenic Riverway* by Haibo Wan et al.

NSPW does not propose to change the operation of the Project from its current run-of-river operating mode and there is no need for routine or scheduled drawdowns. Any future drawdowns that "may" be needed during the subsequent license period will be required by the Commission to completed in consultation with the resource agencies to assure any adverse impacts are avoided or mitigated at the time of the drawdown. The data being requested for a future event that "could" happen is better collected, if needed, once the scope of the proposed action is proposed and collected as needed and analyzed at that time. Therefore, the study being requested for the purpose of a potential future drawdown is not being conducted at this time as part of the relicensing process.

The plan has been amended.

The plan has been amended

2. **Water Quality Study**

- Water quality is a significant component of the aquatic resources Outstandingly Remarkable Value (ORV) for the Wild and Scenic River designation. The Wild and Scenic Rivers Act directs the NPS to protect water quality of the Namekagon (Sec. 1(b)) and work with the Environmental Protection Agency and the WDNR to eliminate or diminish water pollution of the river (Sec. 12(c)).
- The NPS concurs with the use of WDNR protocols and the rationale for not monitoring cyanobacteria.
- The NPS requests that sediment accumulation also be monitored. Results would provide needful baseline information and facilitate better understanding of sedimentation within the project boundaries.

Based upon existing information provided by the USACE, the accumulation of sediment in the upper end of the reservoir is due to sedimentation upstream and not due to operation of the Project-FERC Order Modifying and Approving Drawdown Needs Analysis issued October 31, 1995.

3. **Wood and Blanding's Turtle Nesting Habitat Study**

- This is another example, like the Aquatic and Terrestrial Invasive Plant study, where the effort that goes into the study could provide shoreline survey information outlined in the NPS study request; however, the draft plan does not provide enough detail on shoreline survey methods to determine if NPS needs would be met through this work.
- The NPS-requested shoreline study would provide current information on the status of the shoreline and identify problem areas and the need for potential management attention. It would provide a baseline for monitoring conditions and change over the life of the license. The NPS has responsibility to review shoreline alteration activities such as bank stabilization and small boat docks as water resources projects under Section 7 of the Wild and Scenic Rivers Act.
- The NPS Shoreline Survey request Method 1[1] recommended a longitudinal survey of the river and its banks, using georeferenced photographic equipment (video or still) and cited the High-

[1] NPS comments on the Pre-Application Document and Study Requests, dated 4/28/21, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=020CF9CB-66E2-5005-8110-C31FAFC91712

The HDSS method described by NPS was only used at the RL Harris Hydroelectric Project (FERC No. 2628), a 135 MW peaking facility, to determine the impacts of project operations (peaking) in a 44 mile stretch of the Tallapoosa River downstream of the dam. This method was not used to evaluate erosion or sedimentation within the RL Harris Project Reservoir. Erosion and sedimentation sites within the reservoir were identified by stakeholders and by examining available aerial photography and LIDAR data. Only sites identified by this analysis were then surveyed in the field during the fall/winter pool drawdown. Since the Trego Project is operated in a run-of-river mode that does not conduct seasonal drawdowns, this survey method is not possible at the Project. The Licensee has proposed to evaluate the entire shoreline, and document all erosion sites within the Project rather than just in pre-determined locations. The HDDS study is not necessary to evaluate the Namekagon River downstream of the Project since all inflow is passed downstream of the Project. Project operation does not cause flow fluctuations downstream.

Definition Stream Survey (HDSS) method (Trutta, 2019)[2] used in recent FERC hydropower licensing proceedings, which enables mapping, a visual record of stream and shoreline characteristics, and data collection from multiple sensors. For any planned boat surveys of the shoreline (e.g., turtle, cultural resources, vegetation), please reconsider adopting study Method 1 proposed in the NPS shoreline survey study request to systematically evaluate, quantify, and photograph shoreline conditions including streambank conditions, bank stabilization types and conditions, docks/piers, and public access locations.

The Section 7(a) evaluation to evaluate the effects of the proposed operation of the Project on the Wild and Scenic River. NSPW has proposed studies that provide the data that is not already available to assess the impact of the proposed operation of the Project. The question of 4(e) authority for the Project was previously addressed in the issuance of the current license by order dated June 3, 1994.

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27,2021 letter, including the shoreline survey and hydraulics, sedimentation, and channel change. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Conclusion

Thank you for your consideration of our agency's comments as you develop your final study plan. The NPS looks forward to the results of the three studies reviewed in this letter, as well as the opportunity to continue to collaborate with you throughout the licensing process. Please distribute future communications through Lisa Yager, chief of resource stewardship and education at the St. Croix National Scenic Riverway. Information will be distributed to the NPS team as appropriate through Lisa.

If you have any questions about our response, please contact Lisa Yager at lisa_yager@nps.gov.

Sincerely,

CRAIG HANSEN Digitally signed by CRAIG HANSEN Date: 2022.03.04 13:13:56 -06'00'

Craig Hansen
Superintendent

[2] Trutta Environmental Solutions, *Tallapoosa River High Definition Stream Survey Final Report*, December 2019, included in Alabama Power filing, draft Erosion and Sedimentation Study Report for the R.L. Harris Project under P-2628-065, December 2020. Last accessed 3/31/2021: https://elibrary.ferc.gov/eLibrary/filelist?document_id=14850581&accessionnumber=20200410-5091

The Wisconsin Department of Natural Resources provided their comments verbally on February 21, 2022.

Document Content(s)

20220421 Hayward and Trego Studies List.pdf.....1
Attachment A Aquatic and Terrestrial Inv Spec Stdy.pdf.....7
Attachment B Mussel Study.pdf.....131
Attachment C Recreation Study.pdf.....157
Attachment D WQ Study.pdf.....215
Attachment E Wood-Blanding's Trtle Nest Hab Stdy.pdf.....216

Darrin Johnson

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Monday, July 11, 2022 1:44 PM
To: Shawn Puzen
Subject: RE: Limited Invasive Control Measures at Gile, Hayward, Trego and White River

No vouchers needed.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Monday, July 11, 2022 1:40 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Miller, Matthew J <matthew.j.miller@xcelenergy.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>; Mary Rohde <M.Rohde@gaiconsultants.com>; Laura Sass <L.Sass@gaiconsultants.com>
Subject: RE: Limited Invasive Control Measures at Gile, Hayward, Trego and White River

Hi Cheryl,

GAI will collect vouchers when they visit the areas starting next week and deliver them to the WDNR AIS Regional Coordinator. Please let us know ASAP if you do not want voucher specimens.

The early detection forms will be sent to the WDNR AIS Regional Coordinator, Alex Selle, today, with a copy to you.

Regarding limited control:
Hayward
Yellow iris – The population is persistent and thick throughout the entirety of the project area shoreline. Removal would be difficult, expensive, and likely not effective as it is likely to be present upstream of the flowage. It would take one week to clip the plants with a handheld string trimmer. Therefore, this will not be conducted.

Aquatic forget-me-not – Hand removal may be an option, but it is on private property. The two locations are on either side of a dock and may require a crew to walk on shore to reach it all.

If the WDNR can obtain approval from the landowner, GAI has agreed to remove the plants during the August studies at no additional cost.

Trego
Yellow iris – The population is persistent and spread sporadically throughout the entirety of the project area. Removal would be difficult, expensive, and likely not effective as it is known to be present upstream of the Project boundary. It would take one week to clip the plants with a handheld string trimmer. Therefore, this will not be conducted.

White River
Aquatic forget-me-not – Hand removal may be an option. The crew hand-removed the first plant, but then saw more than they had time to remove that day. The locations were not monotypic but were fairly isolated.

GAI has agreed to remove the plants during the August studies at no additional cost.

Gile Flowage
Aquatic forget-me-not – This was an incidental observation noted during the wood turtle presence/absence surveys. GAI feels it may be difficult to find and remove all plants due to the size of the flowage, but they are happy to keep our eyes peeled during our next survey and hand-remove any plants observed.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Monday, July 11, 2022 9:44 AM
To: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Cc: Miller, Matthew J <matthew.j.miller@xcelenergy.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: RE: New Findings in Hayward, Trego and White River

Can you hand pull any of the plants that are found? I am reaching out to our statewide coordinator for input.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032

(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Monday, July 11, 2022 9:38 AM
To: DNR Invasive Species <DNRInvasiveSpecies@wisconsin.gov>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Miller, Matthew J <matthew.j.miller@xcelenergy.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: FW: New Findings in Hayward, Trego and White River

Good Morning,

NSPW is completing aquatic and terrestrial invasive species monitoring on the White River, Hayward, Trego, and Gile Flowages as part of its relicensing process for the hydroelectric projects.

As part of the recent monitoring, several new occurrences of newly established invasive aquatic and terrestrial species were identified (Please see below).

The online WDNR Early Detection Form will be completed in short order.

Please let us know if you have any additional questions.

Thanks,

SHAWN PUZEN
FERC HYDROPOWER LICENSING AND COMPLIANCE, WATER
Mead & Hunt
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram

120 YEARS OF SHAPING THE FUTURE

From: Mary Rohde <M.Rohde@gaiconsultants.com>
Sent: Monday, July 11, 2022 7:01 AM
To: Darrin Johnson <darrin.johnson@meadhunt.com>; Shawn Puzen <shawn.puzen@meadhunt.com>
Cc: Laura Sass <L.Sass@gaiconsultants.com>
Subject: New Findings in Hayward, Trego and White River

Good Morning, Darrin and Shawn. I hope you both had a nice weekend!

While our field staff were out conducting the aquatic portion of the June ATIS surveys, they found new AIS findings. At the Hayward and Trego Hydroelectric Projects, yellow iris (*Iris pseudacorus*) plants were observed along the shoreline

throughout both Projects. In both areas, the species is so prevalent that capturing specific Latitude/Longitude for individual plants/areas would be very time consuming and general populations will be captured in the August Shoreline survey.

One of the Trego areas:

One of the Hayward areas:

In addition, aquatic forget-me-not was observed in two locations on the Hayward Project (approximately 46.0084727, -91.4587382 and 46.0085591, -91.4586935), and in several locations on the Gile flowage and the White River Flowage.

All of these species were found on the shoreline and will be documented again when our staff are out in August doing the terrestrial portion of the ATIS survey. We felt it important to document them during the aquatic survey as they are new to the project area and were in bloom at the time of the June survey. *Following notification to you we will submit our findings to Wisconsin DNR.*

If you have any questions about these findings, please let us know.

Regards,

Mary K. Rohde
Senior Environmental Manager

GAI Consultants, 515 S. Washburn Street, Suite 104, Oshkosh, WI 54904
M 920.344.8912

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Darrin Johnson

From: Laura Sass <L.Sass@gaiconsultants.com>
Sent: Monday, July 11, 2022 3:53 PM
To: Alexander.Selle@wisconsin.gov
Cc: Mary Rohde; Shawn Puzen; Darrin Johnson; Laatsch, Cheryl - DNR; Miller, Matthew J
Subject: Incident Report Forms for invasive species not previously documented at Hayward, Trego, and White River Flowages
Attachments: AIS Incident Report Form_3200-125_Hayward_PYI.pdf; AIS Incident Report Form_3200-125_Trego_PYI.pdf; AIS Incident Report Form_3200-125_WhiteRiver_FMN.pdf; AIS Incident Report Form_3200-125_Hayward_FMN.pdf

Good afternoon Alex,

We have observed populations of yellow iris (*Iris pseudacorus*) on the Hayward and Trego Flowages and aquatic forget-me-not (*Myosotis scorpioides*) on the Hayward and White River flowages. Please find attached the respective AIS incident report forms. The populations of yellow iris are already well established and wide-spread at both Hayward and Trego Flowages. The forget-me-not plants were more sparce and isolated to the areas reported. We will be visiting all three areas again in late July/early August and will attempt to hand-remove the forget-me-not plants. Please feel free to reach out if you have any questions our would like us to gather more information when we are on the systems next.

Thanks,
Laura

Laura L. Sass, MS
Senior Project Environmental Specialist

GAI Consultants, 3313 S. Packerland Drive, Suite E, De Pere, WI 54115
T 920.328.0980 **M** 608.215.0186

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State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Hayward Lake	Hayward	Sawyer

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-8-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?

This is to report aquatic forget-me-not; found in 2 locations along shore, nearby to GPS coordinates below. Photo documentation not feasible due to access limitations.

Latitude: 46.00855915795532 Longitude: -91.45869357790528

Approximately how large an area do the plants occupy?

- ☒ A Few Plants
- ☐ One or a few beds
- ☐ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Hayward Lake	Hayward	Sawyer

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-7-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?

Pale yellow iris - observed in many shoreline locations throughout the lake (photo available on the next page)

Latitude:	Longitude:

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☐ One or a few beds
- ☒ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Trego Lake	Trego	Washburn

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-6-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?
Pale yellow iris; Observed in many shoreline locations throughout the lake (photo on next page)

Latitude:	Longitude:

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☐ One or a few beds
- ☒ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
White River Flowage	White River	Ashland

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-29-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?

This is to report aquatic forget-me-not; found in 3 shoreline locations on the flowage. One location was pulled out by root: (46.493351, -90.917109)

Latitude: (46.492208, -90.921865) and (46.492463, -90.922219) Longitude:

Photo attached of plant that was pulled.

Approximately how large an area do the plants occupy?

- ☒ A Few Plants
- ☐ One or a few beds
- ☐ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

Darrin Johnson

From: Darrin Johnson
Sent: Friday, January 27, 2023 11:32 AM
To: Beranek, Ashley E - DNR
Cc: Laatsch, Cheryl - DNR; Shawn Puzen; Darrin Johnson
Subject: RE: Temperature Standard for Hayward and Trego Reservoirs

Thank you Ashley.

Darrin Johnson
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | Experience Exceptional

From: Beranek, Ashley E - DNR <Ashley.Beranek@wisconsin.gov>
Sent: Friday, January 27, 2023 11:29 AM
To: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Hudak, Andrew J - DNR <Andrew.Hudak@wisconsin.gov>
Subject: RE: Temperature Standard for Hayward and Trego Reservoirs

Hi Darrin,

I can confirm these two impoundments, Hayward and Trego, should be using the criteria outlined in NR102 Table 2. They both have water residence times of less than 14 days, which we term Impounded Flowing Waters (NR 102.03(1q)) and apply the river/stream criteria for most metrics.

Please let me know if you have any additional questions. Thanks!

Ashley Beranek (Pronouns: she/her/hers; learn why this is done)
Integrated Report / Surface Water Quality Assessments Coordinator
Phone: 608-400-6519
ashley.beranek@wisconsin.gov

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From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Friday, January 27, 2023 10:54 AM
To: Hudak, Andrew J - DNR <Andrew.Hudak@wisconsin.gov>; Beranek, Ashley E - DNR <Ashley.Beranek@wisconsin.gov>
Subject: FW: Temperature Standard for Hayward and Trego Reservoirs

Hi Ashley – Please see the email below. Can you help Darrin with his question?

Cheryl Laatsch

Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
NEW (Work Cell) 920-382-9975
Cheryl.laatsch@wisconsin.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Friday, January 27, 2023 10:41 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: Temperature Standard for Hayward and Trego Reservoirs

Hi Cheryl,

I just wanted to confirm the temperature standards we should be using for the Hayward and Trego reservoirs.

Below is from WDNR's comment on the PAD:

- Trego Project should be subject to the Warm-Large temperature criteria (see table below from Chapter N 102.2 – Water Quality Standards for Wisconsin Surface Waters)
- Hayward Projec =t should be subject to Coldwater temperature criteria (see table below from Chapter N 102.2 – Water Quality Standards for Wisconsin Surface Waters)

Table 2
Ambient Temperatures and Water Quality Criteria for Temperature for Non-Specific Waters
(All values are expressed as degrees Fahrenheit)

	Cold[4]			Warm — Large[5]			Warm — Small[6]			LFF[7]		
Month	Ta[1]	SL[2]	A[3]	Ta	SL	A	Ta	SL	A	Ta	SL	A
JAN	35	47	68	33	49	76	33	49	76	37	54	78
FEB	36	47	68	33	50	76	34	50	76	39	54	79
MAR	39	51	69	36	52	76	38	52	77	43	57	80
APR	47	57	70	46	55	79	48	55	79	50	63	81
MAY	56	63	72	60	65	82	58	65	82	59	70	84
JUN	62	67	72	71	75	85	66	76	84	64	77	85
JUL	64	67	73	75	80	86	69	81	85	69	81	86
AUG	63	65	73	74	79	86	67	81	84	68	79	86
SEP	57	60	72	65	72	84	60	73	82	63	73	85
OCT	49	53	70	52	61	80	50	61	80	55	63	83
NOV	41	48	69	39	50	77	40	49	77	46	54	80
DEC	37	47	69	33	49	76	35	49	76	40	54	79

1 Ta = ambient temperature
2 SL = sub-lethal criteria
3 A = acute criteria
4 Cold = waters with a fish and aquatic life use designation of "cold water community"
5 Warm – Large = waters with a fish and aquatic life use designation of "warm water sport fish community" or "warm water forage fish community" and unidirectional 7Q10 flows ≥ 200 cfs (129 mgd)
6 Warm – Small = waters with a fish and aquatic life use designation of "warm sport fish community" or "warm water forage fish community "and uni-directional 7Q10 flows < 200 cfs (129 mgd)
7 LFF = waters with a fish and aquatic life use designation of "limited forage fish community"

I just wanted to confirm that we don't need to use the Inland lake/impoundment temperature table (Table 4) for the deep hole reservoir monitoring sites at each Project.

Just let me know if you have any questions. Thank you.

Darrin Johnson
FERC Compliance and Licensing | Water
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
Mead&Hunt
LinkedIn | Twitter | Facebook | Instagram

STUDY REPORT CONSULTATION

Darrin Johnson

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Monday, March 6, 2023 9:52 AM
To: Darrin Johnson
Subject: Project: White River, Hayward and Trego Relicensi - File Transfer - Hayward and Trego Study Reports

Project: 2400100-192923.01 **White River, Hayward and Trego Relicensi**

Notification about File Transfer **Hayward and Trego Study Reports**

Note: You have been CC'd on this notification.

Remarks

Hi Cheryl,

Per your request.

Thanks,
Shawn Puzen | FERC Licensing & Compliance
Mead & Hunt | 1702 Lawrence Drive | De Pere, WI 54115
Direct: 920-593-6865 | Mobile: 920-639-2480
shawn.puzen@meadhunt.com | meadhunt.com
https://www.linkedin.com/in/shawnpuzen

View the Transmittal in Newforma Project Center

Download all files

File Transfer Info

To: **Cheryl Laatsch (Wisconsin Department of Natural Resources)**
From: **Shawn Puzen (Mead & Hunt, Inc.)**
CC: **Darrin Johnson (Mead & Hunt, Inc.); Matthew Miller (Xcel Energy Corporation)**

Purpose: **For your review and comment**
Expiration Date: **4/5/2023**

Transferred Files

Hayward and Trego WQ Study Report.pdf	2/14/2023	10:22 AM	2,622 KB
Hayward and Trego WQ Study Report_Appendix C_Field Notes_YSI Profile Data.xlsx	2/8/2023	12:33 PM	91 KB
Hayward and Trego WQ Study Report_Appendix D_Analytical Data Summary.xlsx	2/14/2023	10:21 AM	22 KB
HaywardTregoRecRpt.pdf	3/2/2023	7:57 AM	5,390 KB
HaywardTrego_Turtle Study_Report.pdf	1/30/2023	3:41 PM	7,408 KB
Hayward_and_Trego_ATIS_Reduced.pdf	2/8/2023	9:13 AM	67,695 KB
Hayward_Mussel_Report_Study.pdf	1/25/2023	1:17 PM	5,366 KB
Transmittal - 00016.pdf	3/6/2023	9:52 AM	108 KB
Trego_Mussel_Report_Study.pdf	1/25/2023	1:17 PM	6,390 KB

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Darrin Johnson

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Monday, March 6, 2023 9:58 AM
To: Darrin Johnson
Subject: Project: White River, Hayward and Trego Relicensi - File Transfer - Hayward and Trego Study Reports

Project: 2400100-192923.01 **White River, Hayward and Trego Relicensi**

Notification about File Transfer **Hayward and Trego Study Reports**

Note: You have been CC'd on this notification.

A transfer (File Transfer) has arrived on the Mead & Hunt, Inc. Info Exchange Site.

Remarks

We look forward to discussing this on March 29th.

Thanks,
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View the Transfer in Newforma Project Center

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File Transfer Info

To: **craig_hansen@nps.gov; jonathan_moore@nps.gov; lisa_yager@nps.gov**
From: **Shawn Puzen (Mead & Hunt, Inc.)**
CC: **Darrin Johnson (Mead & Hunt, Inc.); Matthew Miller (Xcel Energy Corporation)**
Expiration Date: **4/5/2023**

Transferred Files

Hayward and Trego WQ Study Report.pdf	2/14/2023	10:22 AM	2,622 KB
Hayward and Trego WQ Study Report_Appendix C_Field Notes_YSI Profile Data.xlsx	2/8/2023	12:33 PM	91 KB
Hayward and Trego WQ Study Report_Appendix D_Analytical Data Summary.xlsx	2/14/2023	10:21 AM	22 KB
HaywardTregoRecRpt.pdf	3/2/2023	7:57 AM	5,390 KB
HaywardTrego_Turtle Study_Report.pdf	1/30/2023	3:41 PM	7,408 KB
Hayward_and_Trego_ATIS_Reduced.pdf	2/8/2023	9:13 AM	67,695 KB
Hayward_Mussel_Report_Study.pdf	1/25/2023	1:17 PM	5,366 KB
Trego_Mussel_Report_Study.pdf	1/25/2023	1:17 PM	6,390 KB

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Darrin Johnson

From: Shawn Puzen
Sent: Monday, March 6, 2023 11:11 AM
To: thomas.h.frost@gmail.com; cjpetersen@msn.com
Cc: Darrin Johnson; Miller, Matthew J; Shawn Puzen
Subject: ATIS Study Report for Hayward and Trego Relicensing.

Categories: Filed by Newforma

Good Morning,

Per your request, I will be sending you a file transfer that contains the study report for the Aquatic and Terrestrial Invasive Species Study. If you recall, the study was requested by the Trego Lake District early on in the relicensing process. It also contains information on substrate and water depth.

Please let me know if you do not receive the report or have trouble downloading it (it is a rather large file that I have not been able to reduce the size of very well).

Thanks,

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ATIS STUDY REPORT

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Hayward and Trego Aquatic and Terrestrial Invasive Species Study Report

Northern States Power Company
Hayward and Trego Hydroelectric Projects
Hayward, Wisconsin
Trego, Wisconsin
GAI Project Number: R220323.02
| FERC Nos. 2417 and 2711
January 2023

Prepared by:
GAI Consultants, Inc.
3313 S Packerland Drive, Suite E
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Prepared on behalf of:
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1702 Lawrence Drive
De Pere, Wisconsin 54115

Hayward and Trego Aquatic and Terrestrial Invasive Species Study Report

Northern States Power Company
Hayward and Trego Hydroelectric Projects
Hayward and Trego, Wisconsin

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January 2023

Prepared for:
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1.0 Project Overview

The Hayward and Trego Hydroelectric Projects (Project or Projects), Federal Energy Regulatory Commission (FERC) Nos. 2417 and 2711, are located in the Town of Hayward, Sawyer County, Wisconsin and the Town of Trego, Washburn County, Wisconsin, respectively (Figures 1 and 2). The hydroelectric dams are owned, operated, and maintained by Northern States Power Company, a Wisconsin corporation (Licensee). The current licenses for both Hayward and Trego expire on November 30, 2025. As part of the relicensing process, the Wisconsin Department of Natural Resources (WDNR) requested the Licensee complete invasive species studies for both Projects. GAI is pleased to submit the results of the Aquatic and Terrestrial Invasive Species Studies (Study or Studies) conducted June 7-10, July 20, and August 1-5, 2022, to fulfill this request. This Study report provides baseline data on native species and aquatic and terrestrial invasive species and includes the following for both Projects:

Aquatic plant surveys – two sampling events conducted in June and July/August,

Water tow samples – collected during the July/August surveys,

Sediment samples – collected during the June surveys, and

Terrestrial upland surveys – conducted during the July/August surveys.

2.0 Introduction

Hayward Lake is a 191-acre impoundment located in the Middle Namekagon River Watershed which is primarily forest and wetland.

Trego Lake is a 383-acre impoundment, also located in the Middle Namekagon River Watershed. Being a part of the Namekagon River, a portion of Trego Lake is part of the St. Croix National Scenic Riverway which is federally protected.

Invasive species pose a threat to aquatic ecosystems. They are defined as non-native species that, when introduced, cause, or are likely to cause, harm to the environment, human health, or the economy. Invasive plant species can displace native plant populations, restrict boating, reduce wildlife habitat, and cause nutrient imbalance in a waterbody. Once established, invasive species can be transferred downstream by recreationists and migrating wildlife.

This Study was conducted to assess the presence of known aquatic and terrestrial invasive species and identify any new invasive species in the Project areas. The Studies encompassed the Hayward and Trego Flowages within the Projects' existing and proposed boundaries and included aquatic and terrestrial plants and select aquatic invertebrates. The Study areas also included the reservoir shorelines and upland shorelines owned by the Licensee.

3.0 Methodology

3.1 Upstream and Downstream Inundated Areas

3.1.1 Aquatic Plant Surveys

Aquatic plants were sampled by approximating the WDNR's Point-Intercept protocols as listed in *Recommended Baseline Monitoring of Aquatic Plants in Wisconsin* (WDNR 2019). Two sampling surveys were completed for each Project: the early-season survey was completed at Hayward on June 7-8, and at Trego on June 9-10; and the late-season survey was completed at Hayward on August 2-3, and at Trego July 20 and August 1 and 4, 2022. The WDNR provided a grid of sample points for both lakes to implement during the studies (Figures 3 and 4). The grid for Hayward Lake was comprised of 482 sample points distributed evenly throughout the flowage, and the grid for Trego Lake contained 493 sample points. The WDNR

requested that this Study extend sampling farther upstream on Trego Lake than the grid provided by the WDNR encompassed; therefore, an additional 28 points were added to the grid, east of Hwy 53 (point numbers 494-521), for a total of 521 sampling points. Each sampling point was located using a boat and a Trimble R1 GNSS Receiver and GPS device and was assessed for sample feasibility.

Points that could not be sampled were categorized as follows:

Non-navigable (per density of plant growth, shallow water, dock, swim area, or safety),

Terrestrial (point located in an upland area), or

Too deep (i.e., over 15 feet deep or deeper than depth of plant growth)

Temporary obstacle (i.e., fisherman or other obstacle in water)

Points were sampled using a double-sided rake mounted on a pole. The rake was lowered until it rested gently on the lake bottom, twisted twice, then raised straight up out of the water. At each sampled point, aquatic plant species' presence and density were collected (Figures 5 - 8 and Attachments A - D). Plant density was measured by rake fullness (Figure 9). Areas not captured by the point-intercept grid were monitored for the species listed in the WDNR aquatic invasive rapid response species list (WDNR 2016). No permanent vouchers were collected. Photographs taken during the Study are included in Attachment E.

Additional information regarding bed substrates and depths was collected at points with water depths up to 15 feet in July/August. Substrate was categorized using nine substrate types: clay, silt, sand, gravel, cobble, boulder, bedrock, wood, or organic. During rake sampling, the presence or absence of woody debris on the bottom was also noted. Locations with coarse woody habitat greater than 4 inches in diameter and five feet in length, which were observed in the water at or below the high-water mark, were mapped. In June, the maximum depth of colonization (MDC) was determined by three empty rake retrievals in different areas at the same depth. Once the MDC was determined, points exceeding that depth were not sampled.

3.1.2 Water Samples

To monitor for the presence of zebra mussels (*Dreissena polymorpha*), two mussel veliger samples were collected during the July survey by approximating WDNR monitoring protocol for zebra mussels (WDNR 2020). One sample each was collected in the reservoir and tailwater at both Projects. A 64-micron mesh zooplankton net was used to collect the zebra mussel veliger samples. To monitor for the presence of spiny water flea (*Bythotrephes longimanus*) and fishhook water flea (*Cercopagis pengoi*), one water flea sample was collected in both the reservoir and tailwater for each Project, approximating WDNR monitoring protocol for water flea (WDNR 2021). A 250-micron mesh zooplankton net was used to collect the water flea samples.

For the reservoir samples (Figures 1 and 2), a horizontal tow was conducted by lowering the net into the water so that the top of the net was fully submerged, and the bottom of the net remained above the bottom or hypolimnion. With the net in this position, the boat was driven backwards slowly (about 2 miles per hour) for two minutes.

Shallow water and fast flows at the tailwater locations (Figures 1 and 2) prevented the use of a boat; therefore, the sampling method was adjusted accordingly. The pool below the dam was accessed on foot. The plankton net was then positioned in the current, such that the top of the net was submerged while the bottom of the net remained above the bottom substrate. The net was held in this position, with water flowing through for two minutes, to collect the water sample.

For all eight samples, while raising the zooplankton net from the water, the net was rinsed from the outside so that the entire sample would be washed into the collection cup. For each sample, as much water as possible was decanted from the collection cup. Each final sample was poured into a quart-sized sample bottle and preserved with 95% ethanol at a 4:1 ethanol to sample ratio. The preserved water samples were sent for analysis to the Wisconsin State Laboratory of Hygiene in Madison, Wisconsin on August 11, 2022, as requested by the WDNR invasive species coordinator.

3.1.3 Sediment Samples

To monitor for invasive macroinvertebrates, sediment samples were collected at public boat launch sites at Hayward and Trego lakes (Figures 1 and 2). A trowel was used to scoop approximately six inches of sediment into a 10-inch Tetra Pond Planter Basket, with a 1/32nd inch mesh (Figure 10). Fine sediment was flushed out of the basket and the remaining materials were examined for Asian clam (*Corbicula fluminea*), faucet snail (*Bithynia tentaculate*), New Zealand mud snail (*Potamopyrgus antipodarum*), Malaysian trumpet snail (*Melanoides tuberculata*), rusty crayfish (*Orconectes rusticus*), and other invasive macroinvertebrates. The areas in the vicinity of these access sites were also visually examined for live snails, crayfish, and shells.

3.2 Terrestrial Upland Areas

The upland shorelines adjacent to the reservoirs, and upland areas owned by the Licensee, were surveyed in early-August using the two methods described below.

3.2.1 Upland Survey - Shoreline

The Trego and Hayward upland shoreline areas were studied on August 1 and 2, 2022, respectively (Figures 11A and 12A). The upland shoreline was surveyed by motorboat, canoe, or on foot where the use of a boat was not feasible. Along the shoreline, an overall characterization of the terrestrial plant composition was made using the *Wisconsin Natural Heritage Inventory (NHI) Recognized Natural Communities Working Document* (Epstein et al. 2007). Shoreline plant composition was studied within a 10-meter riparian zone visible from open water.

The reservoir shoreline surveys were divided into segments based on changes in land use or vegetative communities. When plants included in the NR 40 list were observed, the species type, location, and length of infested shoreline were identified and mapped using a Trimble R1 GNSS Receiver and GPS device. Relative abundance of each observed species within each segment was determined using the Daubenmire Classification Scheme Cover Ranking System. This system provides an estimate of the percent foliage cover as would be observed from above the vegetation. This ranking system was used to estimate relative abundance because it reduces the influence of individual bias in estimating foliage cover and can be applied to the relative size and length of a given segment of study (Daubenmire 1959). See Table 1 below for an overview of the Daubenmire Classification Scheme Cover Ranking System.

Table 1

Daubenmire Classification Scheme Cover Ranking System

Foliage Percent Cover	Rank
1-5	1
5-25	2
25-50	3
50-75	4
75-95	5

3.2.2 Upland Survey - Meander of Terrestrial Areas

Upland areas owned by the Licensee within the Hayward and Trego Project boundaries were studied using a meander survey on August 3 and 4, 2022, respectively (Figures 11B and 12B). The routes traveled during the meander surveys were recorded using a Garmin Forerunner 55 Watch. An overall characterization of the terrestrial plant communities was recorded. Whenever plants included in the NR 40 list were observed, the species and location were recorded using a Trimble R1 GNSS Receiver and GPS device. An estimate of relative abundance, using the Daubenmire System, and the extent to which the species was present (areal coverage), were recorded, as was the route of travel during the meander.

4.0 Results and Discussion

4.1 Hayward Lake Aquatic Plant Survey

4.1.1 June Point-Intercept Survey

A total of 352 points were sampled during the point-intercept survey on June 7-8, 2022 (Figure 5, Attachment A). A majority of the points unable to be sampled were the result of either plant density, inaccessibility due to shallow water, or the water was too deep (i.e., >15 feet or MDC). In addition, eight points could not be sampled because they were either terrestrial (5), within an active swim area (1), within the dam buoys (1), or inaccessible due to a temporary obstacle (1).

Among the points sampled, 344 were shallower than the maximum depth of rooting plants (10.5 feet) with 283 (~82% of the littoral points) exhibiting vegetation. Thirty-four native species were found during the survey (Table 2), two of which were observed visually, but not present on the rake/at a sample point (i.e., watershield (*Brasenia schreberi*) and wild calla (*Calla palustris*). Overall, predominant species were flat-stem pondweed (*Potamogeton zosteriformis*), coontail (*Ceratophyllum demersum*), common waterweed (*Elodea canadensis*), forked duckweed (*Lemna trisulca*), and fern pondweed (*Potamogeton robbinsii*). Figure 13 includes the species dominant on each rake sample in June. The average total rake fullness during the study where plants were present was 1.55 (Figure 5).

Two submergent aquatic invasive species were present during the point-intercept survey as well, Eurasian watermilfoil (*Myriophyllum spicatum,* EWM) and curly-leaf pondweed (*Potamogeton crispus,* CLP). These two species will be discussed further in Section 4.1.3. A number of wetland and terrestrial invasive species were also observed, and their occurrences will be discussed in Section 4.2. WDNR Incident Report Forms can be found in Attachment F

4.1.2 August Point-Intercept Survey

The late-season survey on Hayward Lake was completed on August 2-3, 2022. All navigable sample points 15 feet deep or less were sampled to assess sediment types. A total of 394 points were visited during the August survey (Figure 6, Attachment B). The maximum depth of plant growth was 12.2 feet. Of the points visited, 335 were found to be within the littoral zone. Two hundred ninety-five (88% littoral frequency of occurrence) of these sample sites contained vegetation. Thirty-two native species were found on the rake during the late-season survey (Table 2). Common waterweed, coontail, flat-stem pondweed, and forked duckweed were again four of the predominant species; however, the fifth predominant species during the August survey was wild celery (*Vallisneria americana*). Figure 14 depicts the dominant species on each rake sample in August. The average total rake fullness where plants were present was 1.96. EWM and CLP were again both present during the August survey.

Table 2

Hayward Lake Aquatic Plant Species Abundance

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	August	June	August
Myriophyllum spicatum[c]	Eurasian watermilfoil	13.4	20.0	5.4	7.0
Potamogeton crispus	Curly-leaf pondweed	5.8	0.6	2.4	0.2
Bidens beckii	Water marigold	3.5	7.8	1.4	2.7
Brasenia schreberi	Watershield	Visual	*not observed*	Visual	*not observed*
Ceratophyllum demersum	Coontail	33.4	41.5	13.5	14.6
Chara spp.	Muskgrasses	2.6	1.8	1.1	0.6
Eleocharis acicularis	Needle spikerush	0.3	0.3	0.1	0.1
Elodea canadensis	Common waterweed	33.4	42.7	13.5	15.0
Equisetum spp.	Horsetail species	0.3	*not observed*	0.1	*not observed*
Heteranthera dubia	Water stargrass	8.7	6.6	3.5	2.3
Lemna minor	Small duckweed	1.2	0.9	0.5	0.3
Lemna trisulca	Forked duckweed	29.7	28.7	12.0	10.1
Myriophyllum sibiricum	Northern watermilfoil	1.5	0.3	0.6	0.1
Najas flexilis	Slender naiad	*not observed*	4.8	*not observed*	1.7

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	August	June	August
Nitella spp.	Stoneworts	8.1	18.5	3.3	6.5
Nuphar variegata	Spatterdock	1.7	1.5	0.7	0.5
Nymphaea odorata	White water lily	3.5	3.0	1.4	1.0
Potamogeton amplifolius	Large-leaf pondweed	2.6	1.2	1.1	0.4
Potamogeton epihydrus	Ribbon-leaf pondweed	0.3	0.6	0.1	0.2
Potamogeton friesii	Fries' pondweed	7.6	0.6	3.1	0.2
Potamogeton gramineus	Variable-leaf pondweed	2.6	1.5	1.1	0.5
Potamogeton illinoensis	Illinois pondweed	*not observed*	0.6	*not observed*	0.2
Potamogeton natans	Floating-leaf pondweed	0.6	0.9	0.2	0.3
Potamogeton praelongus	White-stem pondweed	2.9	5.4	1.2	1.9
Potamogeton pusillus	Small pondweed	0.3	2.4	0.1	0.8
Potamogeton richardsonii	Clasping-leaf pondweed	0.9	3.6	0.4	1.3
Potamogeton robbinsii	Fern pondweed	27.0	16.1	10.9	5.7
Potamogeton strictifolius	Stiff pondweed	*not observed*	0.6	*not observed*	0.2
Potamogeton zosteriformis	Flat-stem pondweed	38.1	34.9	15.4	12.3
Ranunculus aquatilis	White water crowfoot	0.9	0.3	0.4	0.1
Sagittaria latifolia	Common arrowhead	*not observed*	0.6	*not observed*	0.2
Sagittaria spp.	Arrowhead spp.	2.3	2.0	0.9	0.7
Sparganium eurycarpum	Common bur-reed	1.7	1.2	0.7	0.4
Sparganium fluctuans	Floating-leaf bur-reed	0.3	*not observed*	0.1	*not observed*
Spirodela polyrhiza	Large duckweed	0.9	0.3	0.4	0.1

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	August	June	August
Stuckenia pectinata	Sago pondweed	0.6	0.3	0.2	0.1
Utricularia minor	Small bladderwort	0.6	*not observed*	0.2	*not observed*
Utricularia vulgaris	Common bladderwort	0.3	*not observed*	0.1	*not observed*
Vallisneria americana	Wild celery	9.0	33.1	3.6	11.6
Wolffia spp.	Watermeals	0.9	*not observed*	0.4	*not observed*

[a] The littoral frequency of occurrence refers to the number of times the species was found divided by the total number of sample locations shallower than the MDC.

[b] The relative frequency of occurrence refers to the frequency at which one species was found in comparison to all species found (percentage).

[c] Red font indicates invasive species.

4.1.3 Hayward Lake Submergent Aquatic Invasive Species

As previously mentioned, EWM and CLP were identified during both of the surveys on Hayward Lake. Point-intercept locations which contained one or both of these species during the surveys are shown in Figures 15 and 16. Both of these species were previously known in the system. Curly-leaf pondweed was verified in 2006, Eurasian watermilfoil was verified in 2011, and a hybrid variety (*Myriophyllum spicatum x M. sibiricum*, HWM) of watermilfoil was verified in 2012. Because verification of hybridity requires genetic testing, occurrences in Hayward Lake can be referred to as EWM or HWM interchangeably.

CLP prefers cooler water and starts growing earlier in the growing season which allows it to establish before many native plants begin to grow. It also senesces earlier in the season, as can be seen in Table 2 and when comparing Figures 15 and 16. The littoral frequency of occurrence of CLP in June was 5.8 as opposed to only 0.6 in August. Although classified as an invasive species, CLP does not always grow aggressively and in some systems can blend with native plant populations, causing no issues. CLP also produces turions which are very hardy and can remain viable at the lake bottom for extended periods of time before sprouting new plants. Hybrid varieties of CLP have been reported as well. As with EWM, hybridity verification requires lab testing to definitively classify parent plants (WDNR 2009). Overall, the frequency of CLP in Hayward Lake is relatively low, and no areas were observed that contained monotypic stands or impeded navigability any more than native plants.

EWM does not begin growing as early in the year as CLP, but it does also typically die back earlier in the growing season than native species, as can also be seen in Table 2. In June, the littoral frequency of occurrence for EWM was 13.4 and in August was 5.4. Similar to CLP, overall frequency of EWM/HWM in Hayward Lake is relatively low, and no surface-matted areas of EWM were observed. When growing aggressively, hybrid watermilfoil has been shown to be more difficult to manage than pure-strain EWM, as it appears to be more resistant to herbicides, and control measures do not typically last for extended periods of time.

4.1.4 Overall Aquatic Plant Survey Analysis and Observations

A total of 38 native aquatic plant species were identified in Hayward Lake during the 2022 point-intercept surveys. Table 3 shows a summary of statistics for each survey. The native species richness values shown are for plants located on the rake only (excludes visual-only occurrences) and includes only plants identified to species (except for the muskgrasses and stoneworts, which are not typically identified to species during PI surveys, and are thus included in the analysis), so they may differ from values given above. Conservatism (C) values range from 1-10. Higher species conservatism values indicate the presence of plants which are sensitive to environmental degradation, while lower C-values indicate plants that are not sensitive and can survive in lower quality systems. The mean C values in June and August were 6.3 and 6.0, respectively, indicating that the system is generally healthy from an aquatic plant perspective.

During the June survey, two species were located with the highest C-value of 10: Floating-leaf bur-reed (*Sparganium fluctuans*) and small bladderwort (*Utricularia minor*). Bladderworts generally favor shallow areas with slow-moving or standing water, often being found alongside water lilies. In August, these types of areas were no longer navigable on Hayward Lake due to excessive plant growth, so while not recorded on the rake during the late-season survey, it was likely still present in the lake.

Hayward Lake was surveyed for wild rice, but none was observed.

Overall littoral frequency of occurrence of plants in June was 82.3% and in August was 88%. With generally shallow depths throughout much of the flowage (Figure 17), aside from the bay where the dam is located, higher overall littoral frequency values were expected. Maximum depth of plant growth being over 10 feet during both of the surveys indicates good water clarity.

Substrate type also directly affects the species type and abundance of plants that can be supported in a waterbody. The majority of substrate samples collected in August (88.6%), at points having depths of less than 15 feet, were classified as organic, which is the most conducive for aquatic plant growth. The remaining locations consisted of 10.5% sand, 0.5% wood, and 0.3% gravel (Figure 18).

During the June point-intercept survey, 42 (11.9%) of the sampling points contained woody debris. Larger coarse woody habitat (CWH; over 4 inches in diameter and 5 feet in length) observed in the water was mapped during the August point-intercept survey (Figure 19). Twenty-nine pieces of CWH were mapped primarily in near-shore and island areas around the lake. In addition, wood pilings which were part of the historic railroad bridge are also present extending into the lake. This location can be seen as a line near the center of the lake on the corresponding map rather than as individual points.

Table 3

Hayward Lake Overall Submergent Plants Summary

Statistic	June 2022	August 2022
Littoral Frequency of Occurrence	82.3	88.0
Maximum Depth of Plants	10.5 feet	12.2 feet
Native Species Richness	30	31
Mean Conservatism (C)	6.3	6.0
FQI	34.7	33.4

4.2 Hayward Terrestrial Upland Areas

Terrestrial invasive species surveys were conducted on August 2 and 5 along the shoreline and upland areas included within the study area. The majority of the shoreline was comprised of residential properties with manicured vegetation; the remainder was comprised of short sections of naturally vegetated and forested areas. The shoreline was inspected by boat or canoe, where feasible, or by walking where navigability was limited. A small area, east of Duffy Road (see Figure 11A), was not accessible either by foot or by boat. This area was comprised of dense emergent vegetation, precluding canoe access, and an unconsolidated bottom which impeded access on foot. Upland shoreline areas generally consisted of manicured turfgrass and landscaped areas on residential properties, punctuated by occasional roadways and emergent wetland and scrub/shrub areas. Terrestrial invasive meander surveys were conducted in three distinct areas, including the Hayward Lake Boat Landing and Hayward City Beach, an area owned by the Licensee located east and south of the dam, and an area owned by the Licensee located west and south of the dam. These areas comprised a mix of mowed vegetation, trees, shrubs, and herbaceous vegetation and contained sizeable populations of invasive species.

4.2.1 Upland Survey - Shoreline

The upland survey was separated into only 2 segments, as the terrain was fairly consistent and dominated by residential land use, with some short sections of naturally forested or vegetated areas interspersed (Figure 11A, Attachment G). For the purposes of this report, Segment 1 is classified as “Developed – Residential”, while Segment 2 is classified as a mix of “Developed – Residential” and “Northern Mesic Forest”. Emergent wetlands, scrub-shrub communities, and roadways were occasionally encountered but were sparsely represented along the shoreline (Table 4).

Table 4

Hayward Terrestrial Shoreline Community Types Summary

Terrestrial Shoreline Community	Mileage of Meander	Percentage of Meander
Developed – Residential	0.32	3.57
Developed – Residential / Northern Mesic Forest	8.65	96.43
Total	8.97	100

The following list summarizes the most commonly encountered herbaceous and woody vegetation species observed within each terrestrial shoreline community:

Developed – Residential

Manicured turf grasses, horticultural plants, occasional trees

Northern Mesic Forest

Overstory: Eastern white pine (*Pinus strobus*), basswood (*Tilia americana*), paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), red pine (*Pinus resinosa*), sugar maple (*acer saccharum*)

Understory: fern species (polypodiophytes)

Invasive species comprised 2.6 miles of shoreline during the terrestrial survey and included glossy buckthorn (*Frangula alnus*), common buckthorn (*Rhamnus cathartica*), Eurasian bush

honeysuckle (*Lonicera spp.*), spotted knapweed (*Centaurea stoebe*), tansy (*Tanacetum vulgare*), yellow iris (*Iris pseudacorus*), aquatic forget-me-not (*Myosotis scorpioides*), purple loosestrife (*Lythrum salicaria*), and suspected narrow-leaf hybrid cattail (*Typha angustifolia x T. latifolia*; Table 5). The woody invasives, including glossy buckthorn, common buckthorn, and Eurasian bush honeysuckle, were among the most frequently observed, along with a large population of aquatic forget-me-not in the eastern portion of the Project area.

Table 5

Hayward Shoreline and Terrestrial Invasive Species Summary

Species	Common Name	Mileage of Meander	Percentage of Meander
Centaurea stoebe	Spotted knapweed	0.12	1.36%
Lythrum salicaria	Purple loosestrife	0.34	3.79%
Typha spp.	Cattail spp. (suspected to be invasive or hybrid)	0.01	0.17%
Tanacetum vulgare	Tansy	0.02	0.19%
Iris pseudacorus	Yellow iris	0.07	0.73%
Frangula alnus	Glossy buckthorn	0.31	3.44%
Rhamnus cathartica	Common buckthorn	0.47	5.29%
Myosotis scorpioides	Aquatic forget-me-not	0.42	4.65%
Lonicera spp.	Eurasian bush honeysuckle	0.85	9.44%

4.2.2 Upland Survey - Meander of Terrestrial Areas

Two areas owned by the Licensee and one are not owned by the Licensee were included in the upland terrestrial meander survey (Figure 11B); the Hayward Lake Boat Landing and City Beach area (not owned by the Licensee) and the area around the Dam (owned by the Licensee). Because the Namekagon River bisected the area around the Dam, each shoreline is reported separately below.

1. **Hayward Lake Boat Landing and City Beach**: This area was characterized by a mixture of maintained turfgrass, a public beach and playground, paved and gravel surfaces, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Eurasian bush honeysuckle
    b. Spotted knapweed
    c. Tansy
    d. Common buckthorn
    e. Glossy buckthorn
2. **East and South of Dam**: This portion of the Dam area owned by the Licensee, was characterized by a mixture of gravel surfaces, road right-of-way, trails leading to river access points, and natural herbaceous and woody vegetation adjacent to the dam. Invasive plant species observed within this area included:
    a. Purple loosestrife
    b. Tansy
    c. Aquatic forget-me-not

d. Spotted knapweed
e. Glossy buckthorn
f. Common buckthorn
g. Eurasian honeysuckle

3. **West and South of Dam**: This portion of the survey, owned by the Licensee, was characterized by a mixture of gravel surfaces, road right-of-way, trails leading to river access points, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:

    a. Eurasian honeysuckle
    b. Common buckthorn
    c. Glossy buckthorn
    d. Tansy
    e. Purple loosestrife

4.2.3 Upland Survey - Overall Observations

The results of the survey revealed the presence of well-established populations of numerous invasive species on the shoreline of Hayward Lake and in adjacent areas owned by the Licensee. Common and glossy buckthorn, Eurasian bush honeysuckle, purple loosestrife and yellow iris were commonly encountered and even dominant in some areas, while other invasives were well represented but less frequently encountered. The invasives species found in these areas is unsurprising, given the long history of residential and recreational use of the waterbody and surrounding areas. Outdoor recreation clubs, natural areas, and state departments of natural resources have increased efforts toward public education and involvement to help reduce the spread of such species.

4.3 Trego Lake Aquatic Plant Survey

4.3.1 June Point-Intercept Survey

A total of 272 points were sampled during the Trego Lake point-intercept survey on June 9-10, 2022 (Figure 7, Attachment C). A majority of the points unable to be sampled were the result of the water either being too deep (exceeding the MDC), or unnavigable due to excessive plant growth or shallow water. In addition, eight of the sample points were considered terrestrial, one was within dam buoy barrier, one was under a dock, and one was a temporary obstacle. Among the points sampled, 263 were shallower than the maximum depth of rooting plants (10.3 feet) and 144 (54.8% of the littoral points) exhibited vegetation. Twenty-seven native aquatic species were found during the survey (Table 6), seven of which were observed visually, but not present on the rake at a sample point. Those species include spatterdock (*Nuphar variegata*), large-leaf pondweed (*Potamogeton amplifolius*), floating-leaf pondweed (*Potamogeton natans*), white-stem pondweed (*Potamogeton praelongus*), common bladderwort (*Utricularia vulgaris*), wild calla (*Calla palustris*), and marsh cinquefoil (*Comarum palustre*). Overall, predominant species were coontail (*Ceratophyllum demersum*), flat-stem pondweed (*Potamogeton zosteriformis*), common waterweed (*Elodea canadensis*), wild rice (*Zizania* spp.), and wild celery (*Vallisneria americana*). Figure 20 includes the species most dominant on each rake sample in June. The average total rake fullness during the study, where plants were present, was 1.3.

Two submergent aquatic invasive species were present during the point-intercept survey as well: Eurasian watermilfoil (*Myriophyllum spicatum,* EWM) and curly-leaf pondweed (*Potamogeton crispus,* CLP). The June CLP littoral frequency of occurrence in Table 6 is underestimated due to surface-matted areas of it growing in parts of the lake that were unnavigable because of its density. EWM and CLP will be discussed further in Section 4.3.3. A

cattail species (*Typha* spp.), observed in June, was not yet able to be identified as native or non-native. However, during the late-season survey, several populations were confirmed as narrow-leaf cattail, or a hybrid variety of non-native cattail. Native cattail was also observed; therefore, it is possible the species are hybridizing. A number of other wetland and terrestrial invasive species were also observed, and their occurrences will be discussed in Section 4.6. WDNR Incident Report Forms can be found in Attachment H

4.3.2 July/August Point-Intercept Survey

The late-season survey on Trego Lake was completed on July 20, August 1 and 4, 2022. All navigable sample points 15 feet deep or less were sampled to assess sediment types. A total of 301 points were visited (Figure 8, Attachment D). Of the points visited, 258 were found to be within the littoral zone (points within the MDC), and 149 (57.8% littoral frequency of occurrence) of these contained vegetation. The maximum depth of plant growth was 11.0 feet.

Twenty-eight native species were found during the late-season survey (Table 6), four of which were observed visually, but not present on the rake at a sampling point. Those four species were: common arrowhead (*Sagittaria latifolia*), crested arrowhead (*Sagittaria cristata*), creeping spikerush (*Eleocharis palustris*), and grass-leaved arrowhead (*Sagittaria graminea*). Coontail, wild celery, common waterweed, and flat-stem pondweed were again four of the predominant species; however, wild rice had grown to a point that where present, these areas were no longer navigable, so littoral frequencies are underestimated. Wild rice locations are illustrated in Figure 8. The fifth species that took its place during this late-season survey was stoneworts (*Nitella* spp.) Figure 21 depicts the predominant species for each rake sample in July/August. The overall average total rake fullness, where plants were present, was 1.6.

During the late-season survey, one occurrence of spiny hornwort was confirmed (*Ceratophyllum echinatum).* Spiny hornwort is found only in North America, and inhabits lakes and slow-moving streams, but is less frequently observed than its sister species, coontail. Spiny hornwort typically grows in clearer, more acidic waters and is distinguished from coontail by having limp, barely toothed leaves that fork 3-4 times.

EWM and CLP were again both present during this survey, however, with less frequency than in June, as expected. Narrow-leaf cattail was also confirmed, and is discussed in further detail in Section 4.6

Table 6

Trego Lake Aquatic Plant Species Abundance

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	July/Aug	June	July/Aug
Myriophyllum spicatum[c]	Eurasian watermilfoil	5.7	3.9	4.7	2.6
Potamogeton crispus	Curly-leaf pondweed	6.5	1.6	5.3	1.0
Bidens beckii	Water marigold	0.4	*not observed*	0.3	*not observed*
Calla palustris	Wild calla	Visual	*not observed*	Visual	*not observed*
Ceratophyllum demersum	Coontail	24.3	26.4	20.1	17.5

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	July/Aug	June	July/Aug
Ceratophyllum echinatum	Spiny hornwort	*Not noted*	0.4	*Not noted*	0.3
Chara spp.	Muskgrasses	1.1	1.9	0.9	1.3
Comarum palustre	Marsh cinquefoil	Visual	*not observed*	Visual	*not observed*
Eleocharis palustris	Creeping spikerush	*not observed*	Visual	*not observed*	Visual
Elodea canadensis	Common waterweed	19.4	22.9	16.0	15.2
Heteranthera dubia	Water stargrass	2.3	1.9	1.9	1.3
Lemna minor	Small duckweed	1.1	3.5	0.9	2.3
Lemna trisulca	Forked duckweed	6.5	11.2	5.3	7.5
Myriophyllum sibiricum	Northern watermilfoil	0.8	0.4	0.6	0.3
Najas flexilis	Slender naiad	*not observed*	0.4	*not observed*	0.3
Nitella spp.	Stoneworts	6.8	17.8	5.6	11.8
Nuphar variegata	Spatterdock	Visual	0.4	Visual	0.3
Nymphaea odorata	White water lily	1.1	0.8	0.9	0.5
Potamogeton amplifolius	Large-leaf pondweed	Visual	*not observed*	Visual	*not observed*
Potamogeton friesii	Fries' pondweed	0.4	1.9	0.3	1.3
Potamogeton natans	Floating-leaf pondweed	Visual	*not observed*	Visual	*not observed*
Potamogeton praelongus	White-stem pondweed	Visual	1.2	Visual	0.8
Potamogeton richardsonii	Clasping-leaf pondweed	0.8	0.8	0.6	0.5
Potamogeton robbinsii	Fern pondweed	3.8	3.5	3.1	2.3
Potamogeton zosteriformis	Flat-stem pondweed	20.2	14.7	16.6	9.8
Ranunculus aquatilis	White water crowfoot	0.8	0.4	0.6	0.3

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	July/Aug	June	July/Aug
Sagittaria cristata	Crested arrowhead	*not observed*	Visual	*not observed*	Visual
Sagittaria graminea	Grass-leaved arrowhead	*not observed*	Visual	*not observed*	Visual
Sagittaria latifolia	Common arrowhead	*not observed*	Visual	*not observed*	Visual
Sparganium eurycarpum	Common bur-reed	1.5	0.8	1.3	0.5
Spirodela polyrhiza	Large duckweed	0.4	5.4	0.3	3.6
Stuckenia pectinata	Sago pondweed	0.4	*not observed*	0.3	*not observed*
Tolypella intricata	Tassel stonewort	*not observed*	1.2	*not observed*	0.8
Typha spp.	Non-native cattail	Visual	Visual	Visual	Visual
Utricularia vulgaris	Common bladderwort	Visual	*not observed*	Visual	*not observed*
Vallisneria americana	Wild celery	7.6	25.6	6.3	17.0
Wolffia spp.	Watermeal species	*not observed*	0.8	*not observed*	0.5
Zizania spp.	Wild rice	9.5	1.2	7.8	0.8

[a]The littoral frequency of occurrence refers to the number of times the species was found divided by the total number of sample locations shallower than the MDC.

[b]The relative frequency of occurrence refers to the frequency at which one species was found in comparison to all species found (percentage).

[c]Red font indicates invasive species.

4.3.3 Trego Lake Submergent Aquatic Invasive Species

As previously mentioned, EWM and CLP are both present in Trego Lake. Figures 22 and 23 display the point-intercept locations where these invasive species were found during the surveys. These species were previously known to occur in the system. Curly-leaf pondweed was verified in 2011 and Eurasian/hybrid watermilfoil was verified more recently in 2019. Because verification of hybridity requires genetic testing and cannot be field identified with certainty, occurrences in Trego Lake can be referred to as EWM or HWM interchangeably. No samples of milfoil were sent for hybridity testing as a part of this Study.

CLP starts growing early in the growing season which allows it to establish before many native plants begin to grow. It also senesces earlier in the season, as evidenced in Table 6. The littoral frequency of occurrence of CLP in June was 6.5 as opposed to only 1.6 in the July/August survey. Although an invasive species, CLP does not always grow aggressively and

in some systems can blend with native plant populations, causing no issues. However, in the large bay at the southern end of Trego Lake, CLP was observed growing in a large, dense, surface-matted area which impeded navigation, making some areas impossible to navigate. CLP produces turions which are very hardy and can remain viable at lake bottom for extended periods of time before sprouting new plants. Because of this, when warranted, management of this species should occur for more than just one growing season, and during consecutive years.

While EWM does not start growing as early as CLP, it also typically dies back earlier in the growing season, as depicted in Table 6. In June, the littoral frequency of occurrence for EWM was 5.7 and in July/August was 3.9. The overall frequency of EWM/HWM in Trego Lake is relatively low, and no monotypic areas of EWM were observed.

4.3.4 Trego Lake Overall Aquatic Plant Survey Analysis and Observations

A total of 35 native aquatic plant species were identified in Trego Lake during the 2022 point-intercept surveys. Table 7 shows a summary of statistics for each of the surveys. The native species richness values shown are for plants located on the rake only (excludes visual-only occurrences) and also includes only those plants identified to species (except for muskgrasses and stoneworts which are not typically identified to species during PI surveys, and are included in the analysis), so they may differ from values given in previous sections. Conservatism (C) values range from 1-10 and indicate a plant's sensitivity to anthropogenic disturbance. Higher species conservatism values indicate the presence of plants which are sensitive to environmental degradation, while lower C-values indicate plants that are not sensitive and can survive in lower quality systems. The mean C values in June and August were 5.9 and 6.2, respectively, indicating that the system is generally healthy from an aquatic plant perspective.

Overall littoral frequency of occurrence of plants in June was 54.8% and in August was 57.8%. As mentioned above, two of the species' frequencies are thought to be under-represented in the surveys. During the early-season survey in June, CLP was likely close to its peak biomass, and areas at the southern end of the flowage contained point-intercept locations which were unnavigable due to surface-matted CLP, mixed with some other species. This results in the littoral frequency of CLP to appear less than what it would have been had all of those areas been surveyed. It also decreases the overall littoral frequency of plants in the lake, and likely the overall average total rake fullness.

The other species believed to be under-represented in the Trego Lake survey is wild rice. During the June survey, most of the wild rice was in its early, floating-leaf stage and was able to be floated through in a canoe, making more points able to be sampled. When the later-season survey was completed, the wild rice had grown into its emergent stage and could no longer be navigated, thereby making many of these points unable to be surveyed. This resulted in the underreporting of the littoral frequency of wild rice as well as contributing to a lower overall frequency of plants in the lake. However, all occurrences of wild rice were mapped in the field and are accounted for in Figure 8.

The Trego Project area demonstrated a variety of habitat types. The upstream portion of the Project reservoir was riverine with steady flow and a sandy bottom. Vegetation in this area was limited to the protected bays adjacent to the main river channel. Further downstream, the lake opens into a wider area at the confluence of Little Mackay Creek and the Namekagon River. At this location, the water is shallow and many aquatic and emergent plants are well established. Moving downstream toward the dam, the lower (northern) portion of the lake narrows and becomes deeper. While the southern end of Trego Lake is primarily shallow with high plant biomass, several portions farther north are more riverine, having a steep underwater slope with depths exceeding what is necessary for plant growth, except near shore (Figure 24).

Substrate type also directly affects the species type and abundance of plants that can be supported in a waterbody. The majority of substrate samples collected in August (68.4%), at points having depths of less than 15 feet, were classified as organic, which is the most conducive substrate for aquatic plant growth. The remaining locations consisted of 24.6% sand, 4.3% gravel, and 1.7% cobble, 0.7% boulder, and 0.3% silt (Figure 25).

Woody debris was mapped within Trego Flowage during the June point-intercept survey. Forty-four (16.2%) of the sampling points contained woody debris. Larger coarse woody habitat (CWH; over 4 inches in diameter and 5 feet in length) observed in the water was mapped during the August point-intercept survey (Figure 26). One hundred forty-eight pieces of CWH were located in near-shore and shallow areas of Trego Lake.

Table 7

Trego Lake Overall Submergent Plants Summary

Statistic	June 2022	July/Aug 2022
Littoral Frequency of Occurrence	54.8	57.8
Maximum Depth of Plants	10.3	11.0
Native Species Richness	20	22
Mean Conservatism (C)	5.9	6.2
FQI	26.4	29.2

4.4 Trego Terrestrial Upland Areas

Terrestrial invasive species surveys were conducted on August 1, 4, and 5, 2022, along the shoreline and upland areas included within the study area. Land use along the shoreline was mixed, with light to moderate residential development among an otherwise wooded terrain. Roadways, emergent wetlands, and scrub/shrub areas were also observed but were minor components of the overall shoreline. The shoreline was inspected by boat or on-foot where navigability was restricted. Terrestrial invasive meander surveys were also conducted near the dam and at 2 boat landings.

4.4.1 Upland Survey – Shoreline

The upland survey was separated into 5 segments based on survey logistics rather than on land use or vegetative communities because the shoreline was a fairly consistent mix of residential properties and forested areas (Figure 12A, Attachment I). All 5 segments are classified as a mix of “Developed – Residential” and “Northern Mesic Forest”. Emergent wetlands, scrub-shrub communities, and roadways were occasionally encountered but were sparsely represented along the shoreline (Table 8).

Table 8

Trego Terrestrial Shoreline Community Types Summary

Terrestrial Shoreline Community	Mileage of Meander	Percentage of Meander
Northern Mesic Forest / Developed - Residential	17.81	100
Total	17.81	100

The following list summarizes the most commonly encountered herbaceous and woody vegetation species observed within each terrestrial shoreline community:

Developed - Residential

Manicured turf grasses, horticultural plants, occasional trees

Northern Mesic Forest

Overstory: Eastern white pine (*Pinus strobus*), red maple (*acer rubrum*), white cedar (*Thuja occidentalis*) paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), red pine (*Pinus resinosa*), white oak (*Quercus alba*)

Understory: fern species (polypodiophytes), common milkweed (*Asclepias syriaca*)

Invasive species comprised approximately 2 miles of shoreline during the terrestrial survey and included spotted knapweed (*Centaurea stoebe*), purple loosestrife (*Lythrum salicaria*), yellow iris (*Iris pseudacorus*), Japanese knotweed (*Fallopia japonica*), aquatic forget-me-not (*Myosotis scorpioides*), and suspected narrow-leaf hybrid cattail (*Typha angustifolia x T. latifolia*; Table 9). Narrow-leaf cattail was the most predominant species, followed by purple loosestrife, which was restricted to a heavily infested pond area north of River Road in Segment 4. Spotted knapweed was also fairly common in drier areas, while yellow iris was intermittent along the water's edge. Aquatic forget-me-not was relatively rare. One isolated, dense population of Japanese knotweed was observed and that occurred in Segment 2.

Table 9

Trego Shoreline and Terrestrial Invasive Species Summary

Species	Common Name	Mileage of Meander	Percentage of Meander
Centaurea stoebe	Spotted knapweed	0.18	1.01%
Lythrum salicaria	Purple loosestrife	0.86	4.83%
Typha spp.	Non-native cattail spp.	0.92	5.17%
Iris pseudacorus	Yellow iris	0.04	0.22%
Fallopia japonica	Japanese knotweed	0.01	0.06%
Myosotis scorpioides	Aquatic forget-me-not	0.002	0.01%

4.4.2 Upland Survey - Meander of Terrestrial Areas

Meander surveys were conducted in four locations Two of the areas owned by the Licensee were included in the upland terrestrial meander survey (Sheet 1 of Figure 12B):

1. **Town of Trego Boat Landing**: This boat landing, not owned by the Licensee, is primarily comprised of a paved road with sand and gravel parking spaces bordered by trees. Little to no vegetation was present within this area. Invasive plant species observed within this area included:
    a. Spotted knapweed
2. **Trego Town Park Boat Landing**: This boat landing, not owned by the Licensee, is comprised of a gravel parking area bordered by trees. Invasive plant species observed within this area included:
    a. Eurasian honeysuckle

3. **North Side of Dam**: This portion of the survey, owned by the Licensee, was characterized by a large, forested area, road-ROW, a gravel parking area, a large, mowed area adjacent to the dam, and areas of natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Eurasian honeysuckle
    b. Common buckthorn
    c. Spotted knapweed
4. **South Side of Dam:** This portion of the survey, owned by the Licensee, is characterized by a steep forested area near the river, road-ROW, a gravel parking area, a mowed area adjacent to the dam and powerhouse, and areas of natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Eurasian honeysuckle
    b. Spotted knapweed

4.4.3 Upland Survey - Overall Observations

Overall, invasive species populations were light to moderate throughout the Project, with the exceptions of narrow-leaf cattail, which was occasionally observed in high densities, and purple loosestrife, which has heavily infested the pond area north of River Road. Yellow iris was identified along the water's edge quite frequently, but typically not in high densities. Only one population of Japanese knotweed was observed and that was at a private residence. Likewise, aquatic forget-me-not was only identified in one location.

4.5 Water Samples

The samples for zebra mussel veligers and water fleas collected from Hayward and Trego lakes were dropped off for analysis at the Wisconsin State Lab of Hygiene on August 11, 2022. All results were reported as "absent" of zebra mussel veligers and water fleas. The results from the lab can be found in Attachments J and K.

4.6 Sediment Samples

Boat launches are an ideal location to sample for aquatic invasive species because of the high traffic associated with boat anglers, recreational watercraft and shoreline fishing. Public access locations can be a conduit for the introduction of aquatic invasive species through the emptying of bait buckets, boat bilges, live wells, or hulls which may be holding water from other infested waterbodies.

At Hayward Lake, sediment samples were collected from the public boat launch off of South Second Street (Figure 1). Chinese mystery snails were previously verified in Hayward Lake. While no additional invasive invertebrates were observed in the sediment samples collected, Japanese mystery snails were observed in some of the shallow sandy areas in the lake during surveys. While this was not a previously listed aquatic invasive species in Hayward Lake, it is not unexpected since they are present upstream in Smith Lake and downstream in Trego Lake.

At Trego Lake, sediment samples were collected from the public boat launches on Trego Landing Road, and Cash Road (Figure 2). Chinese mystery snails and Japanese mystery snails were previously known in the system (both verified in 2007), and were also observed during the 2022 surveys, along with native snails. No additional invasive invertebrates were found.

5.0 Conclusion

Lake Hayward and Trego Lake are quite different from one another. Lake Hayward is more developed and has a higher incidence of invasive species, which is expected as these two factors typically coincide with one another. Trego Lake is less developed and has a lower incidence of shoreline invasive species. It is also more riverine than Lake Hayward. Undeveloped watersheds and waterbodies have historically been correlated with higher quality systems (Sass et al. 2010).

During the 2022 surveys, Trego Lake was found to have higher frequencies of curly-leaf pondweed than Lake Hayward. With Trego Lake being a high-quality system and considering its protected status, its higher incidence of invasive species was unexpected. This is likely due in part to the level of use it gets from recreationists, who unknowingly assist in the spread of invasive species. However, areas of Trego Flowage also support large, dense populations of wild rice, whereas none was found in Lake Hayward. The dense beds of wild rice are located within the same general area of Trego Lake as where the surface-matted CLP grows.

6.0 References

Daubenmire, Rexford. 1959. A Canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

Epstein, E.J., Judziewicz, E.J., Spence, E. 2007. Madison: Wisconsin Department of Natural Resources, Natural Heritage Inventory Program. *Wisconsin Natural Heritage Inventory (NHI) Recognized Natural Communities – Working Document.* (Updated online 2022 at https://dnr.wi.gov/topic/endangeredresources/communities.asp)

Sass, L.S., M.A. Bozek, J.A. Hauxwell, K. Wagner, S. Knight. 2010. Response of aquatic macrophytes to human land use perturbations in the watersheds of Wisconsin lakes, USA. Aquatic Botany 93 (1), 1-8

Wisconsin Department of Natural Resources. 2020. *Veliger Sampling Protocol; Standard Operating Procedures.* 16 pp.

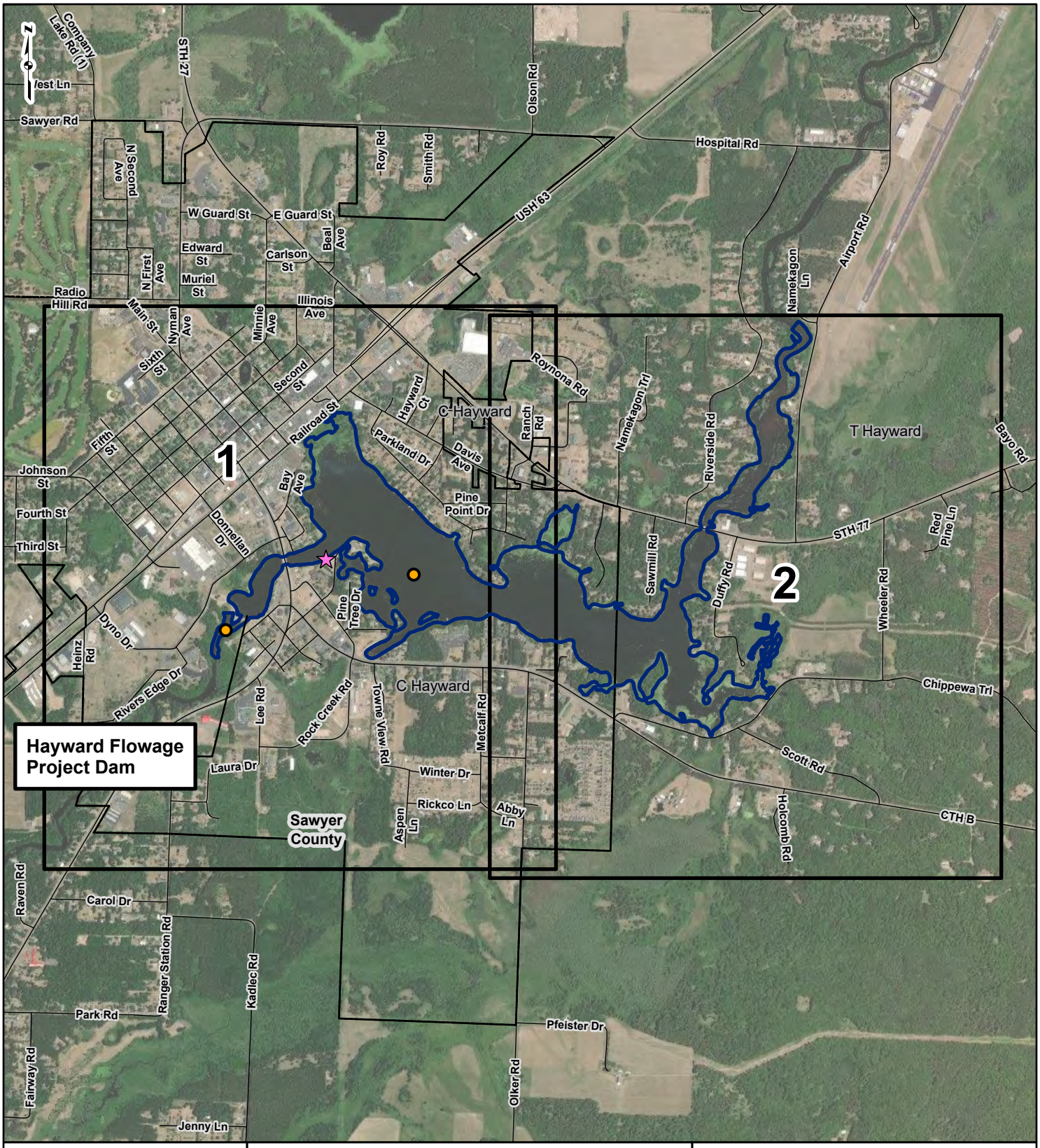
Wisconsin Department of Natural Resources. 2021. *Waterflea Sampling Protocol; Standard Operating Procedures.* 20 pp.

Wisconsin Department of Natural Resources. 2019. *Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis,* and applications. PUB-SS-1068.

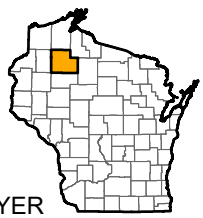
Wisconsin Department of Natural Resources. 2016. *Aquatic Invasive Rapid Response Species List*. PUB-SS-1162.

Wisconsin Department of Natural Resources. 2009. Curly-leaf Pondweed: A Technical Review of Distribution, Ecology, Impacts, and Management. PUB-SS-1052.

FIGURE 1
Hayward Project Location and Overview Map



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Water Tow Location
- Sediment Sample Location
- Project Boundary
- Map Index
- Road Centerline
- Community Boundary
- County Boundary

0 1,000 2,000 4,000 Feet

Figure 1
Hayward Project Location and Overview Map

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

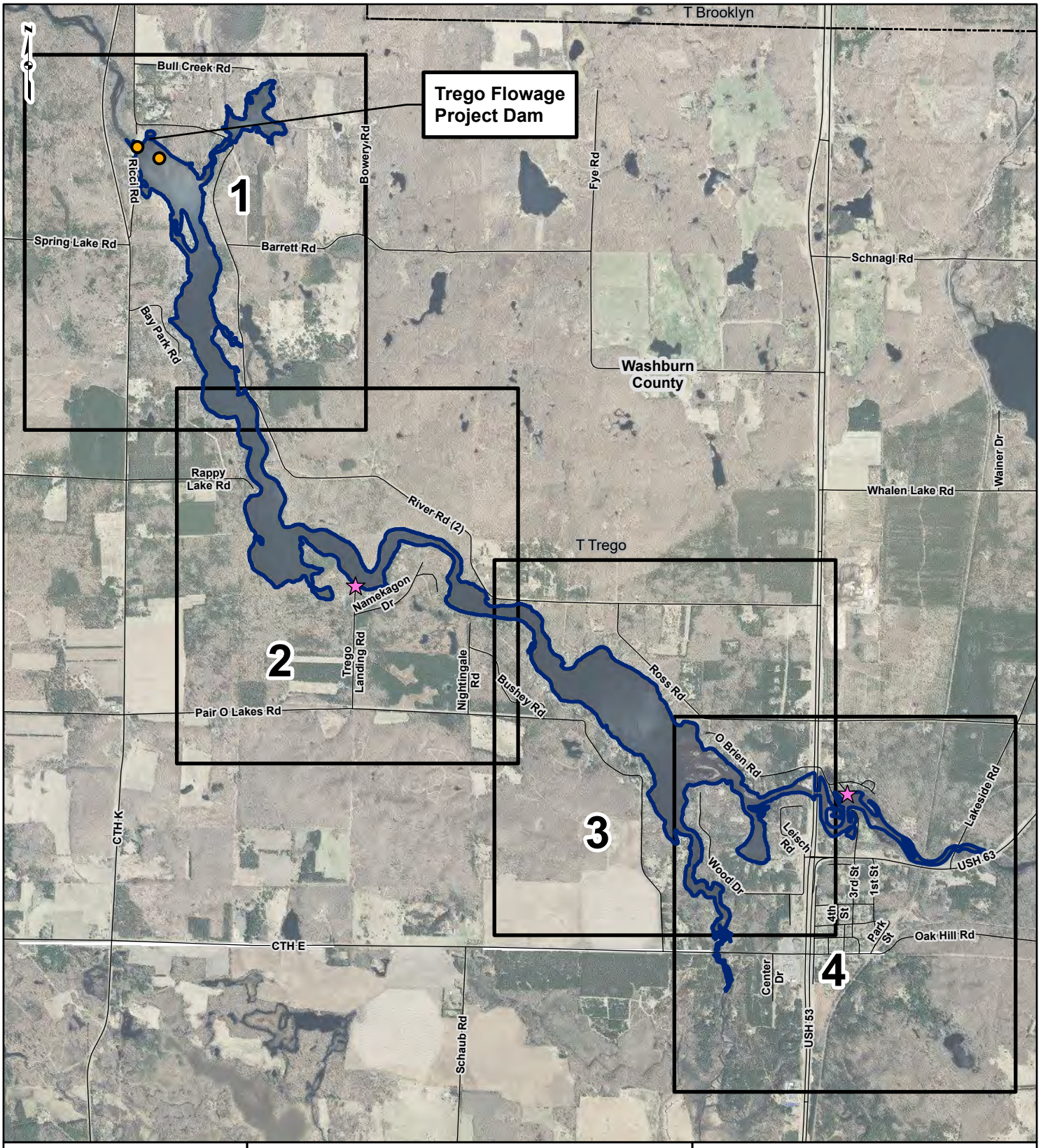
Mead & Hunt

DRAWN BY: EMW
CHECKED: TDB
DATE: 10/31/2022
APPROVED: LLS

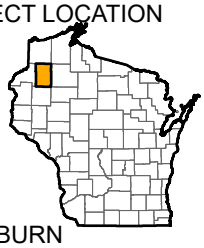
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 2
Trego Project Location and Overview Map



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Water Tow Location
- Sediment Sample Location
- Project Boundary
- Map Index
- Road Centerline
- Community Boundary
- County Boundary

0 1,500 3,000 6,000 Feet

Figure 2
Trego Project Location and Overview Map

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW
CHECKED: TDB
DATE: 10/31/2022
APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx

FIGURE 3
Hayward Point-Intercept Grid Provided by the WDNR

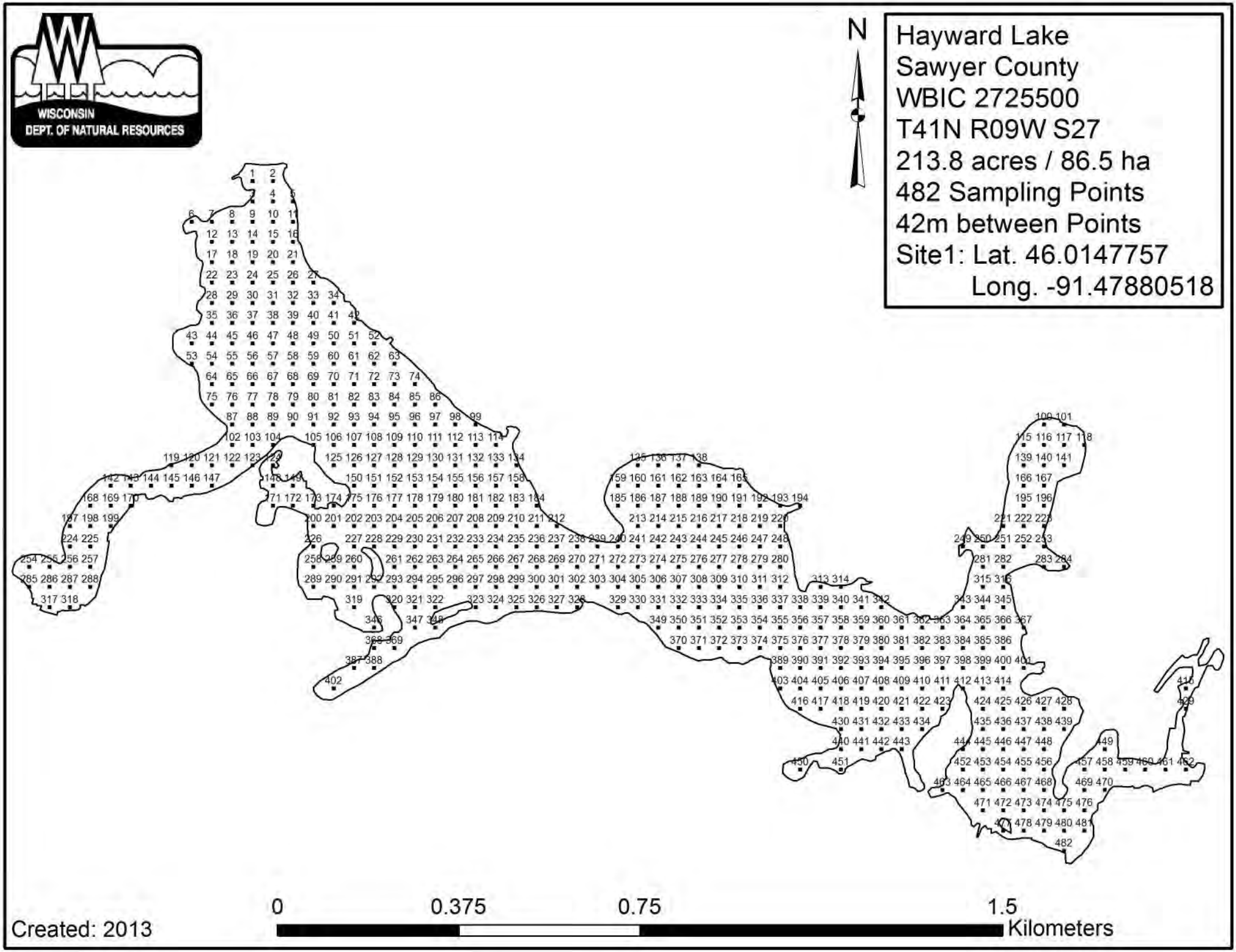
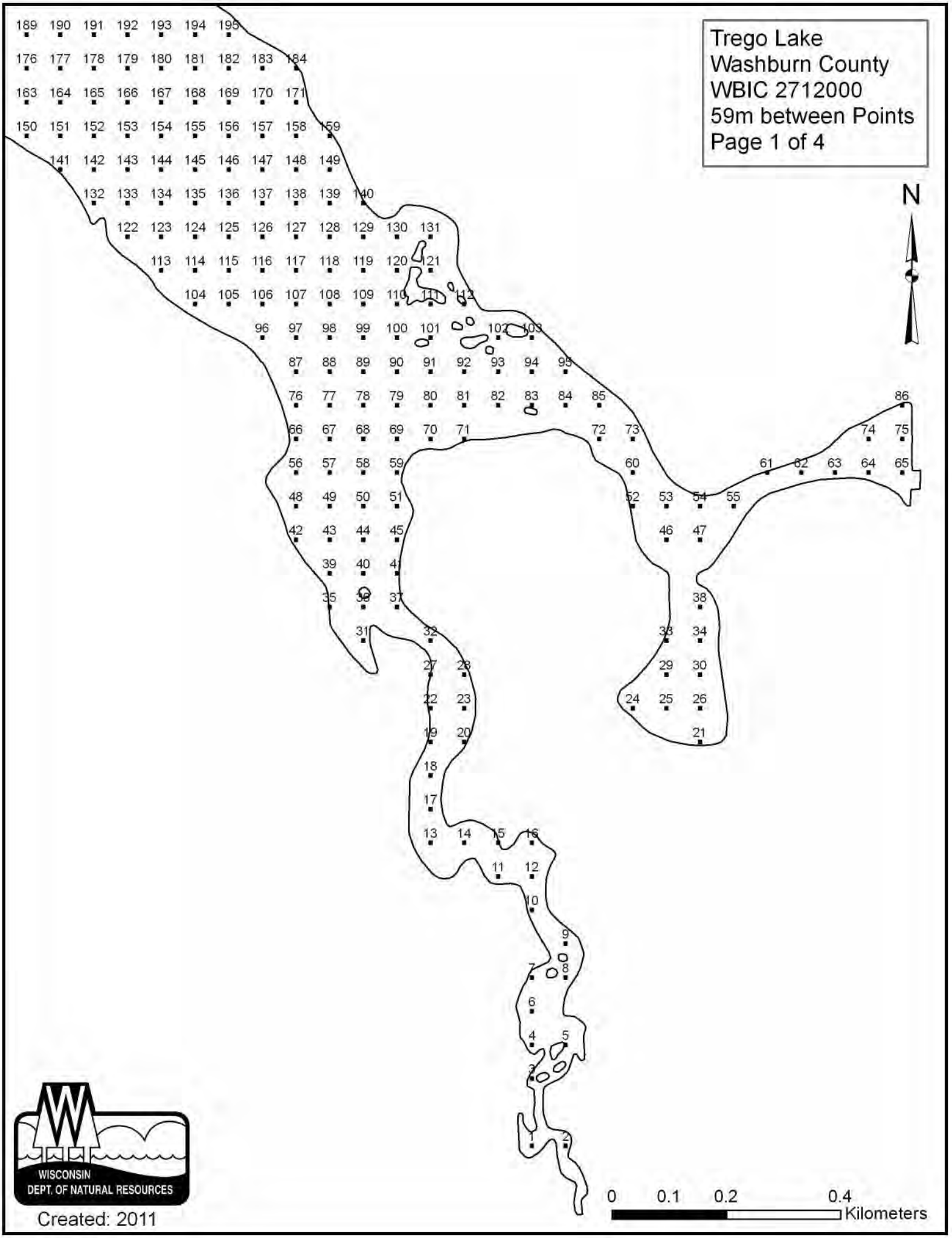
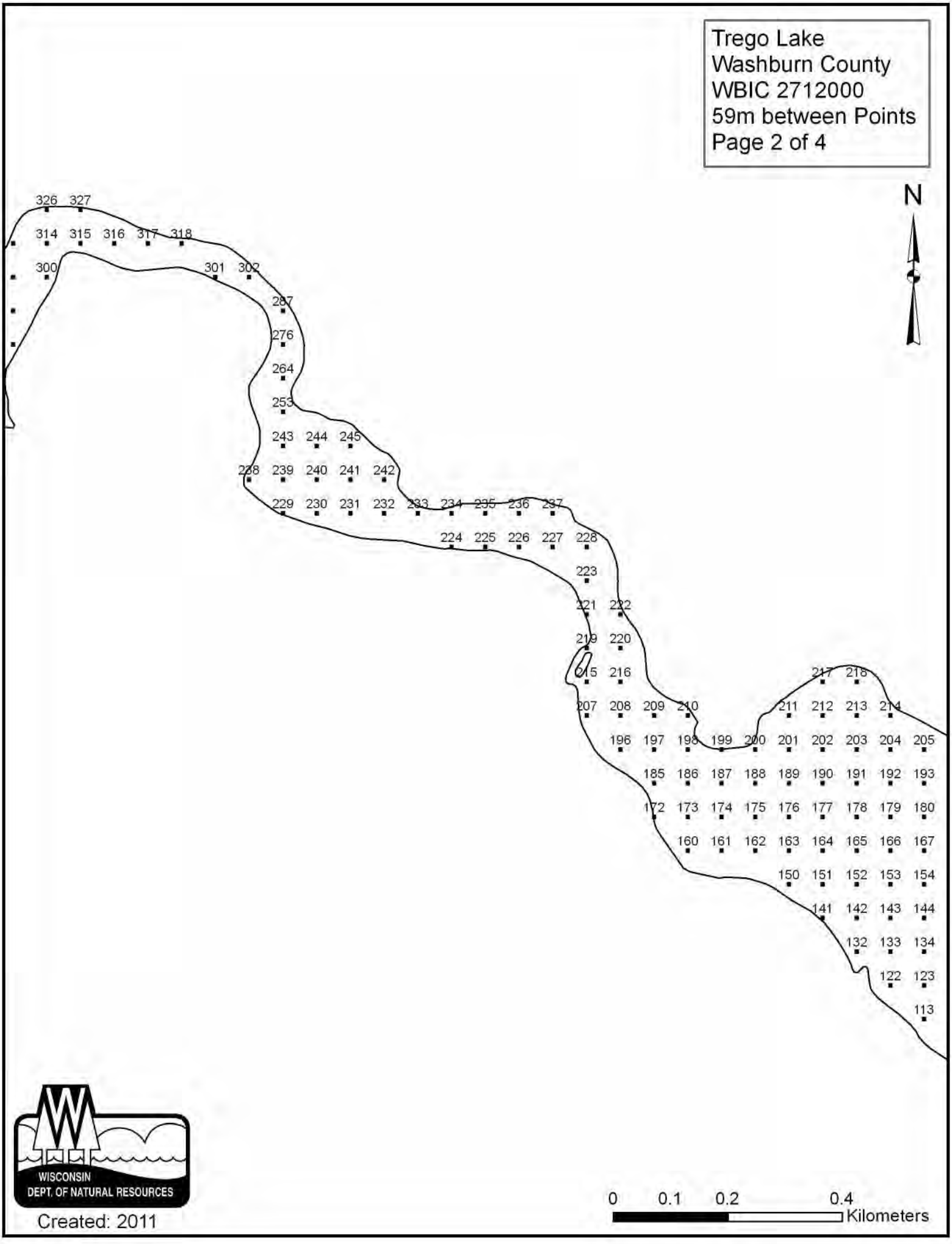

WISCONSIN
DEPT. OF NATURAL RESOURCES
N
Hayward Lake
Sawyer County
WBIC 2725500
T41N R09W S27
213.8 acres / 86.5 ha
482 Sampling Points
42m between Points
Site1: Lat. 46.0147757
Long. -91.47880518
0
0.375
0.75
1.5
Kilometers
Created: 2013

FIGURE 4
Trego Point-Intercept Grid Provided by the WDNR


Trego Lake
Washburn County
WBIC 2712000
59m between Points
Page 1 of 4
N
WISCONSIN
DEPT. OF NATURAL RESOURCES
Created: 2011
0 0.1 0.2 0.4
Kilometers


Trego Lake
Washburn County
WBIC 2712000
59m between Points
Page 2 of 4
N
326 327
314 315 316 317 318
300 301 302
287
276
264
253
243 244 245
238 239 240 241 242
229 230 231 232 233 234 235 236 237
224 225 226 227 228
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221 222
219 220
215 216 217 218
207 208 209 210 211 212 213 214
196 197 198 199 200 201 202 203 204 205
185 186 187 188 189 190 191 192 193
172 173 174 175 176 177 178 179 180
160 161 162 163 164 165 166 167
150 151 152 153 154
141 142 143 144
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122 123
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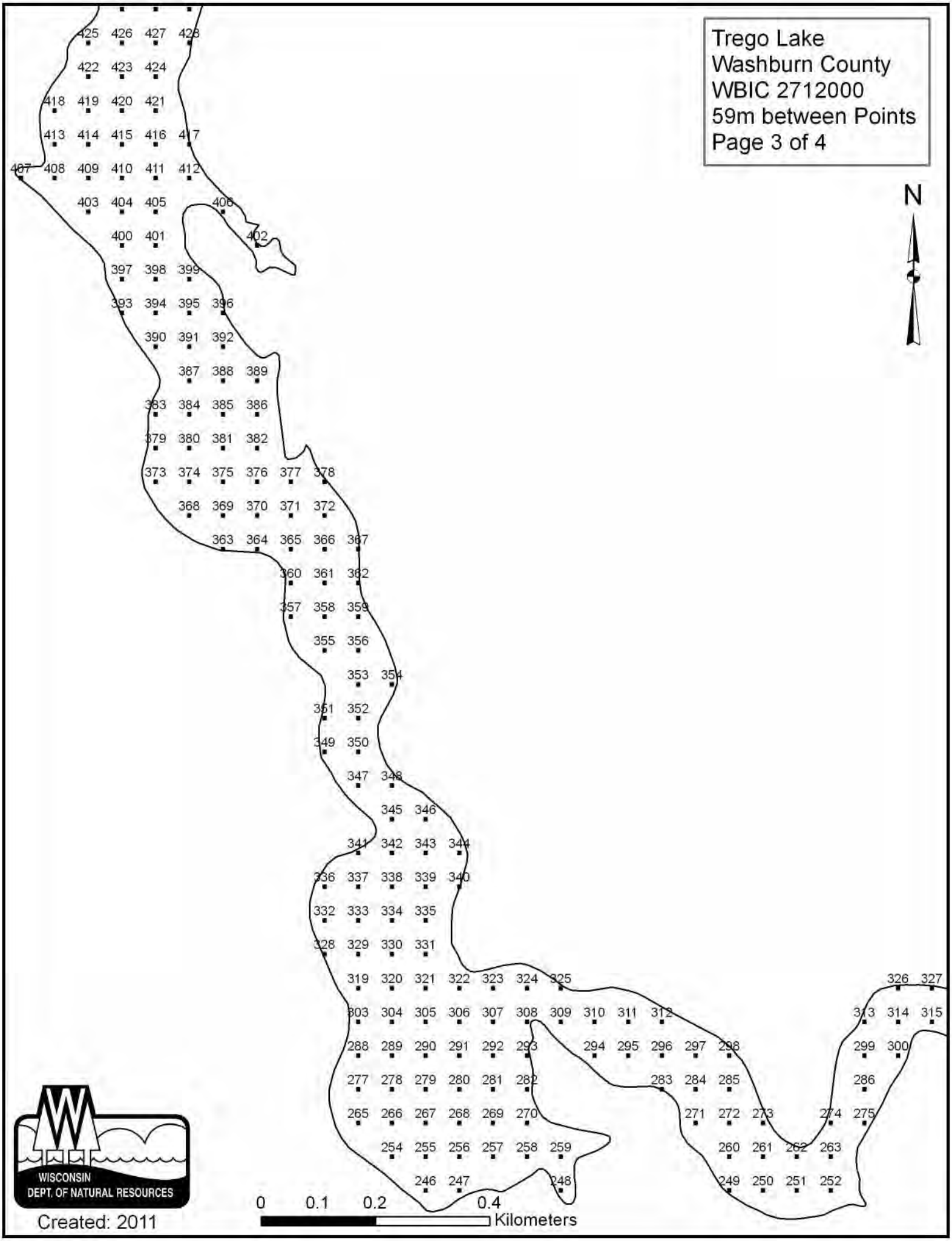
WISCONSIN
DEPT. OF NATURAL RESOURCES
Created: 2011
0 0.1 0.2 0.4
Kilometers


Trego Lake
Washburn County
WBIC 2712000
59m between Points
Page 3 of 4
N
425 426 427 428
422 423 424
418 419 420 421
413 414 415 416 417
407 408 409 410 411 412
403 404 405 406
400 401 402
397 398 399
393 394 395 396
390 391 392
387 388 389
383 384 385 386
379 380 381 382
373 374 375 376 377 378
368 369 370 371 372
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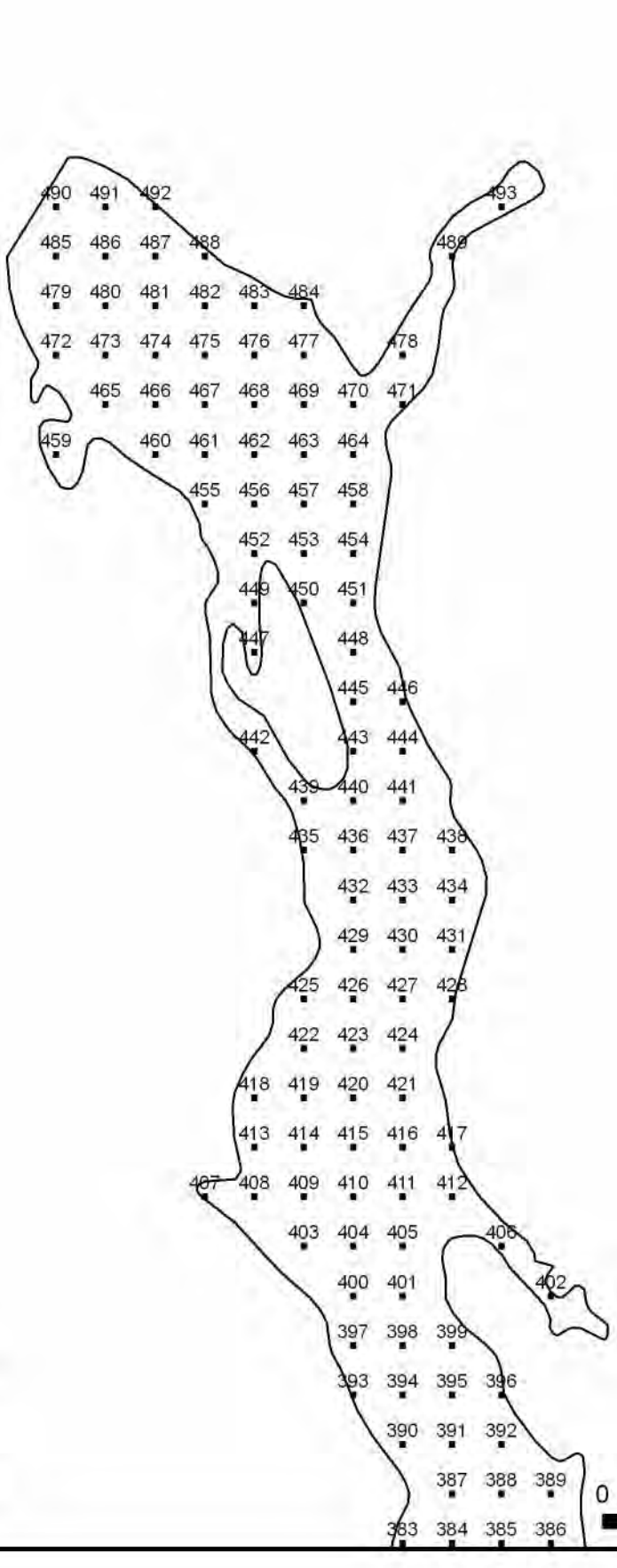
277 278 279 280 281 282
283 284 285
286
265 266 267 268 269 270
271 272 273
274 275
254 255 256 257 258 259
260 261 262 263
246 247 248
249 250 251 252
WISCONSIN
DEPT. OF NATURAL RESOURCES
Created: 2011
0 0.1 0.2 0.4
Kilometers

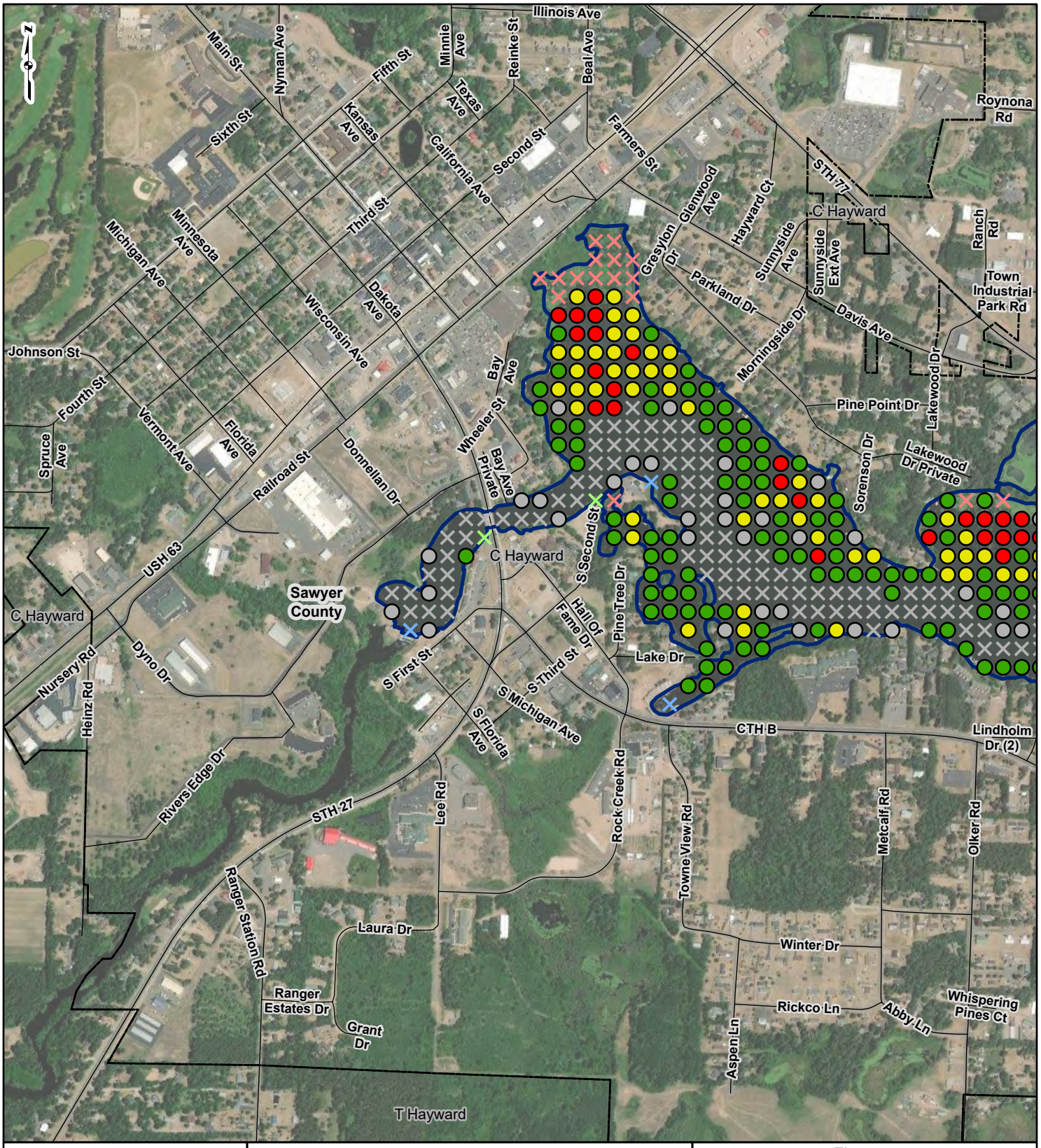
Trego Lake
Washburn County
WBIC 2712000
59m between Points
Page 4 of 4



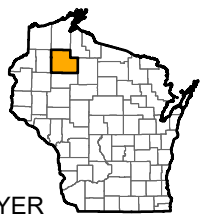
WISCONSIN
DEPT. OF NATURAL RESOURCES

Created: 2011

FIGURE 5
Hayward June Point-Intercept Survey



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 5
June Point
Intercept Survey
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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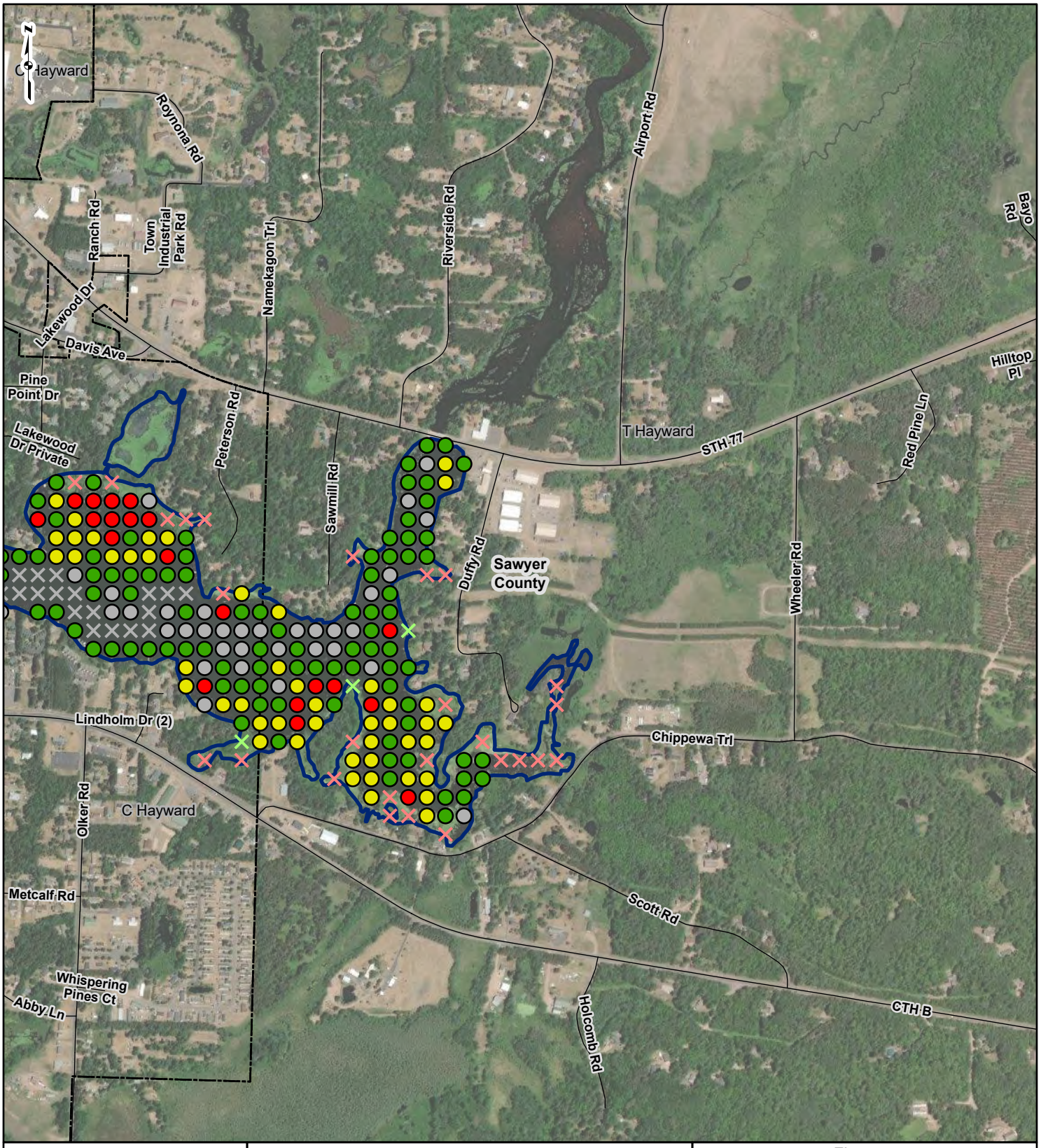
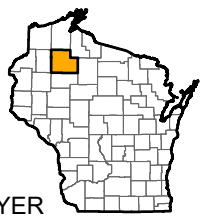


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 5
June Point
Intercept Survey
Sheet 2 OF 2

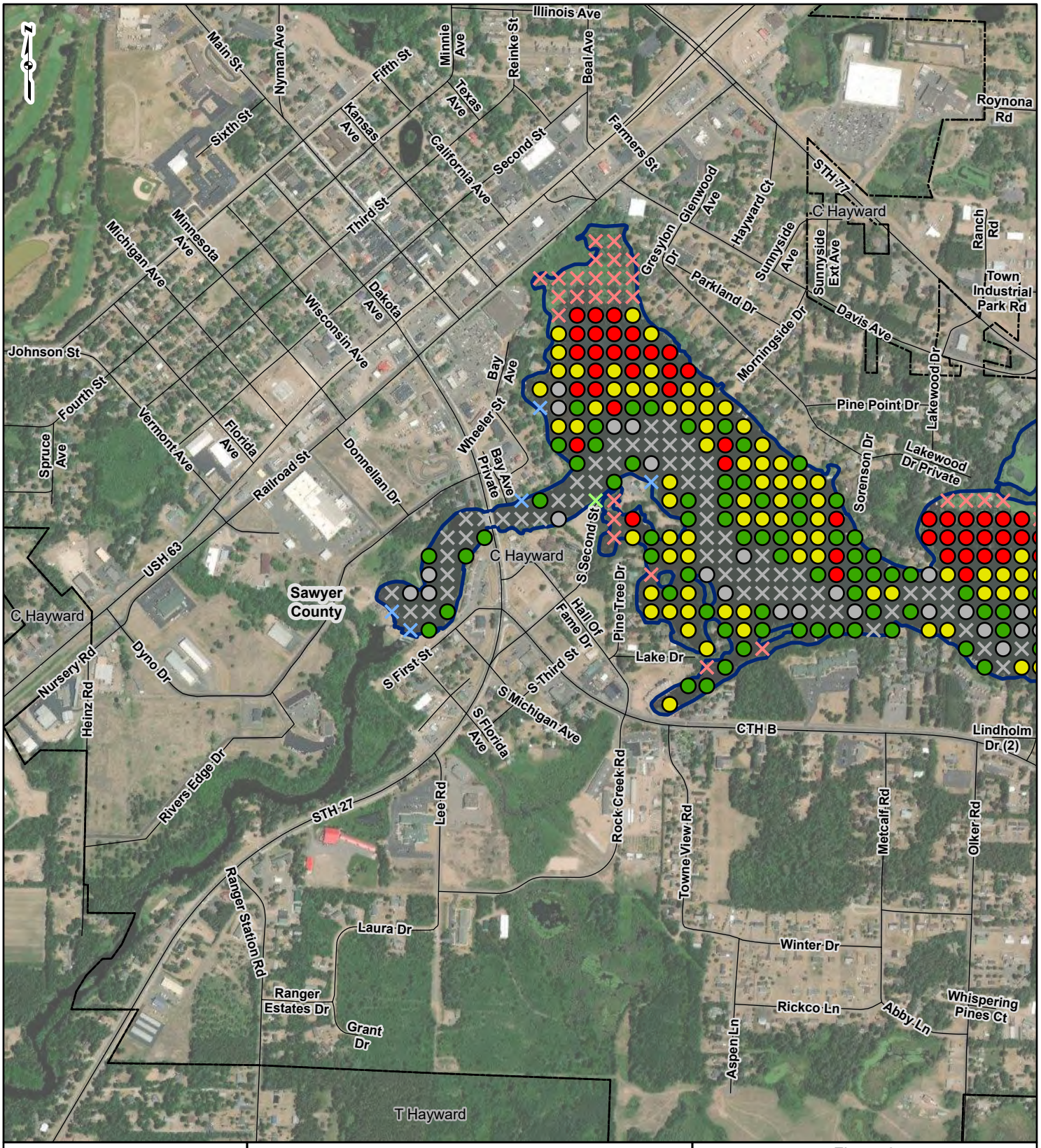
Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

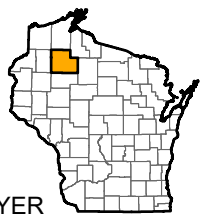
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 6
Hayward August Point-Intercept Survey



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Rake Fullness
0
1
2
3

Point-Intercept Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 6
August Point Intercept Survey
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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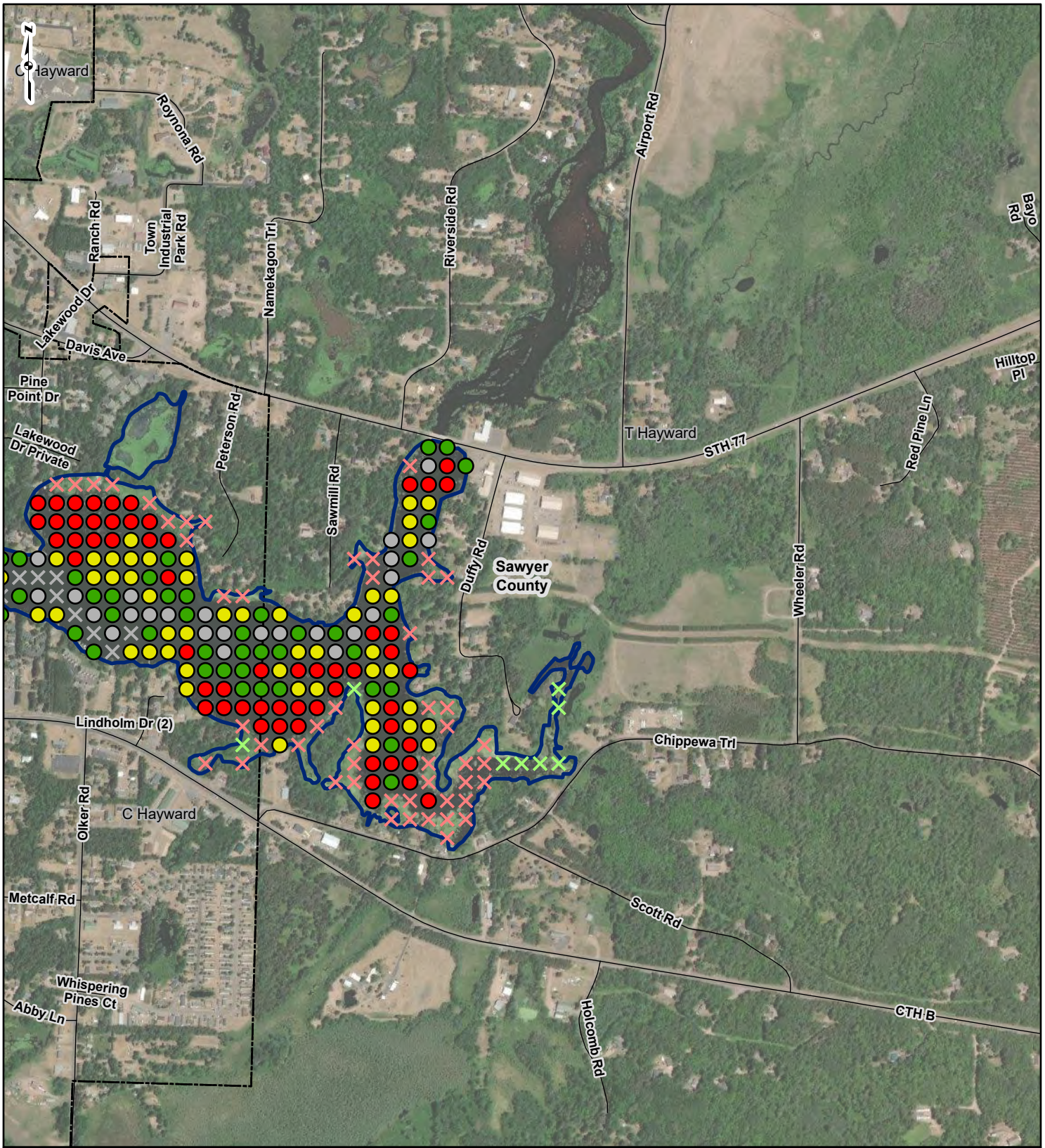
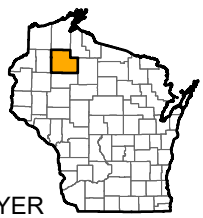


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 6
August Point Intercept Survey
Sheet 2 OF 2

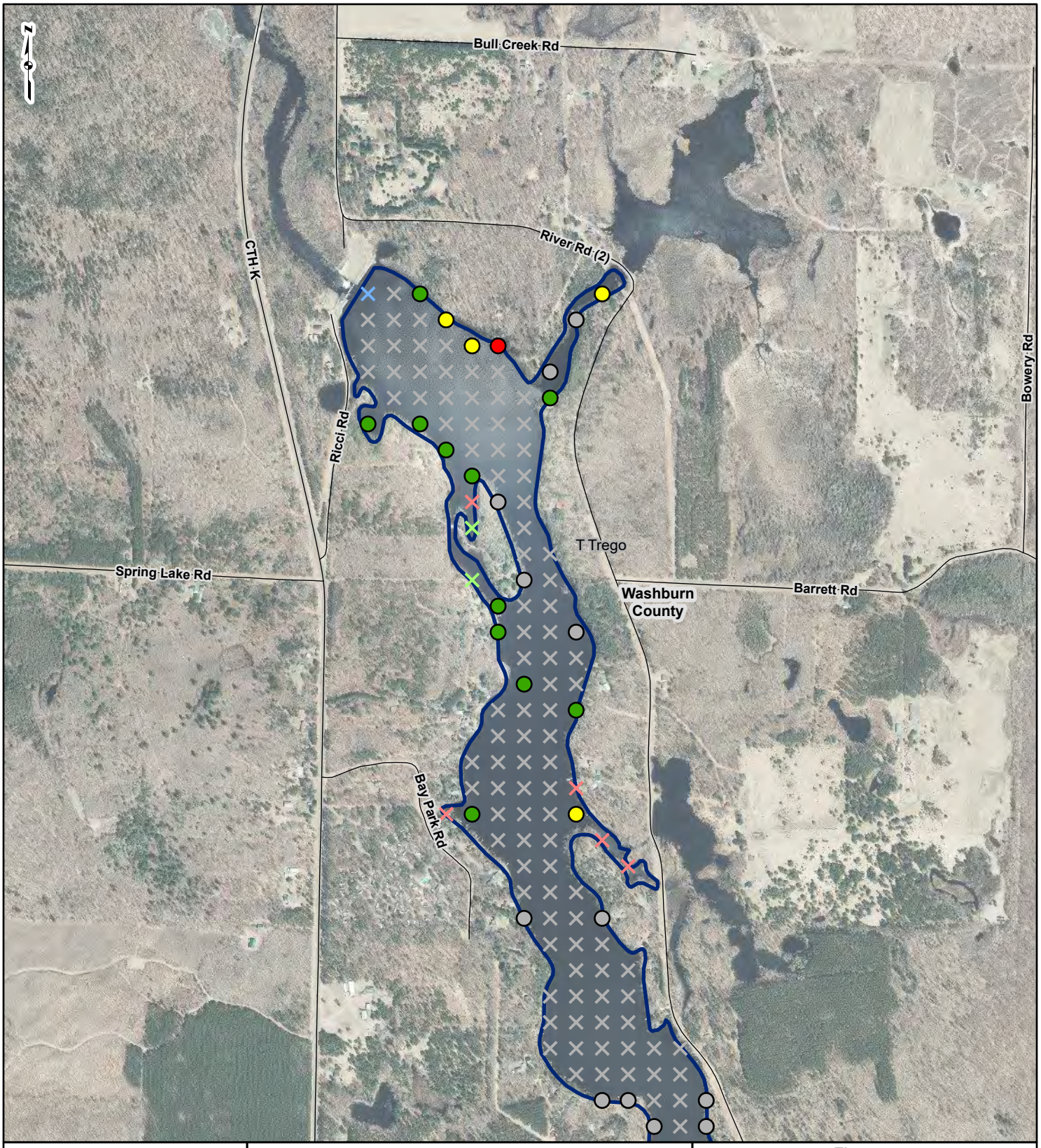
Hayward Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

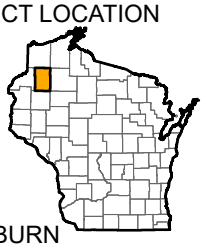
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 7
Trego June Point-Intercept Survey



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 7
June Point
Intercept Survey
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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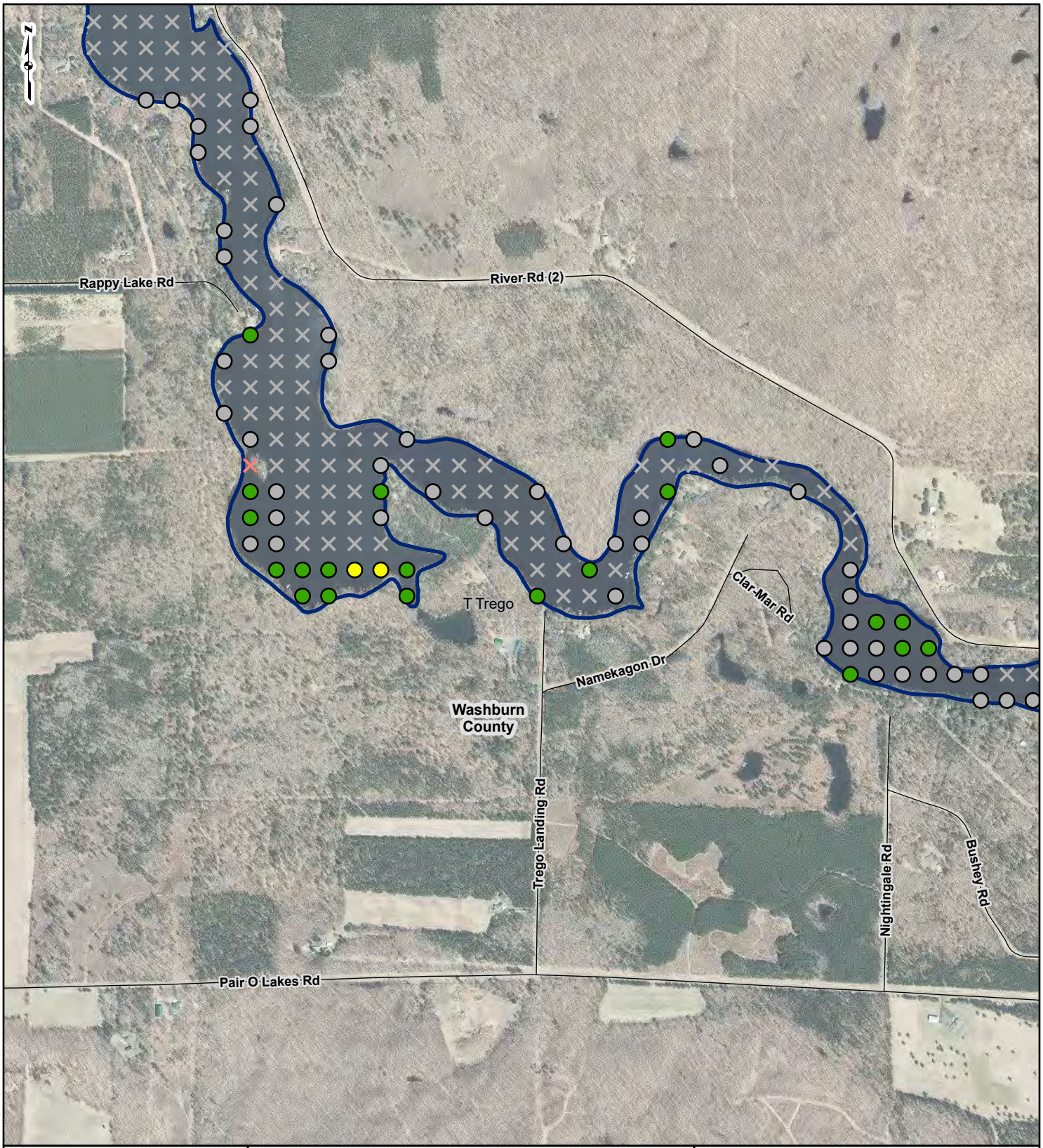
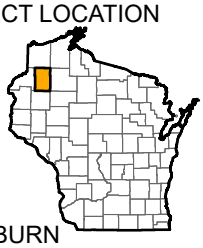


PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 7
June Point
Intercept Survey
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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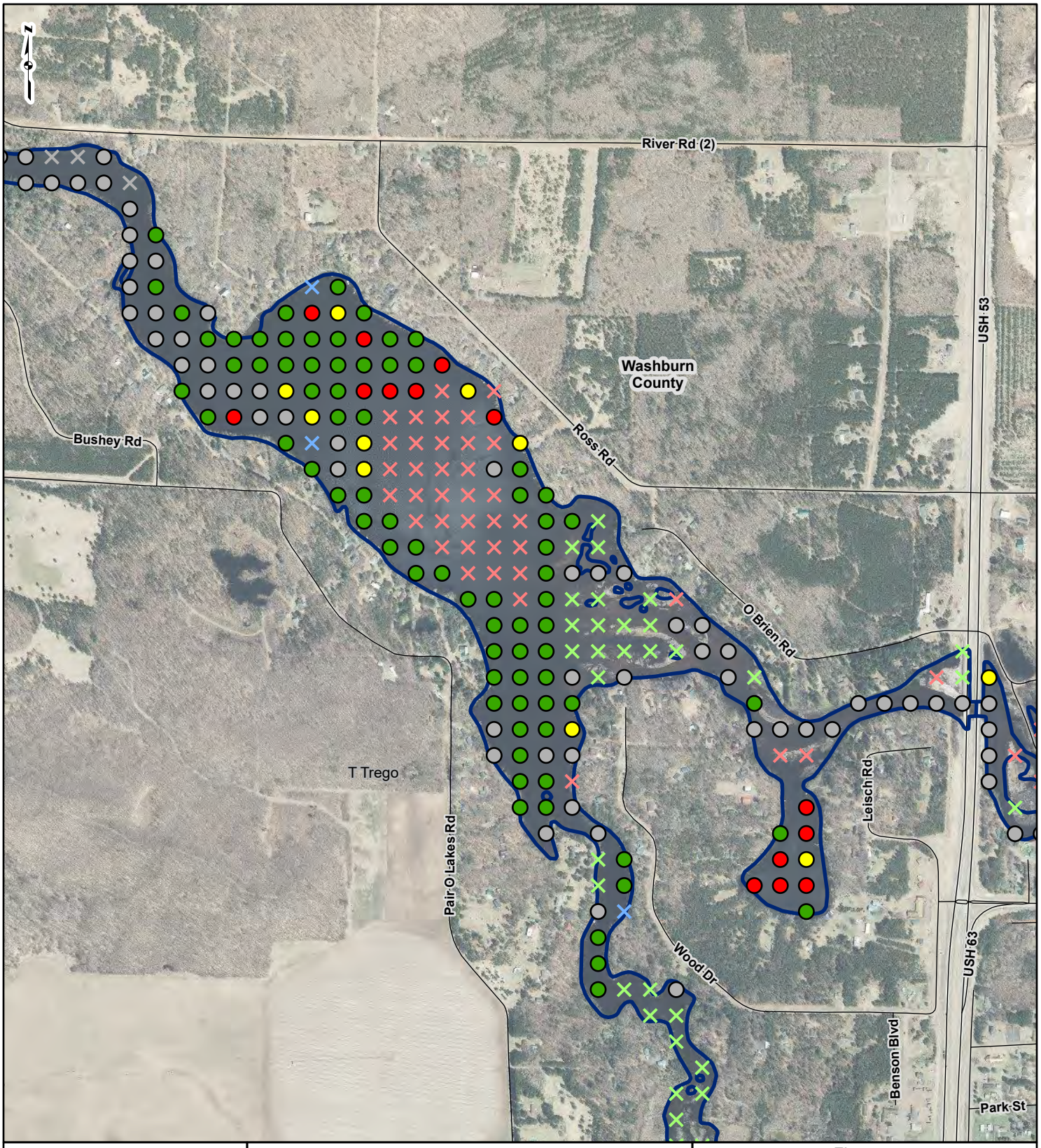
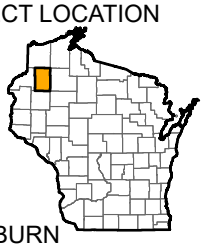


PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 7
June Point Intercept Survey
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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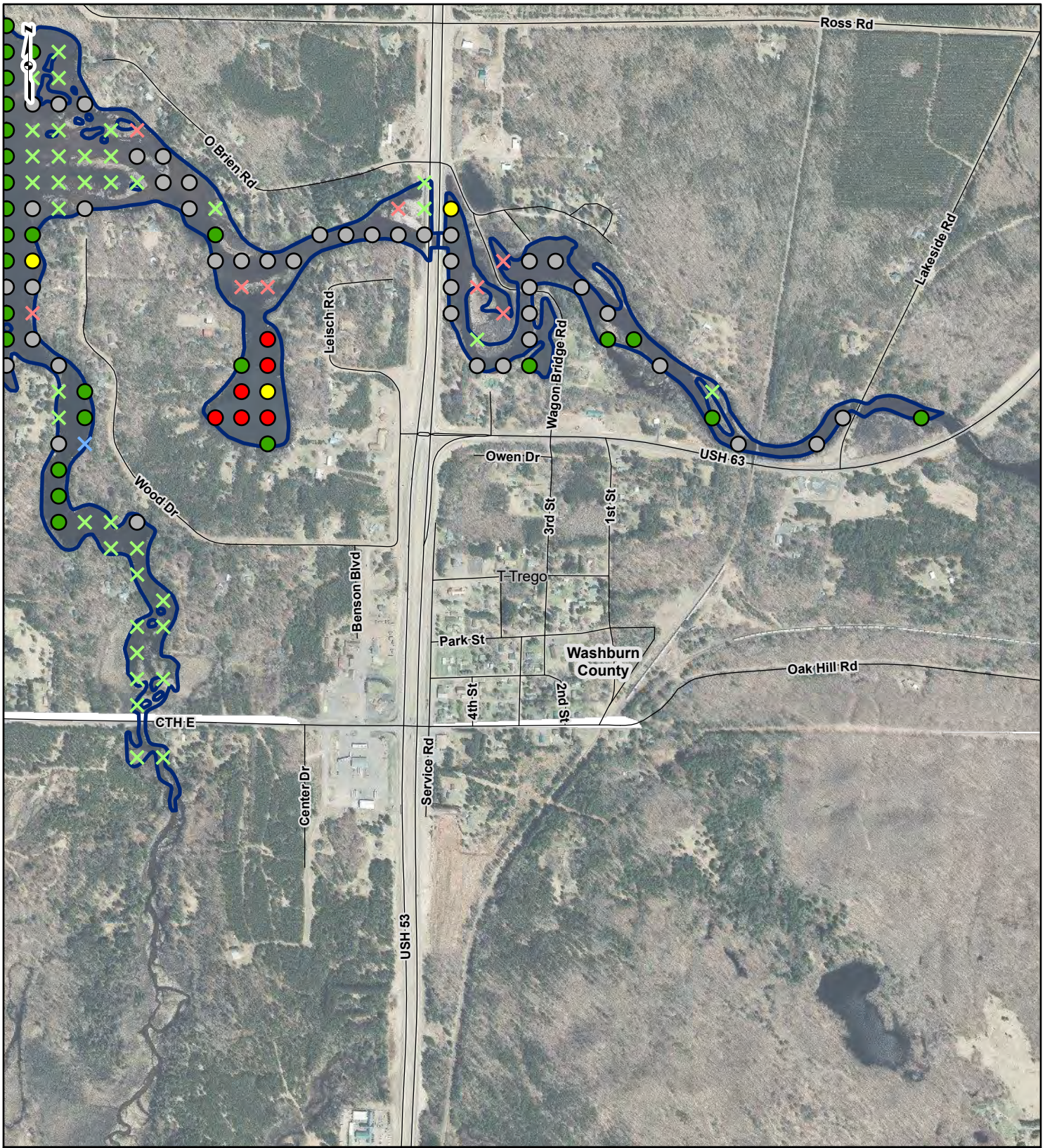

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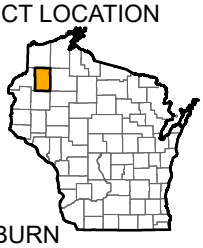


WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Rake Fullness

- 0
- 1
- 2
- 3

- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 7
June Point
Intercept Survey
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

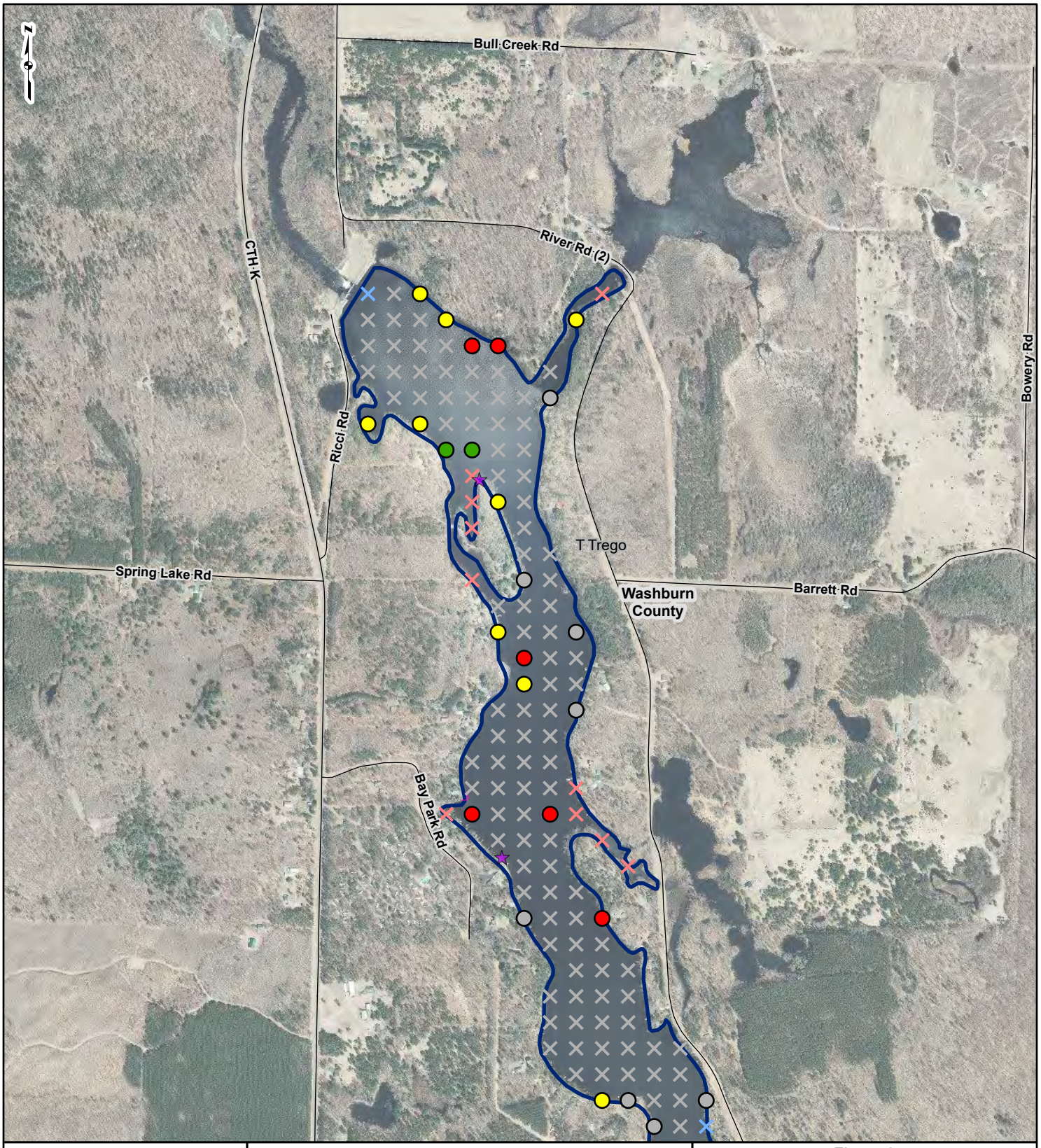
Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

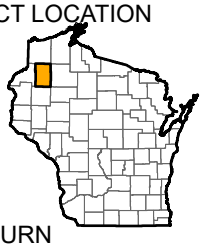
REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx

FIGURE 8
Trego July/Aug Point-Intercept Survey



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- Wild Rice Locations

Rake Fullness

- 0
- 1
- 2
- 3

- Wild Rice Area
- Point-Int. Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 8
July/August Point Intercept Survey
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Cer

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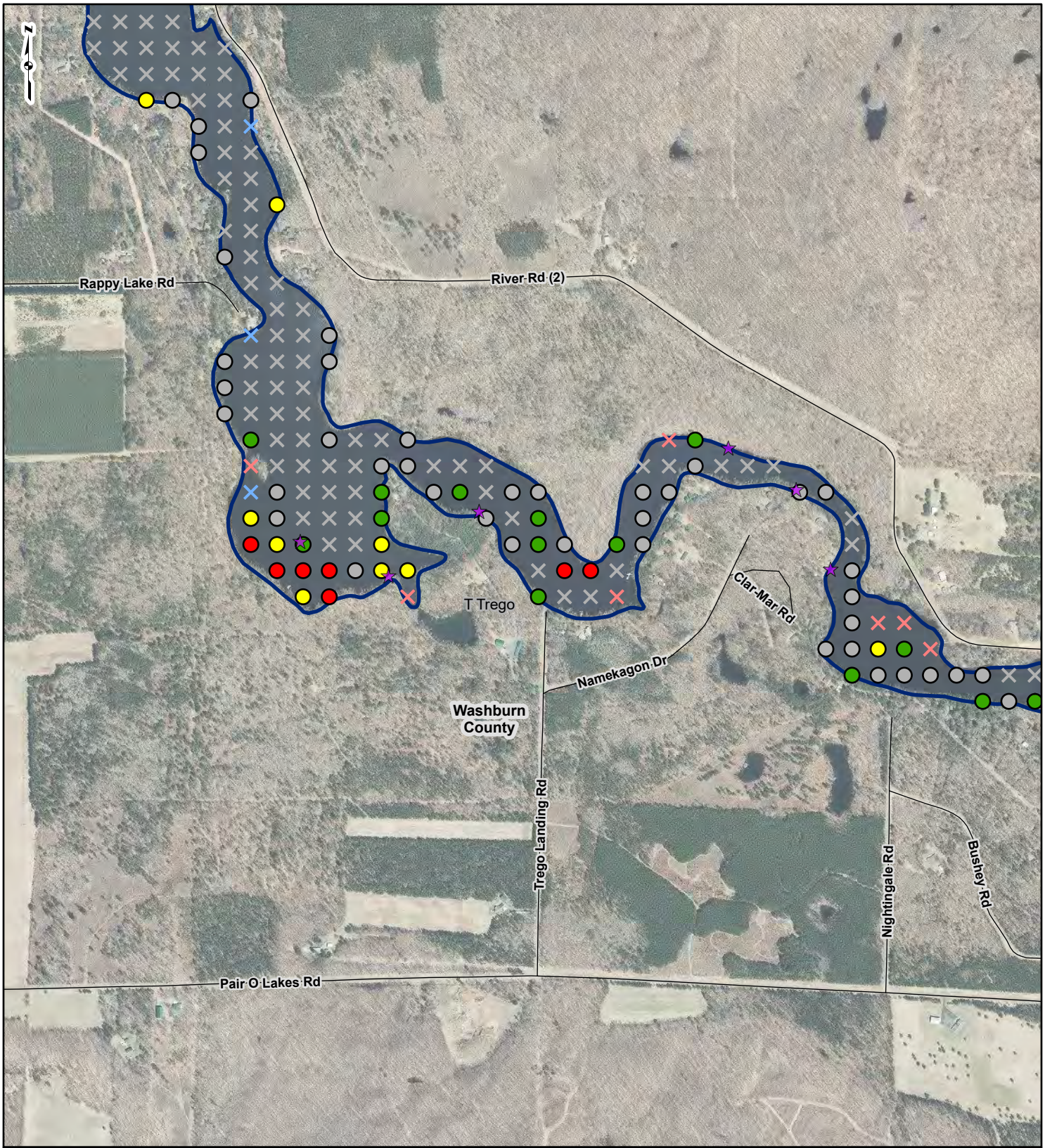
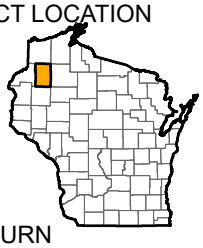


PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- Wild Rice Locations

Rake Fullness

- 0
- 1
- 2
- 3

- Wild Rice Area
- Point-Int. Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 8
July/August Point
Intercept Survey
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Cer

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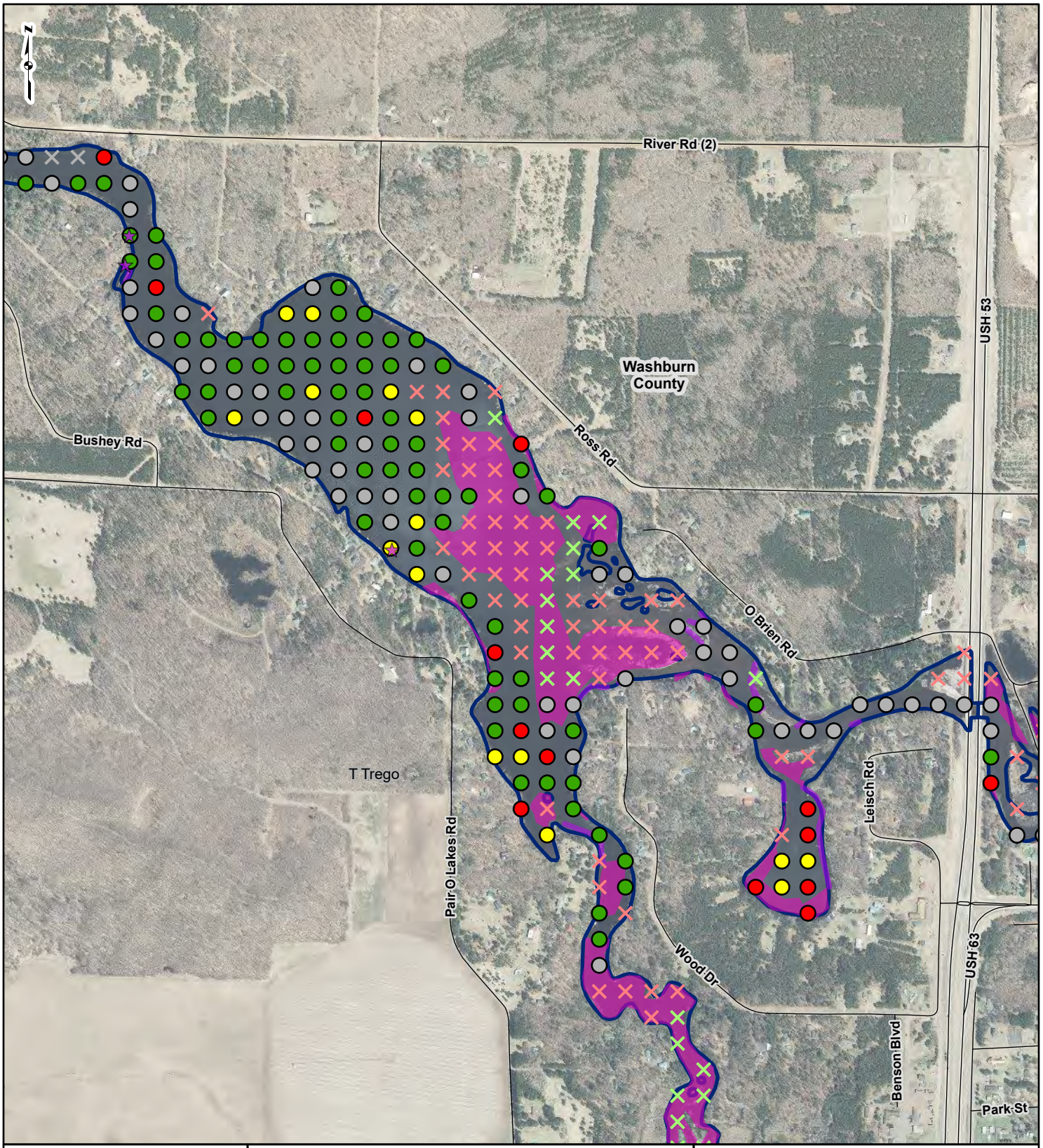
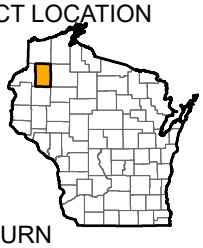


PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- Wild Rice Locations

Rake Fullness

- 0
- 1
- 2
- 3

- Wild Rice Area
- Point-Int. Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 8
July/August Point Intercept Survey
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
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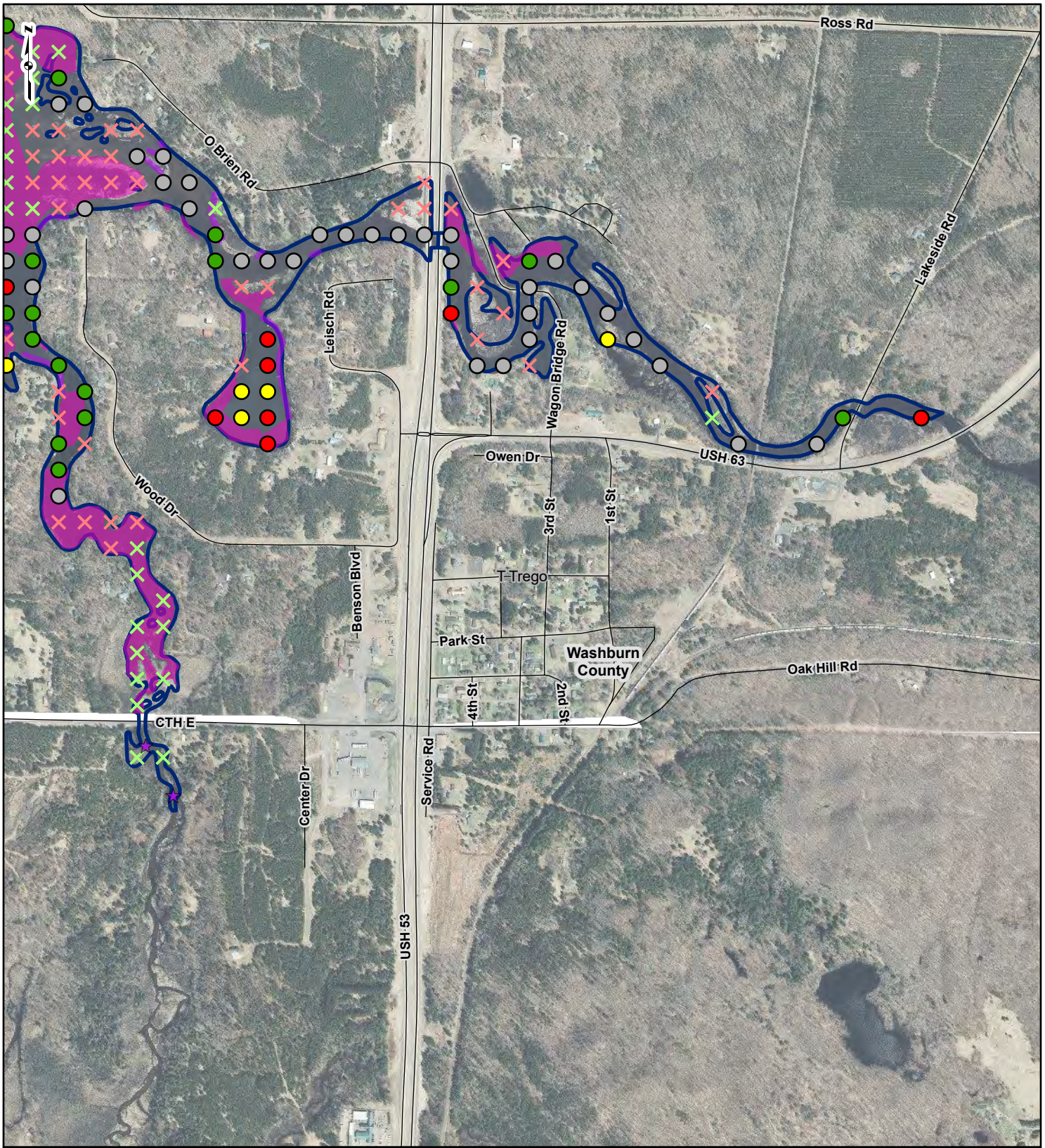

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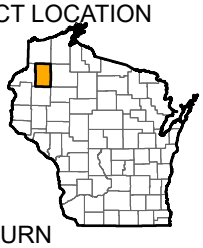

WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other
Wild Rice Locations

Rake Fullness
0
1
2
3

Wild Rice Area
Point-Int. Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 8
July/August Point Intercept Survey
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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FIGURE 9
Rake Fullness per WDNR Protocol

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

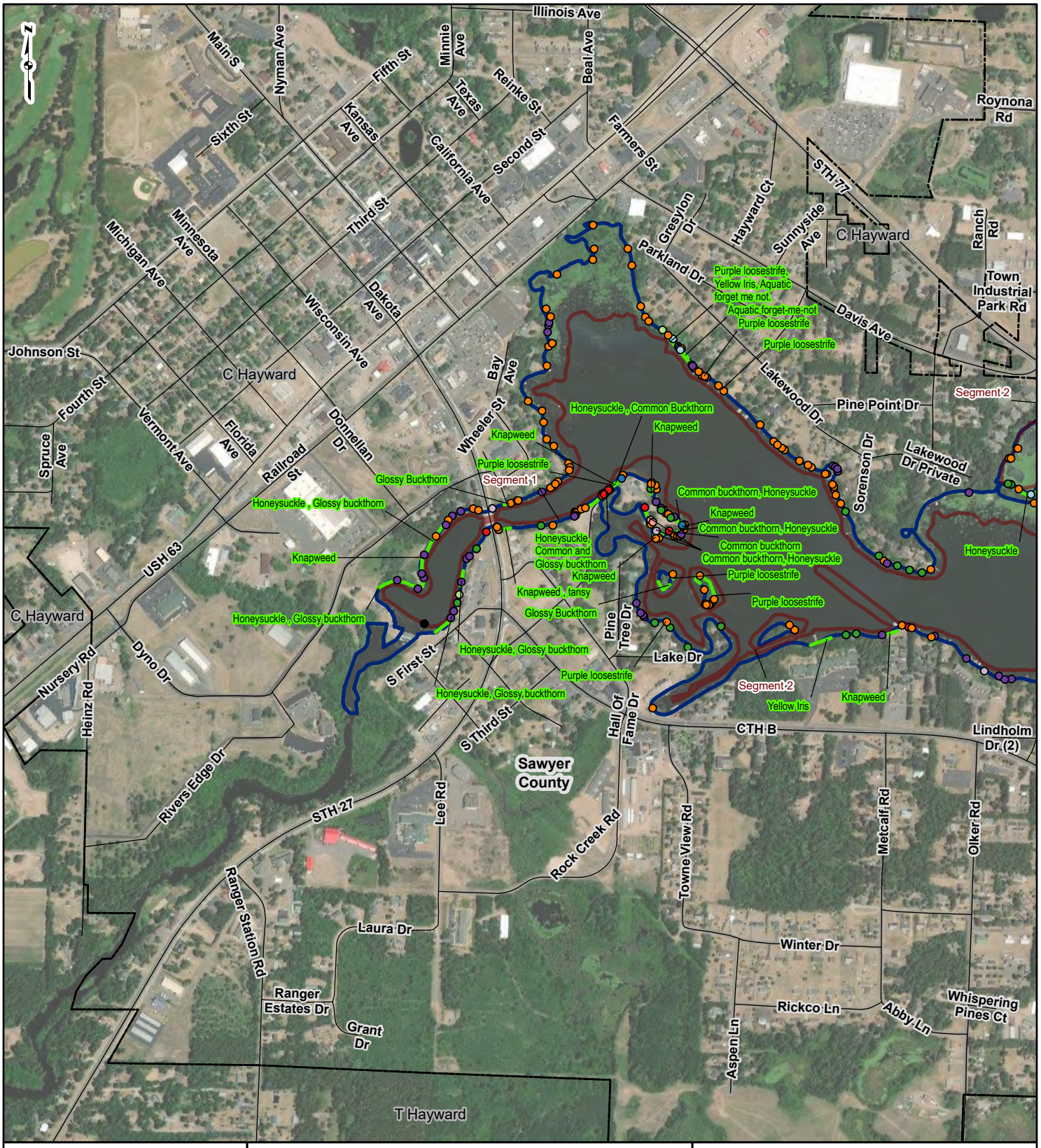
Figure 9. Rake Fullness per WDNR protocol.
Illustration of rake fullness rating used during the survey. Photo used from *Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications*. PUB-SS-1068,WDNR 2019.

FIGURE 10
Sediment Sampling Equipment

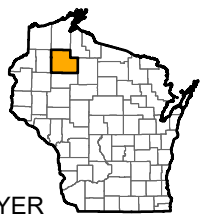
Figure 10. Sediment sampling equipment.

10-inch Tetra Pond Planter Basket, with 1/32-inch mesh, and garden trowel

FIGURE 11A
Hayward Shoreline Terrestrial Invasive Species



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Common Name		
Aquatic forget me not	Knapweed	Start/Stop Locations
Common buckthorn	Narrow Leaf Cattail	Meander Segments
Glossy buckthorn	Purple Loosestrife	Project Boundary
Honeysuckle	Tansy	Road Centerline
Honeysuckle, Common Buckthorn	Yellow Iris	Community Boundary
	Invasive Line	County Boundary

0 500 1,000 2,000 Feet

Figure 11A
Shoreline Terrestrial Invasive Species
Sheet 1 of 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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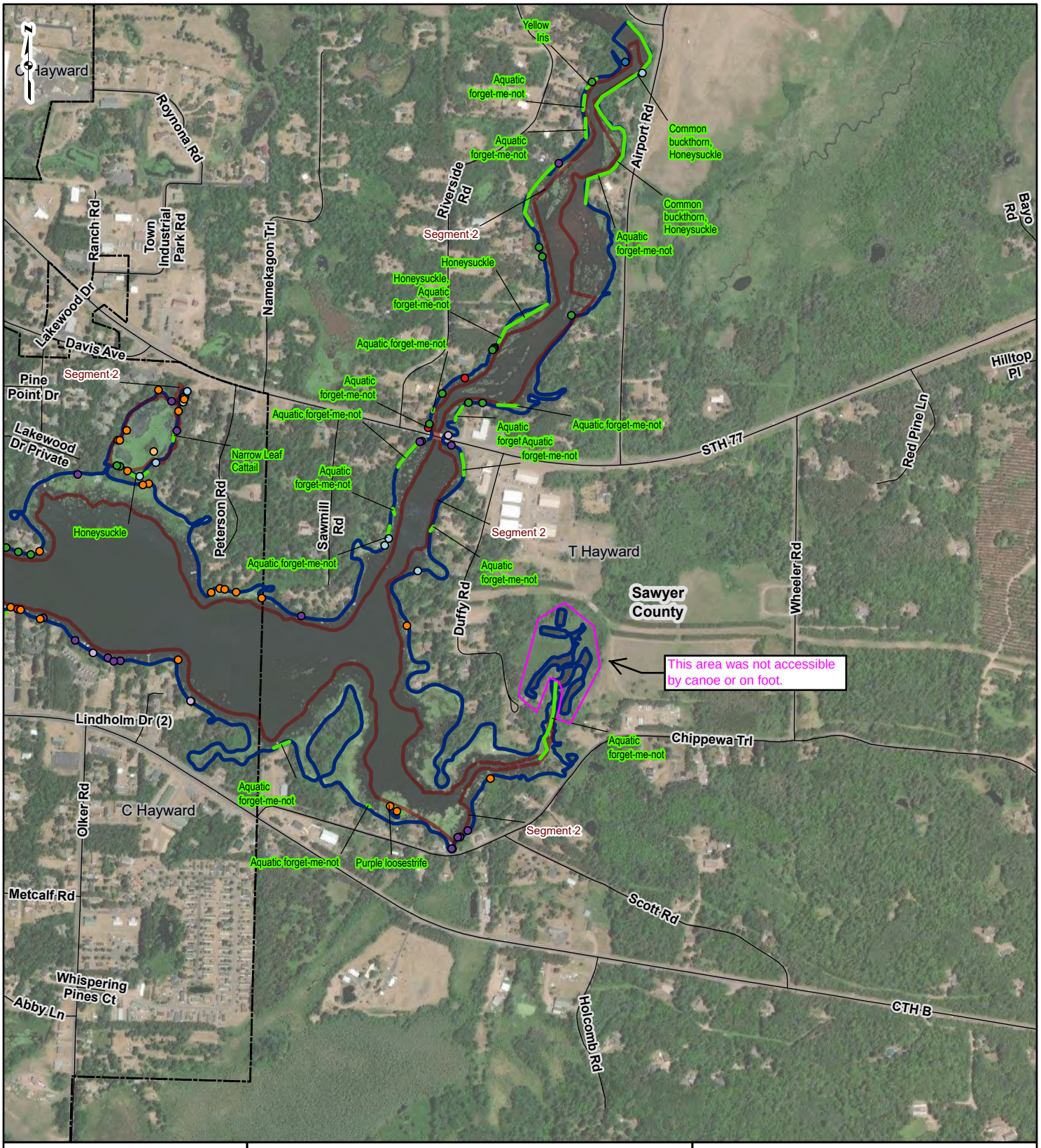
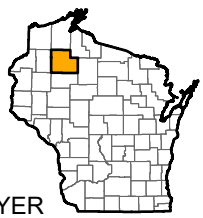


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Common Name			
Aquatic forget me not	Knapweed	Start/Stop Locations	
Common buckthorn	Narrow Leaf Cattail	Meander Segments	
Glossy buckthorn	Purple Loosestrife	Project Boundary	
Honeysuckle	Tansy	Road Centerline	
Honeysuckle, Common Buckthorn	Yellow Iris	Community Boundary	
	Invasive Line	County Boundary	

0 500 1,000 2,000 Feet

Figure 11A
Shoreline Terrestrial Invasive Species
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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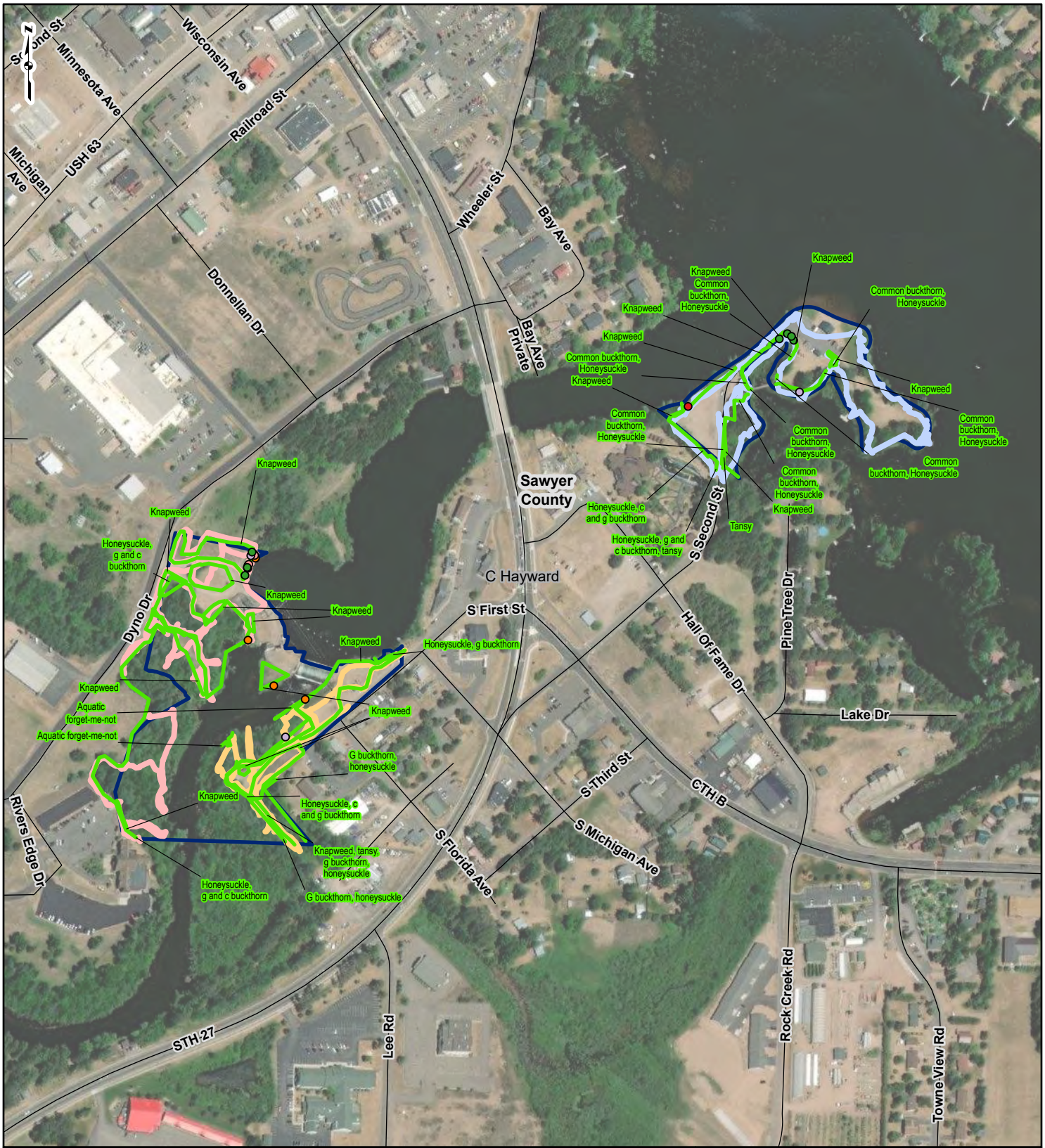
FIGURE 11B
Hayward Upland Terrestrial Meanders and Invasive Species

gai consultants
transforming ideas into reality



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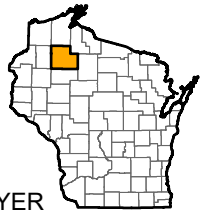

SAWYER COUNTY, WISCONSIN

LEGEND

Common Name		
Aquatic forget me not	Narrow Leaf Cattail	Terrestrial Meander Segment 2
Common buckthorn	Purple Loosestrife	Terrestrial Meander Segment 3
Glossy buckthorn	Tansy	Project Boundary
Honeysuckle	Yellow Iris	Road Centerline
Honeysuckle, Common Buckthorn	Invasive Line	Community Boundary
Knapweed	Terrestrial Meander Segment 1	County Boundary

0 225 450 900 Feet

Figure 11B
Upland Terrestrial Meanders and Invasive Species

Hayward Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

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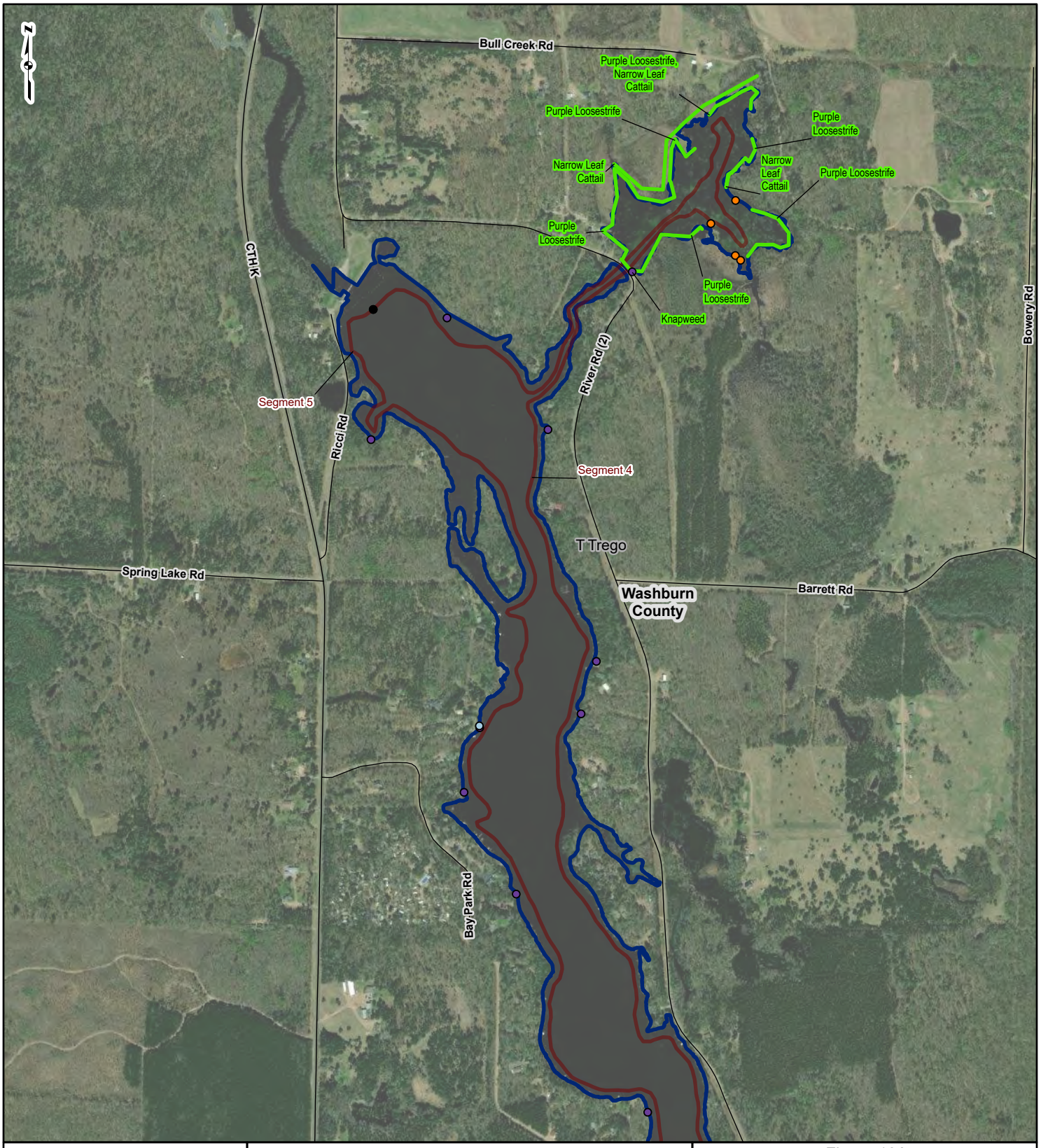
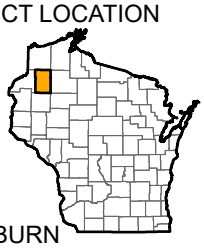
FIGURE 12A
Trego Shoreline Terrestrial Invasive Species



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

Common Name
- Aquatic forget me not
- Knapweed
- Purple Loosestrife
- Yellow Iris
- Japanese Knotweed
- Narrow leaf cattail
- Nightshade
- Start/Stop Locations
- Invasive Species
- Meander Segments
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 12A
Trego Shoreline Terrestrial Invasive Species
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

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REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/26/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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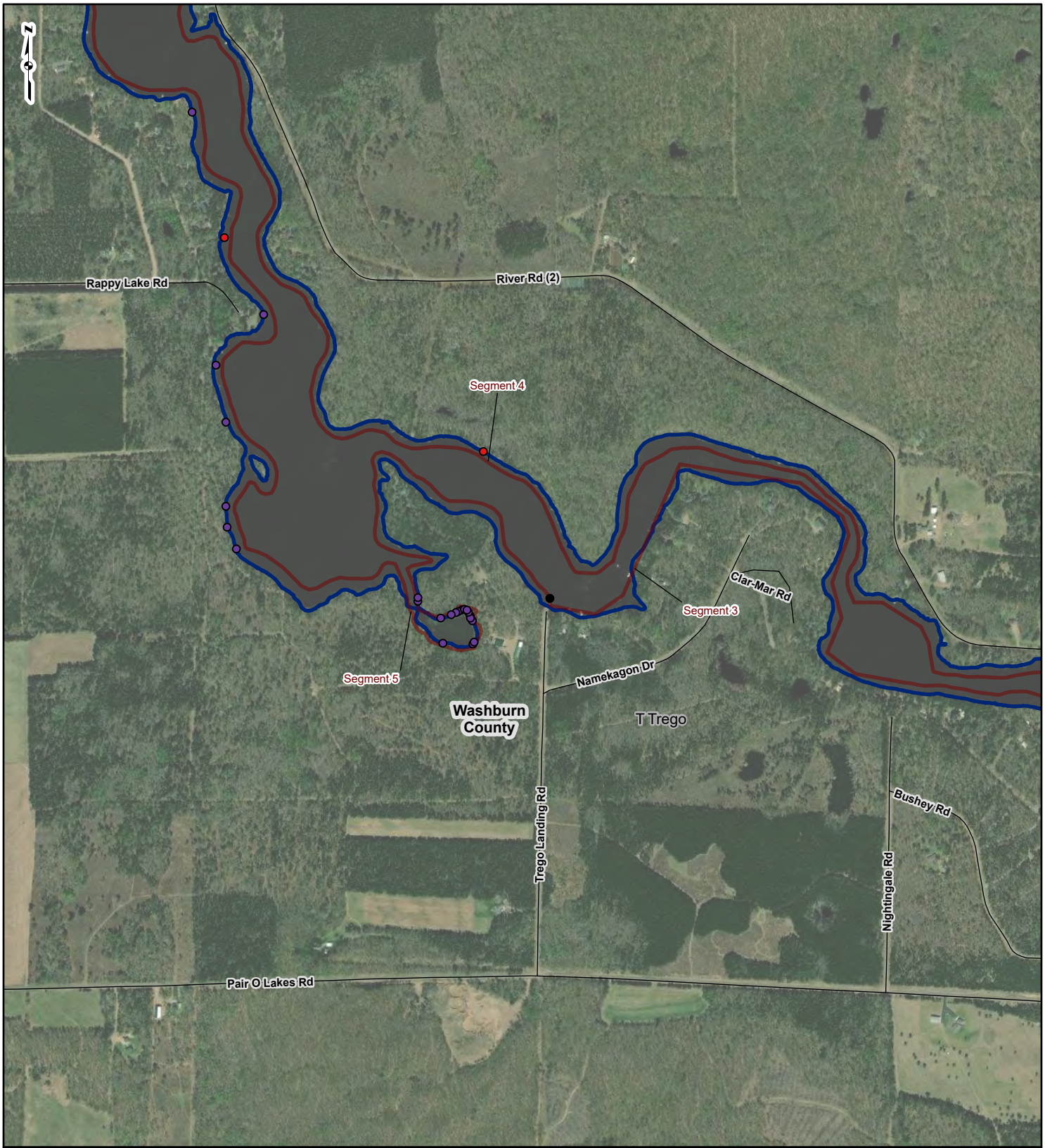

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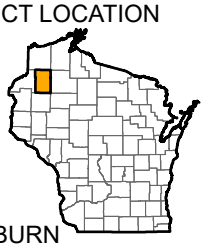

WASHBURN COUNTY, WISCONSIN

LEGEND

Common Name
- Aquatic forget me not
- Knapweed
- Purple Loosestrife
- Yellow Iris
- Japanese Knotweed
- Narrow leaf cattail
- Nightshade
- Start/Stop Locations
- Invasive Species
- Meander Segments
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 12A
Trego Shoreline Terrestrial Invasive Species
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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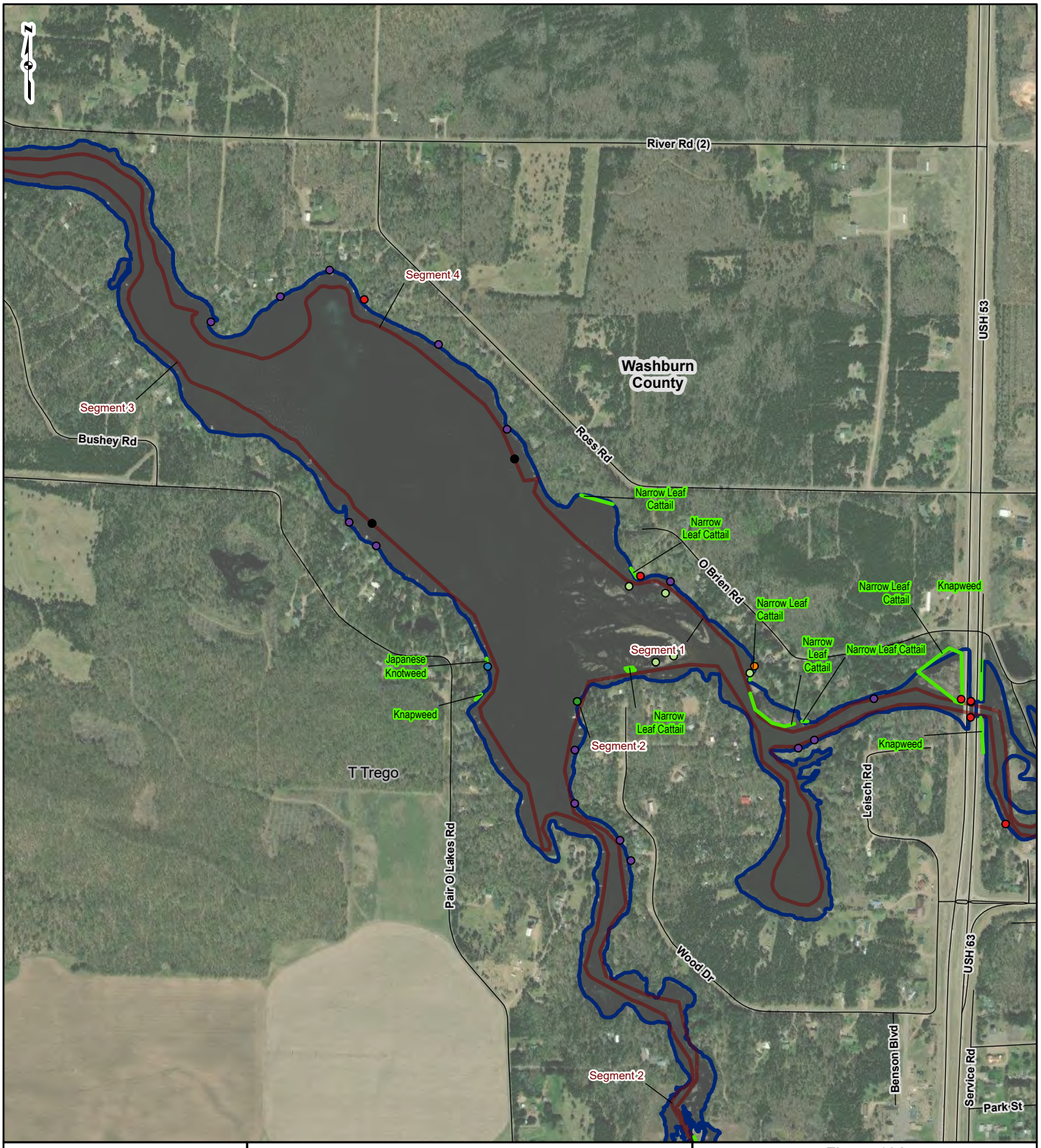

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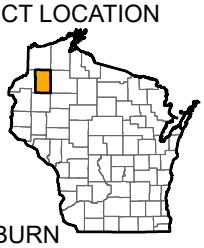

WASHBURN COUNTY, WISCONSIN

LEGEND

Common Name
- Aquatic forget me not
- Knapweed
- Purple Loosestrife
- Yellow Iris
- Japanese Knotweed
- Narrow leaf cattail
- Nightshade
- Start/Stop Locations
- Invasive Species
- Meander Segments
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 12A
Trego Shoreline Terrestrial Invasive Species
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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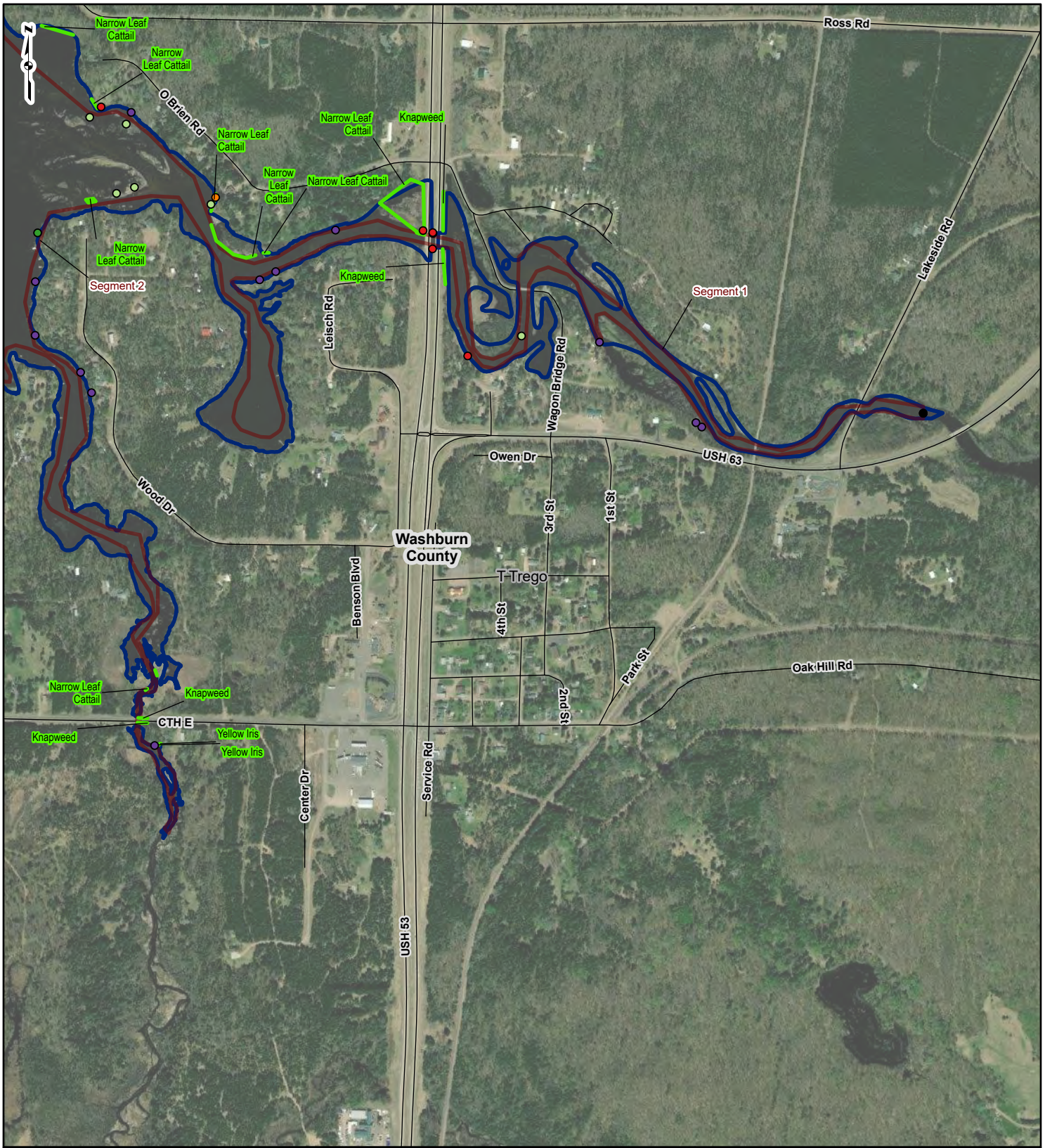

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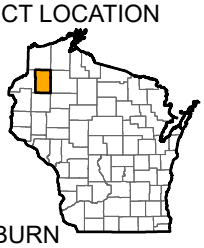

WASHBURN COUNTY, WISCONSIN

LEGEND

Common Name
- Aquatic forget me not
- Knapweed
- Purple Loosestrife
- Yellow Iris
- Japanese Knotweed
- Narrow leaf cattail
- Nightshade
- Start/Stop Locations
- Invasive Species
- Meander Segments
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 12A
Trego Shoreline Terrestrial Invasive Species
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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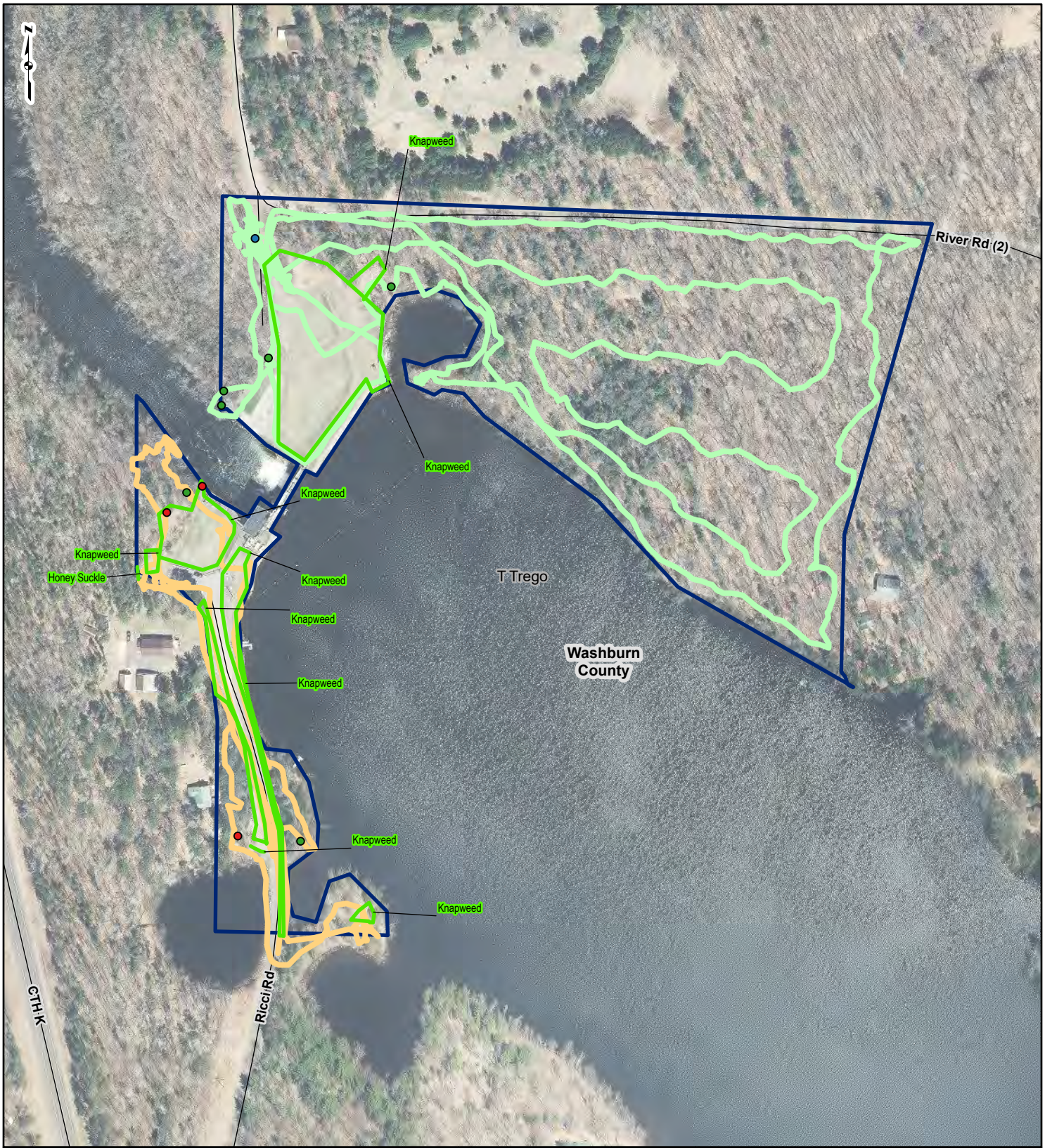
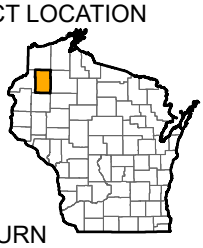
FIGURE 12B
Trego Upland Terrestrial Meanders and Invasive Species



PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Common Name
- Common buckthorn
- Honeysuckle
- Knapweed
- Purple Loosestrife

- Invasive Species
- Cash Road
- North Side Dam
- South Side Dam
- Trego Landing

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 125 250 500 Feet

Figure 12B
Upland Terrestrial Meanders and Invasive Species
Sheet 1 of 3

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

DRAWN BY: EMW DATE: 10/26/22
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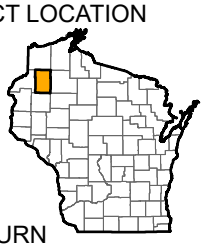
PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Common Name
- Common buckthorn
- Honeysuckle
- Knapweed
- Purple Loosestrife

- Invasive Species
- Cash Road
- North Side Dam
- South Side Dam
- Trego Landing

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 125 250 500 Feet

Figure 12B
Upland Terrestrial Meanders and Invasive Species
Sheet 2 of 3

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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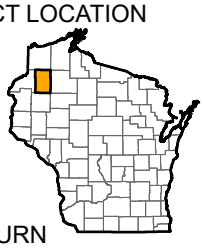

WASHBURN COUNTY, WISCONSIN

LEGEND

Common Name
- Common buckthorn
- Honeysuckle
- Knapweed
- Purple Loosestrife

- Invasive Species
- Cash Road
- North Side Dam
- South Side Dam
- Trego Landing

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 125 250 500 Feet

Figure 12B
Upland Terrestrial Meanders and Invasive Species
Sheet 3 of 3

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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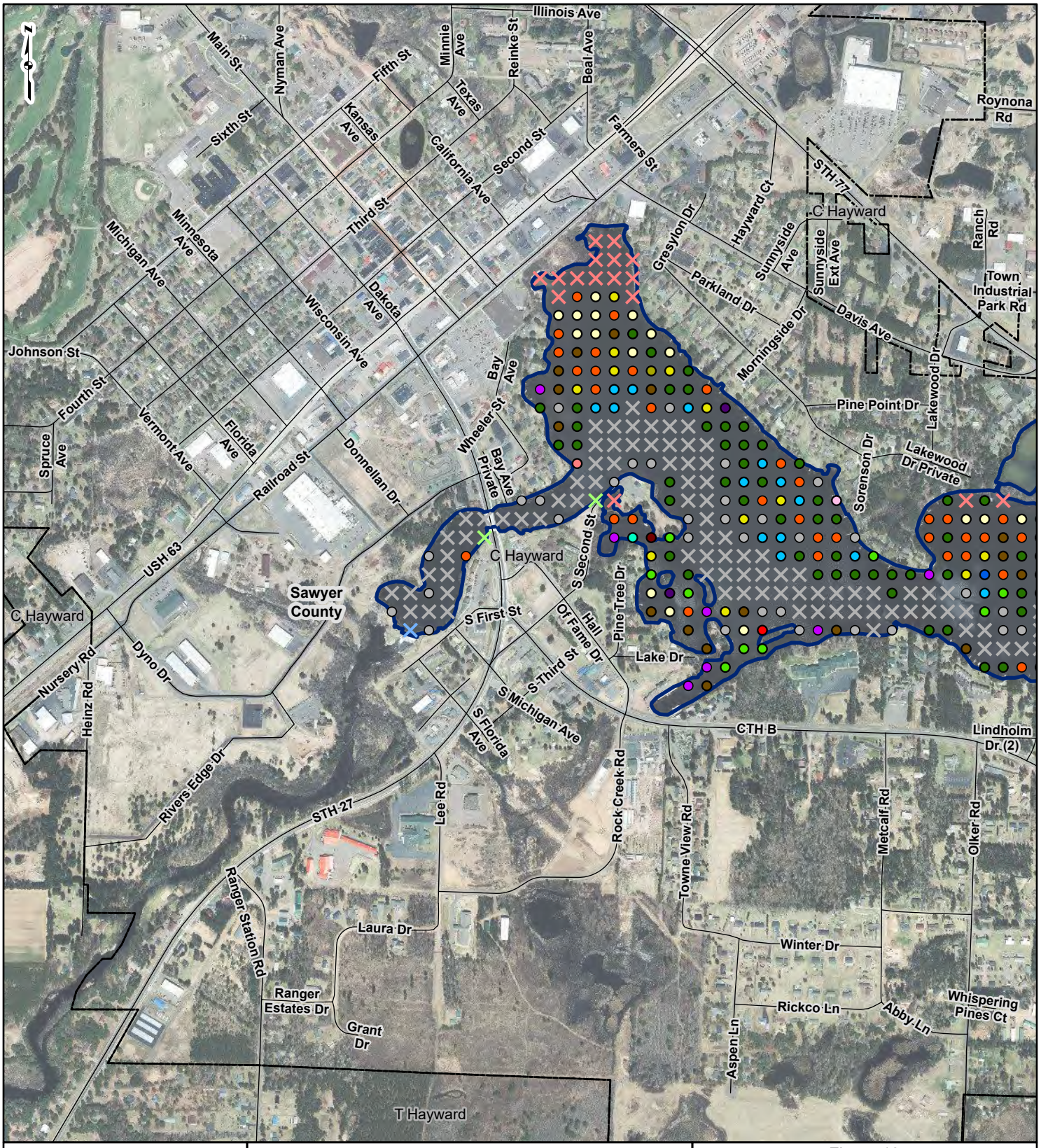
FIGURE 13
Hayward June Predominant Species



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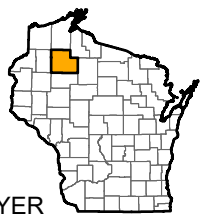

SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/Shallow
- Other

Predominant Species

- None
- Arrowhead sp.
- Clasping-leaf pondweed
- Common bur-reed
- Common waterweed
- Coontail
- Curly-leaf pondweed
- Eurasian watermilfoil
- Fern pondweed
- Flat-stem pondweed
- Forked duckweed
- Fries' pondweed
- Large-leaf pondweed
- Muskgrass
- Nitella
- Small pondweed
- Variable-leaf pondweed
- Water stargrass
- Wild celery
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 13
June Predominant Species
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

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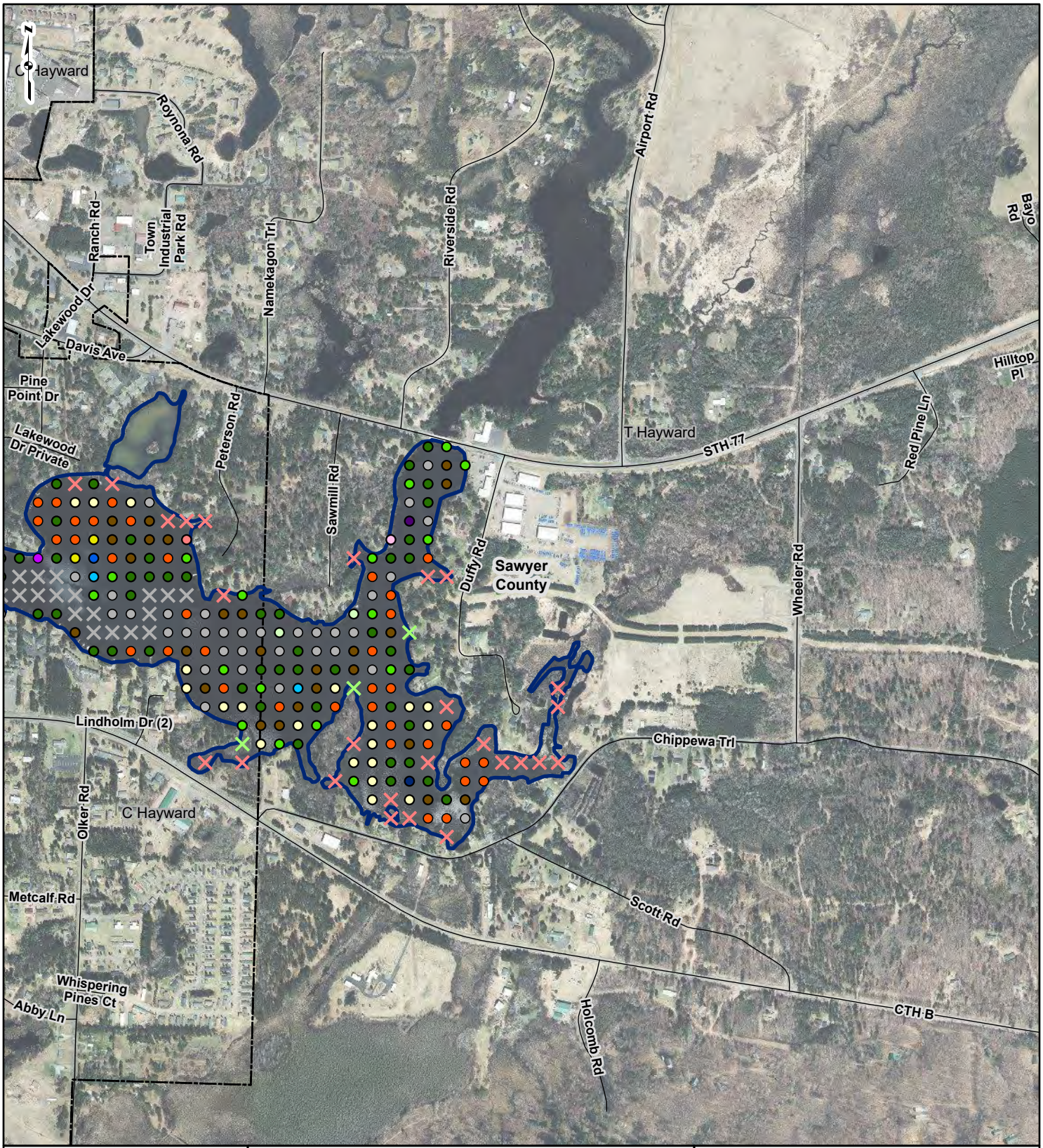

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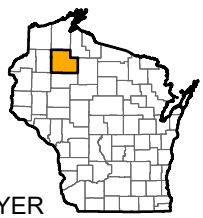

SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/Shallow
- Other

Predominant Species

- None
- Arrowhead sp.
- Clasping-leaf pondweed
- Common bur-reed
- Common waterweed
- Coontail
- Curly-leaf pondweed
- Eurasian watermilfoil
- Fern pondweed
- Flat-stem pondweed
- Forked duckweed
- Fries' pondweed
- Large-leaf pondweed
- Muskgrass
- Nitella
- Small pondweed
- Variable-leaf pondweed
- Water stargrass
- Wild celery
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 13
June Predominant Species
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

DRAWN BY: EMW DATE: 10/31/2022
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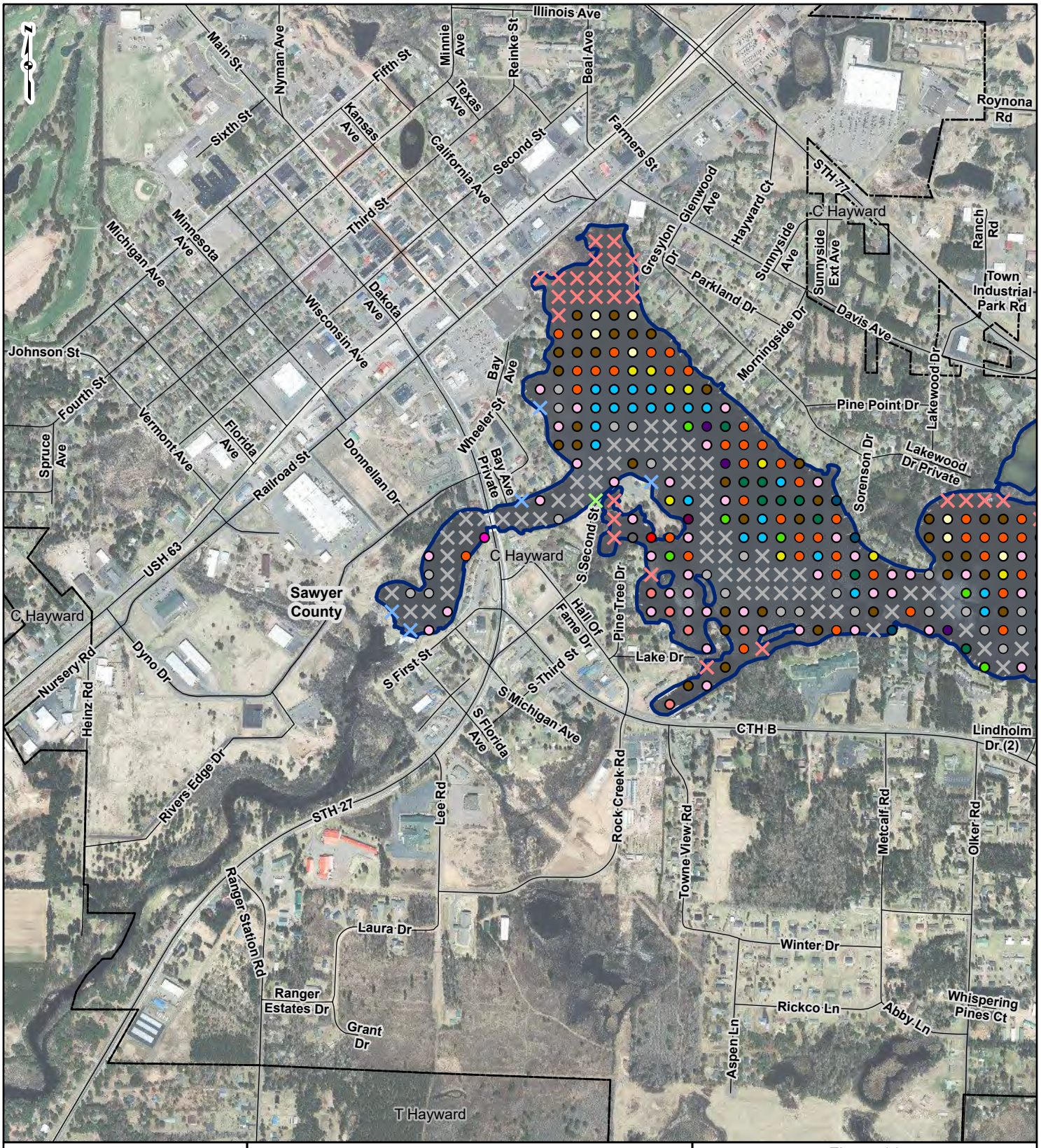
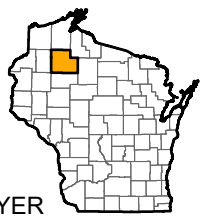
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 14
Hayward August Predominant Species



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/Shallow
- Other

Predominant Species

- None
- Arrowhead sp.
- Clasping-leaf pondweed
- Common waterweed
- Coontail
- Eurasian watermilfoil
- Fern pondweed
- Flat-stem pondweed
- Floating-leaf pondweed
- Forked duckweed
- Nitella
- Slender naiad
- Water marigold
- Water stargrass
- White-stem pondweed
- White water lily
- Wild celery
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 14
August
Predominant Species
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/31/2022
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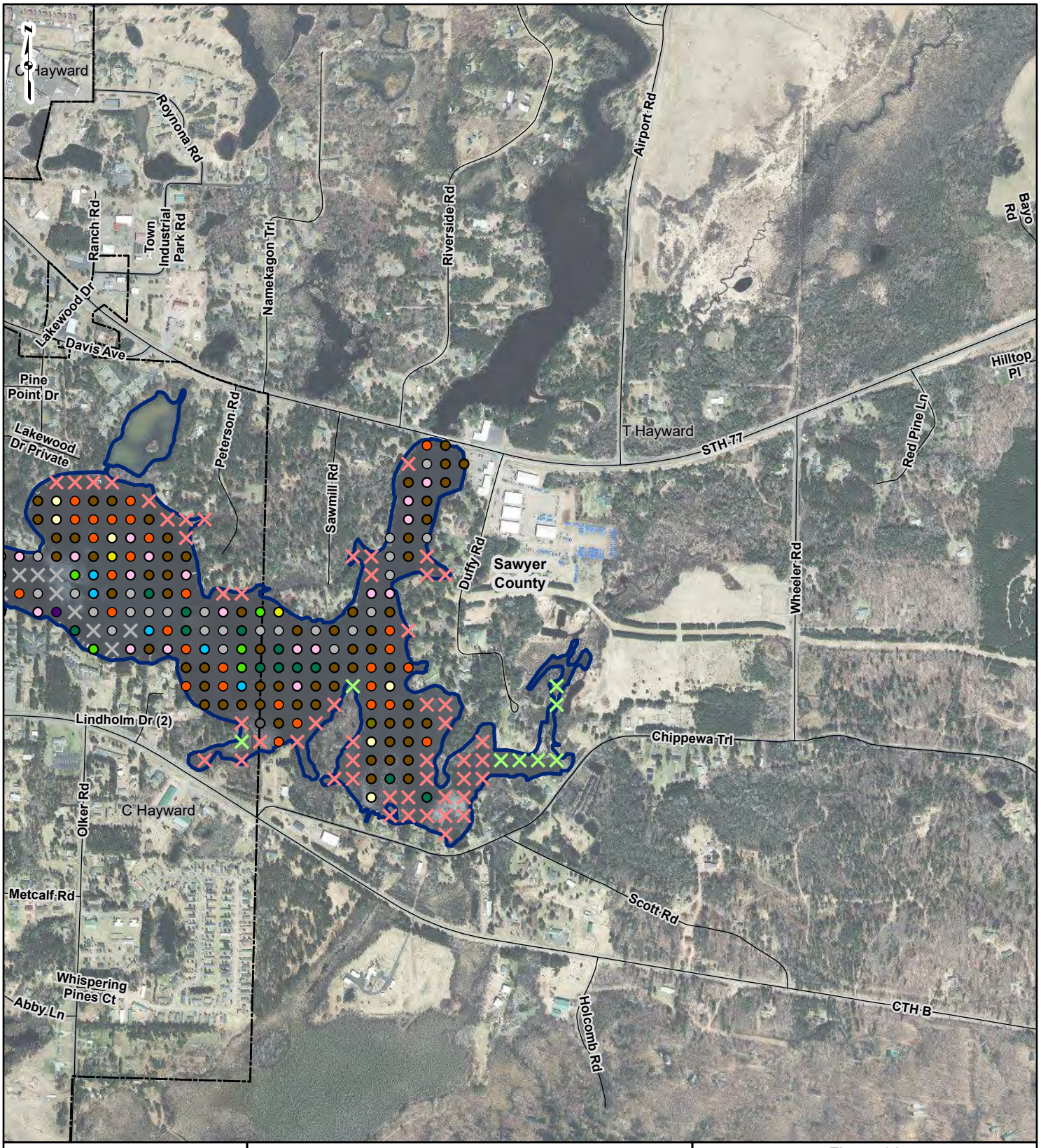
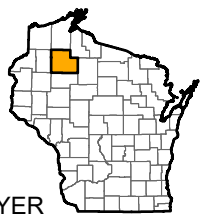
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/Shallow
- Other

Predominant Species

- None
- Arrowhead sp.
- Clasping-leaf pondweed
- Common waterweed
- Coontail
- Eurasian watermilfoil
- Fern pondweed
- Flat-stem pondweed
- Floating-leaf pondweed
- Forked duckweed
- Nitella
- Slender naiad
- Water marigold
- Water stargrass
- White-stem pondweed
- White water lily
- Wild celery
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 14
August
Predominant Species
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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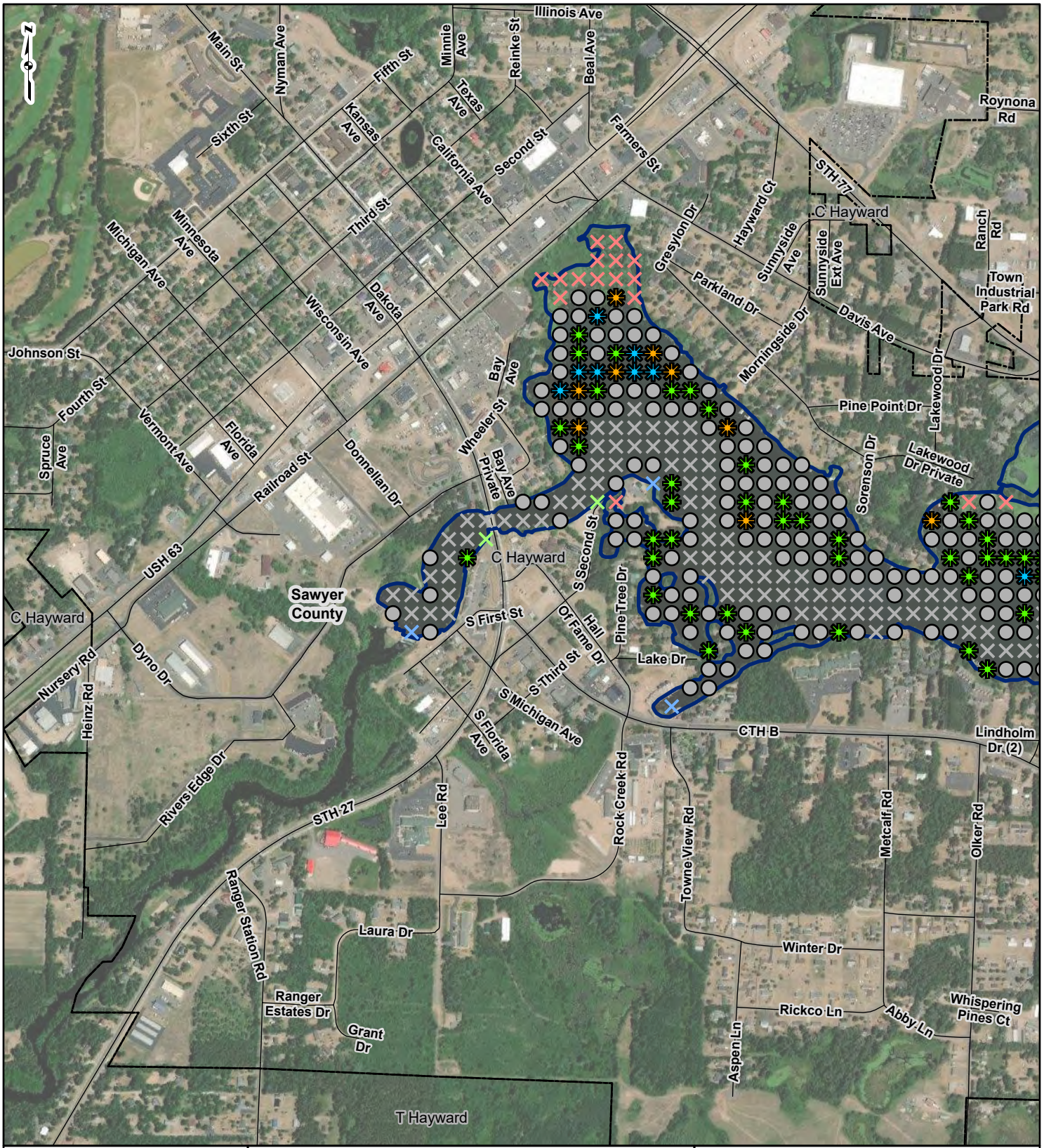
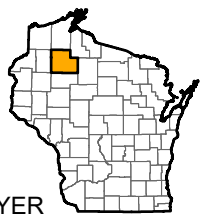
FIGURE 15
Hayward June Aquatic Invasive Species



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 15
June
Aquatic Invasive Species
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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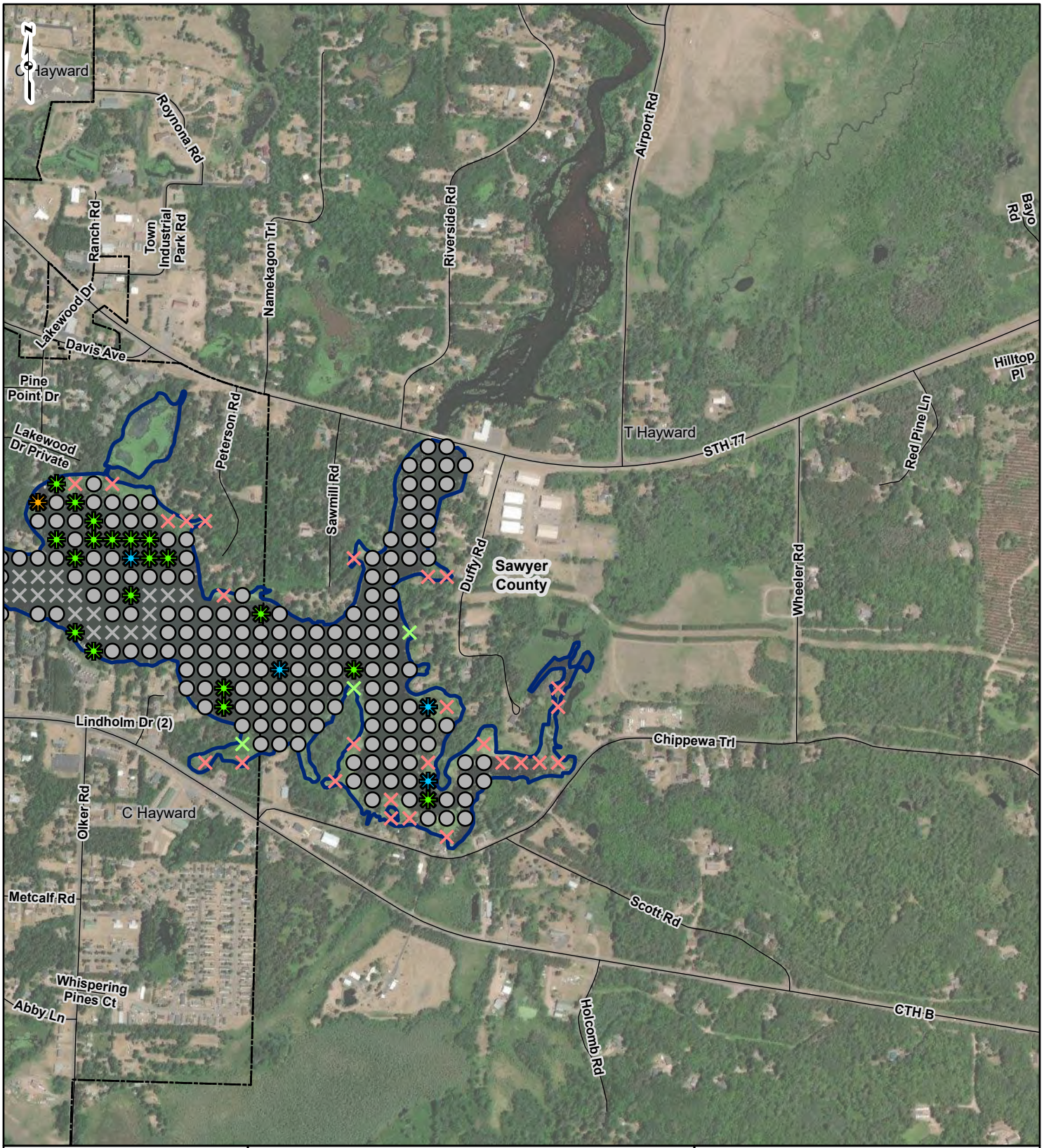
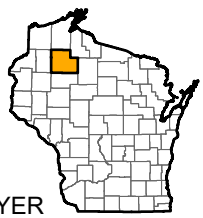


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 15
June
Aquatic Invasive Species
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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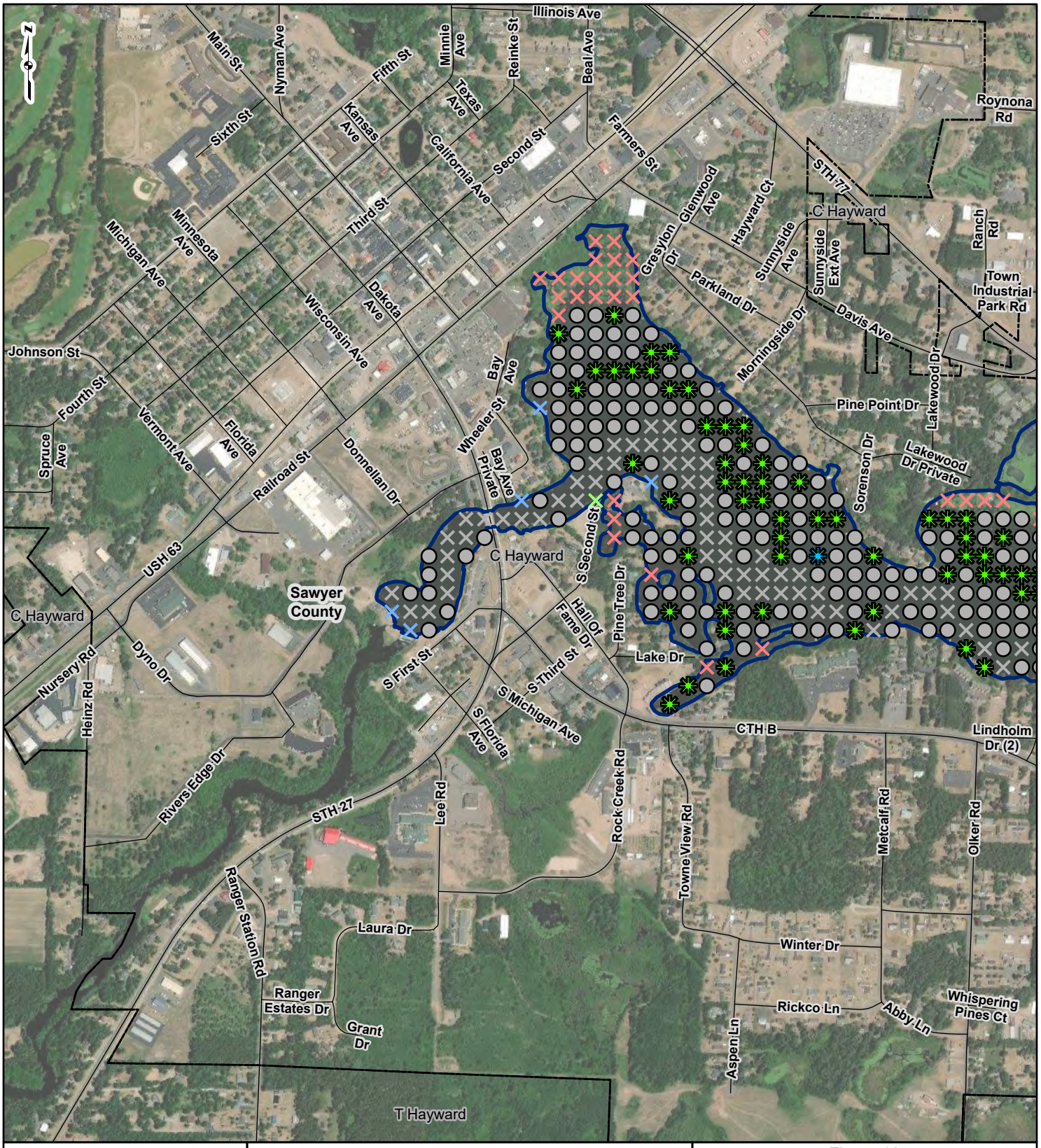
FIGURE 16
Hayward August Aquatic Invasive Species

gai consultants
transforming ideas into reality



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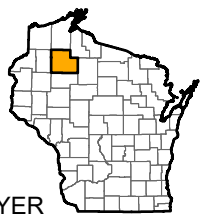

SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 16
August
Aquatic Invasive Species
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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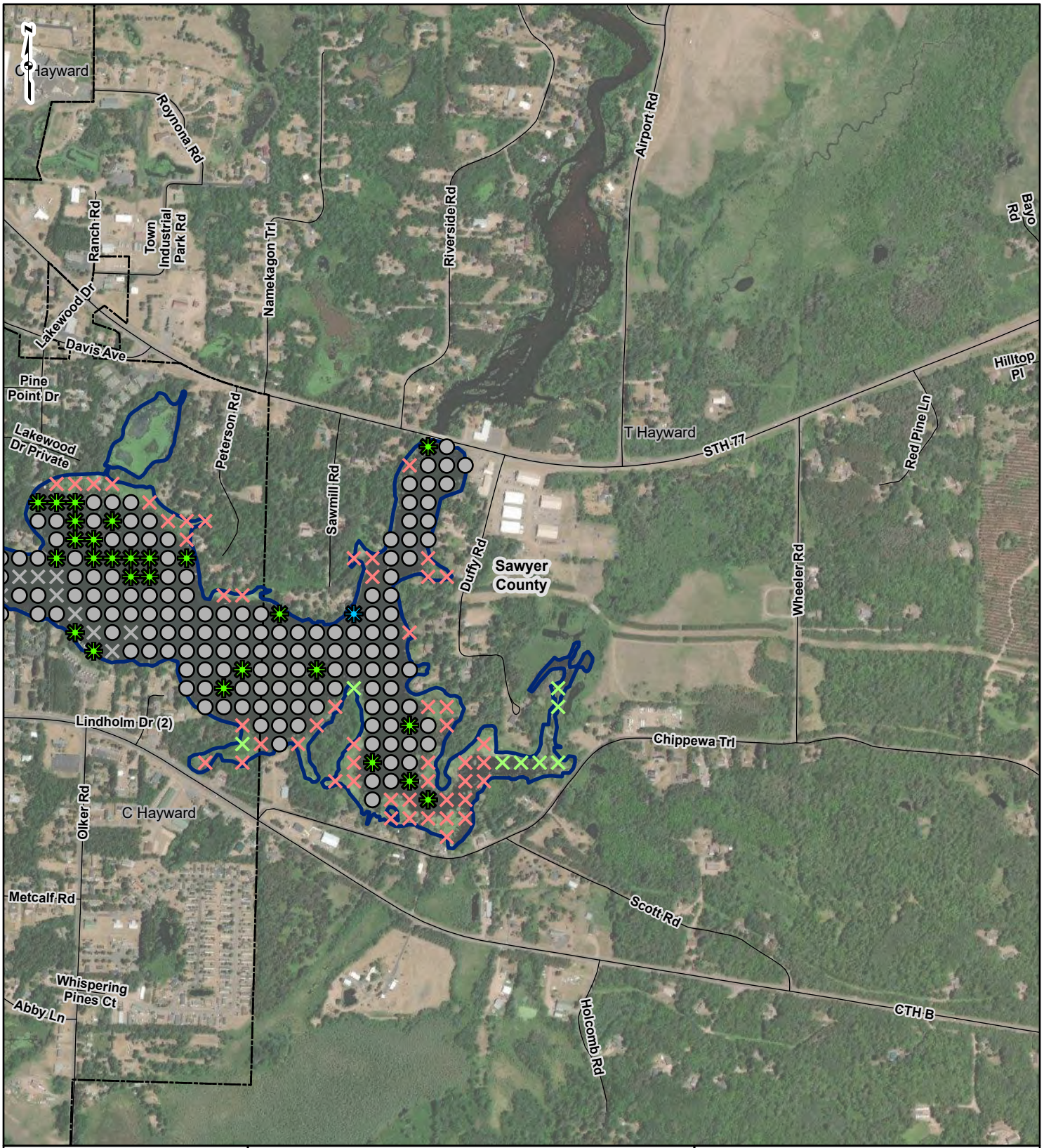
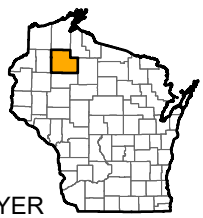


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 16
August
Aquatic Invasive Species
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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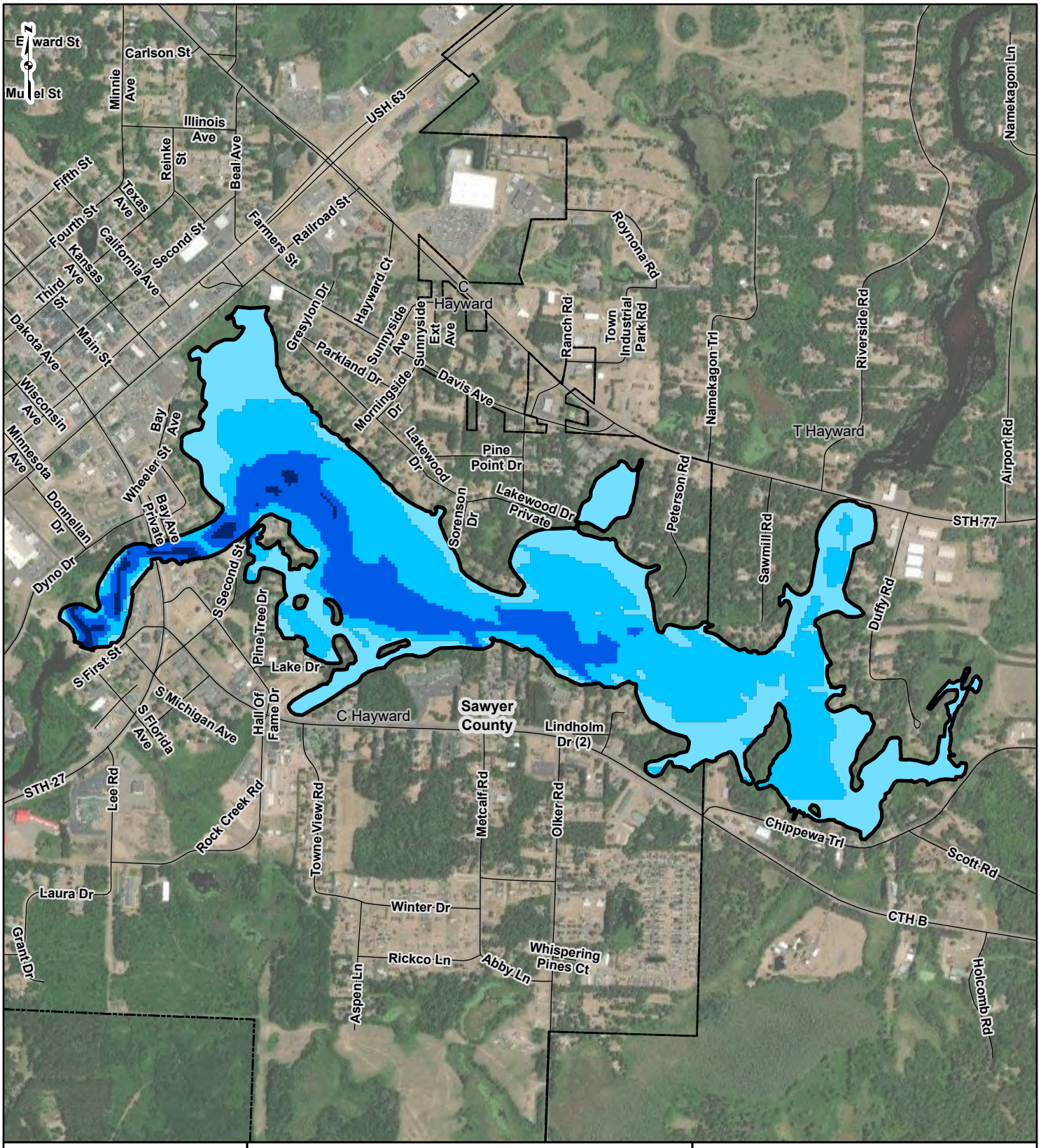
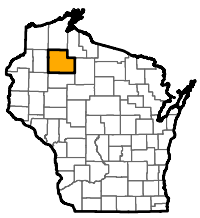
G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 17
Hayward Bathymetric Map



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Depth
- 0 - 5 ft
- 5 - 10 ft
- 10 - 15 ft
- >15 ft

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 600 1,200 2,400 Feet

Figure 17
Hayward Bathymetric Map

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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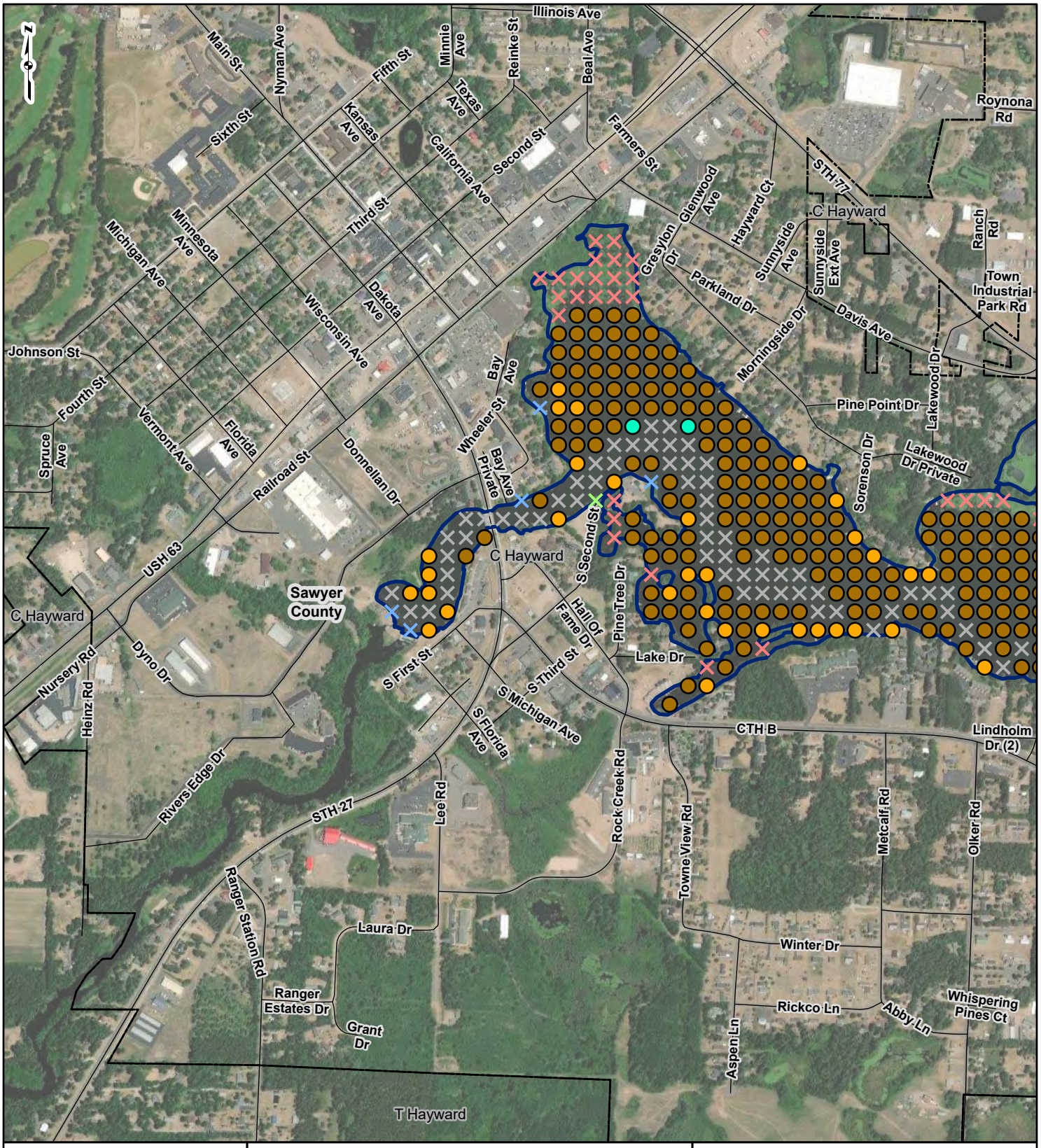
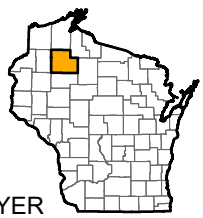
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Depth_Mapping\R220323_Hayward_Depth_Mapping\Depth\Hayward_Depth_Mapping_2022_10_27.aprx

FIGURE 18
Hayward Substrate Types



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Dominant Substrate
Gravel
Organic
Sand
Wood

Point-Intercept Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 18
Substrate Types
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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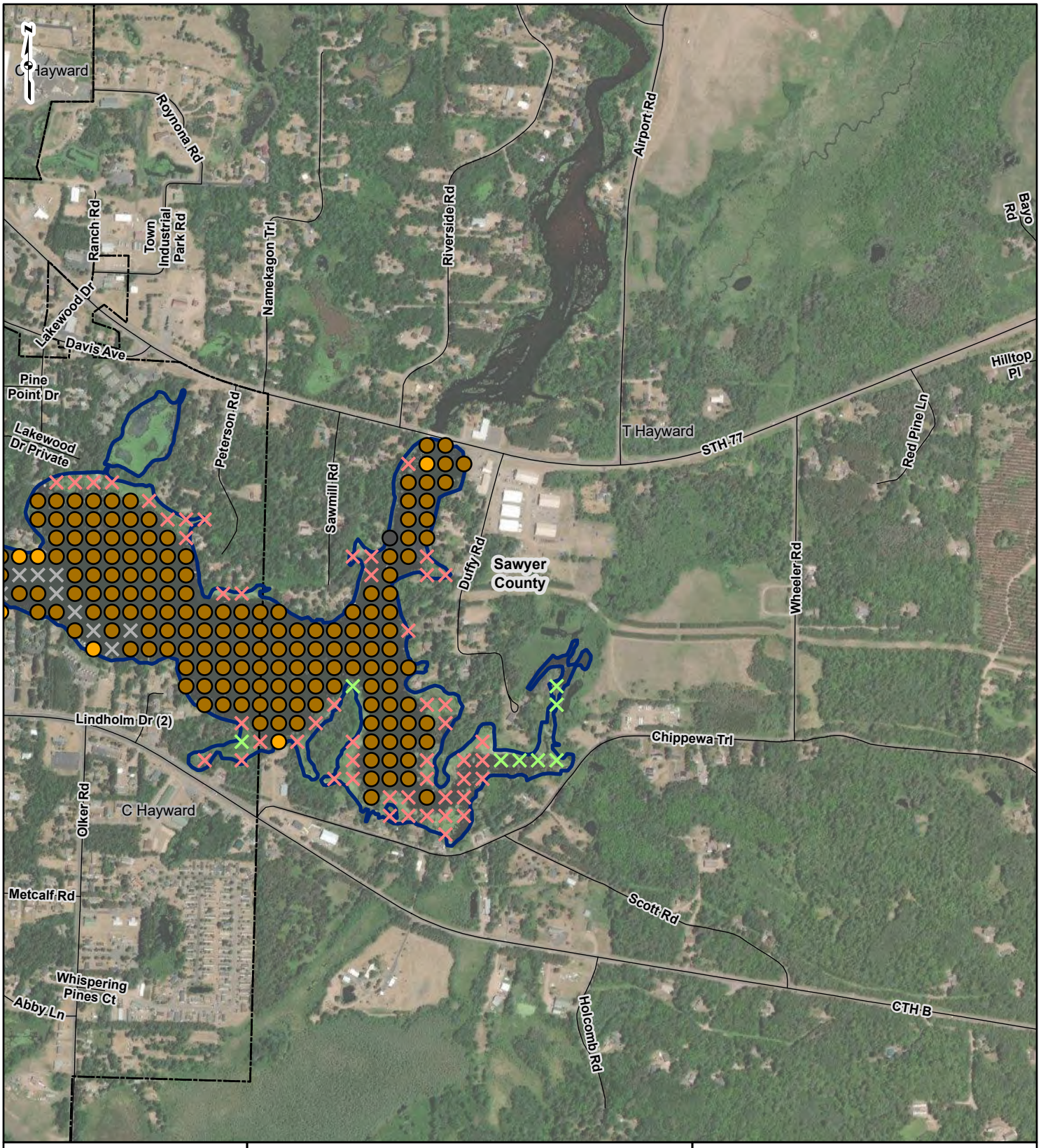
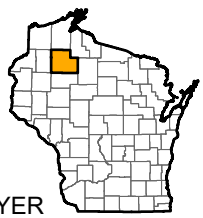


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Dominant Substrate
Gravel
Organic
Sand
Wood

Point-Intercept Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 18
Substrate Types
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
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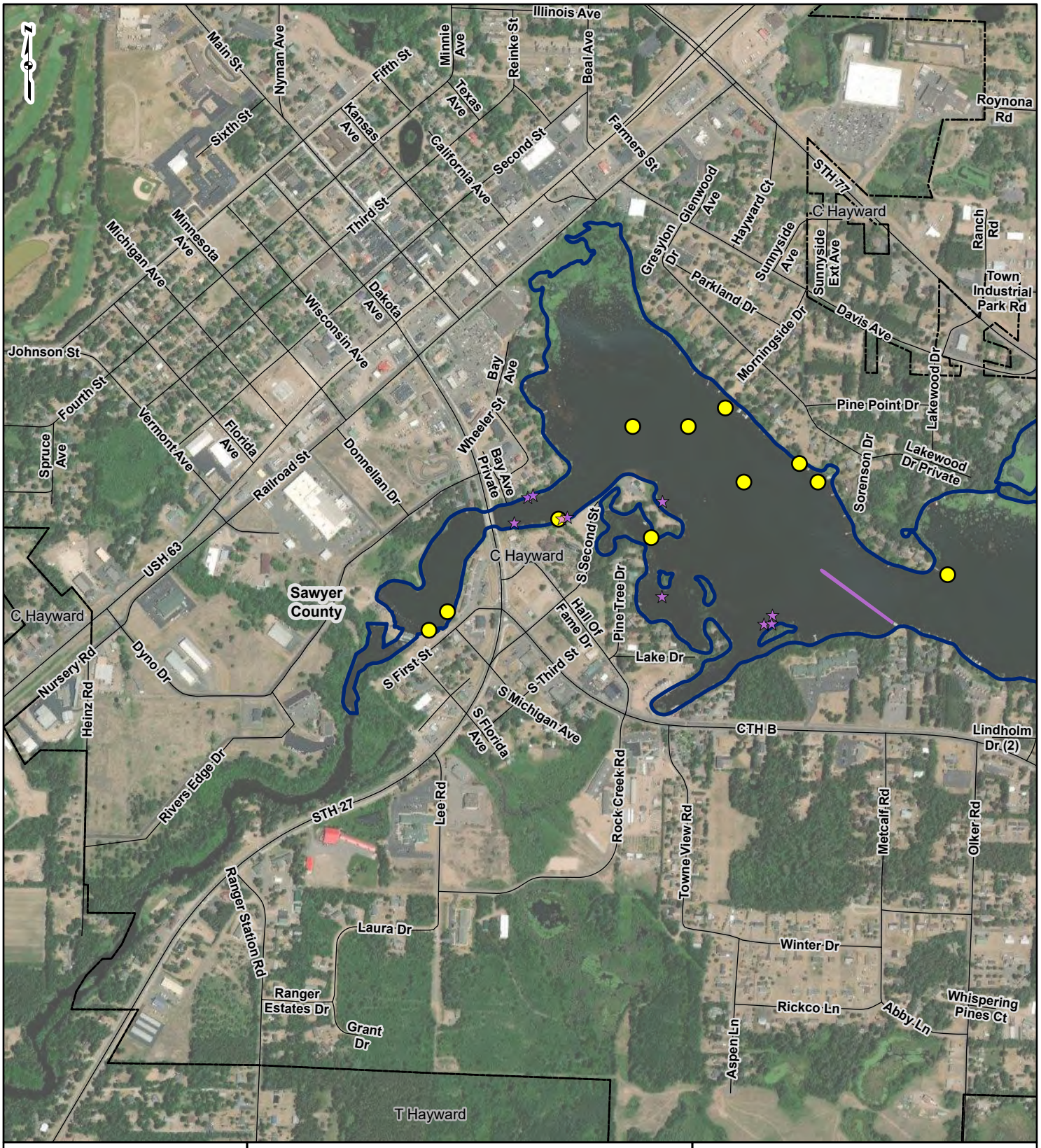
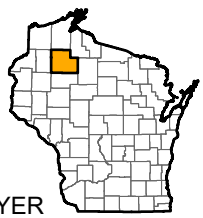
G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 19
Hayward Coarse Woody Debris/Habitat Map



PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Coarse Woody Habitat Area
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 19
Coarse Woody Debris/Habitat
Sheet 1 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/31/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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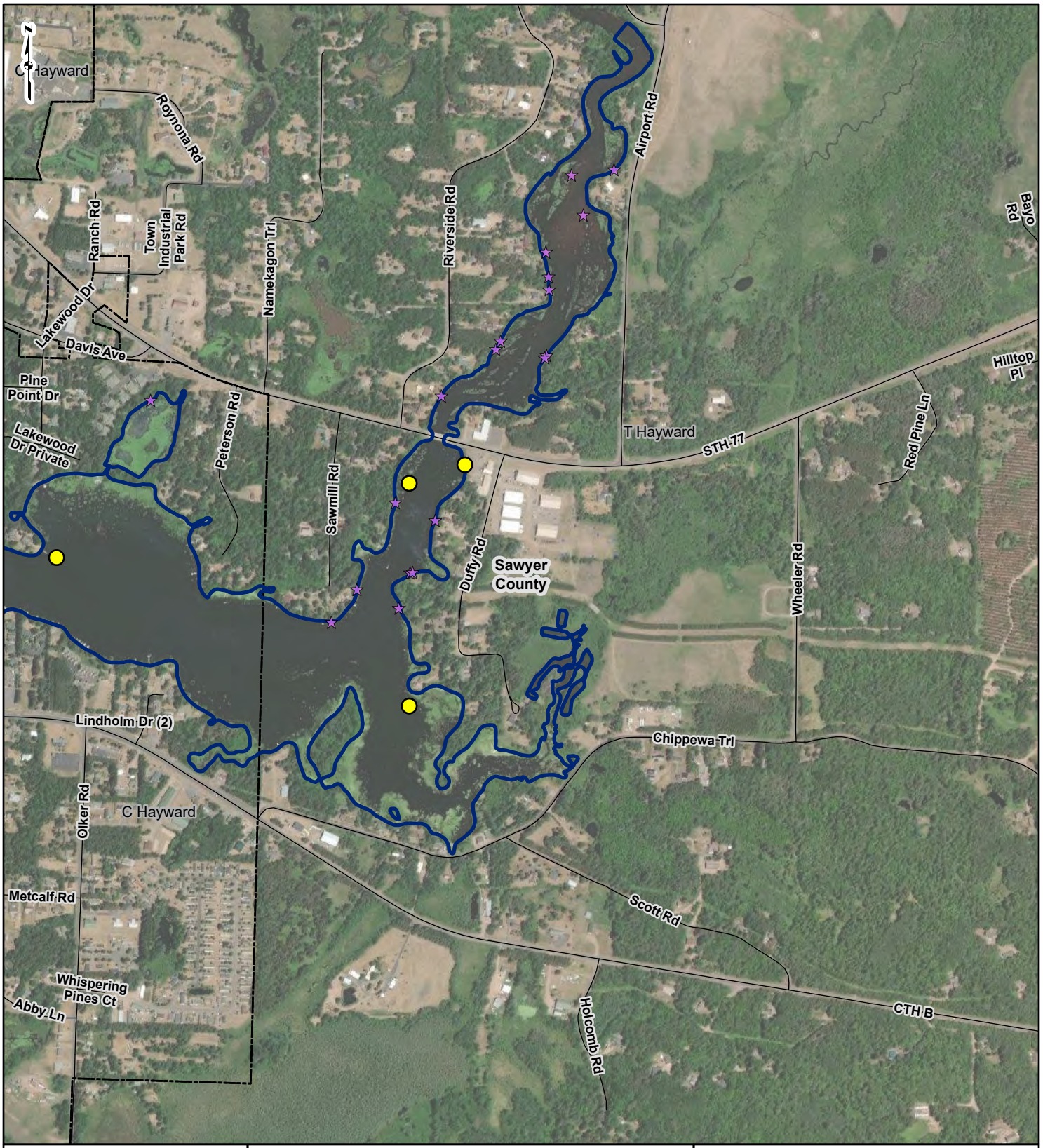
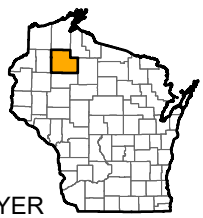


PROJECT LOCATION



SAWYER COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Coarse Woody Habitat Area
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 19
Coarse Woody Debris/Habitat
Sheet 2 OF 2

Hayward Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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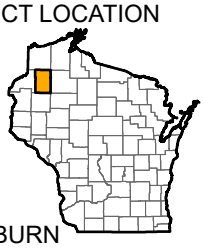
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Hayward\R220323_00_Hayward_Invasive_Mapping\R220323_00_Hayward_Invasive_Mapping.aprx

FIGURE 20
Trego June Predominant Species

PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common waterweed
Coontail
Curly-leaf pondweed
Eurasian watermilfoil
Fern pondweed
Flat-stem pondweed
Forked duckweed
Muskgrasses
Nitella
Small duckweed
Water stargrass
Wild celery
Wild rice

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 20
June Predominant Species
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

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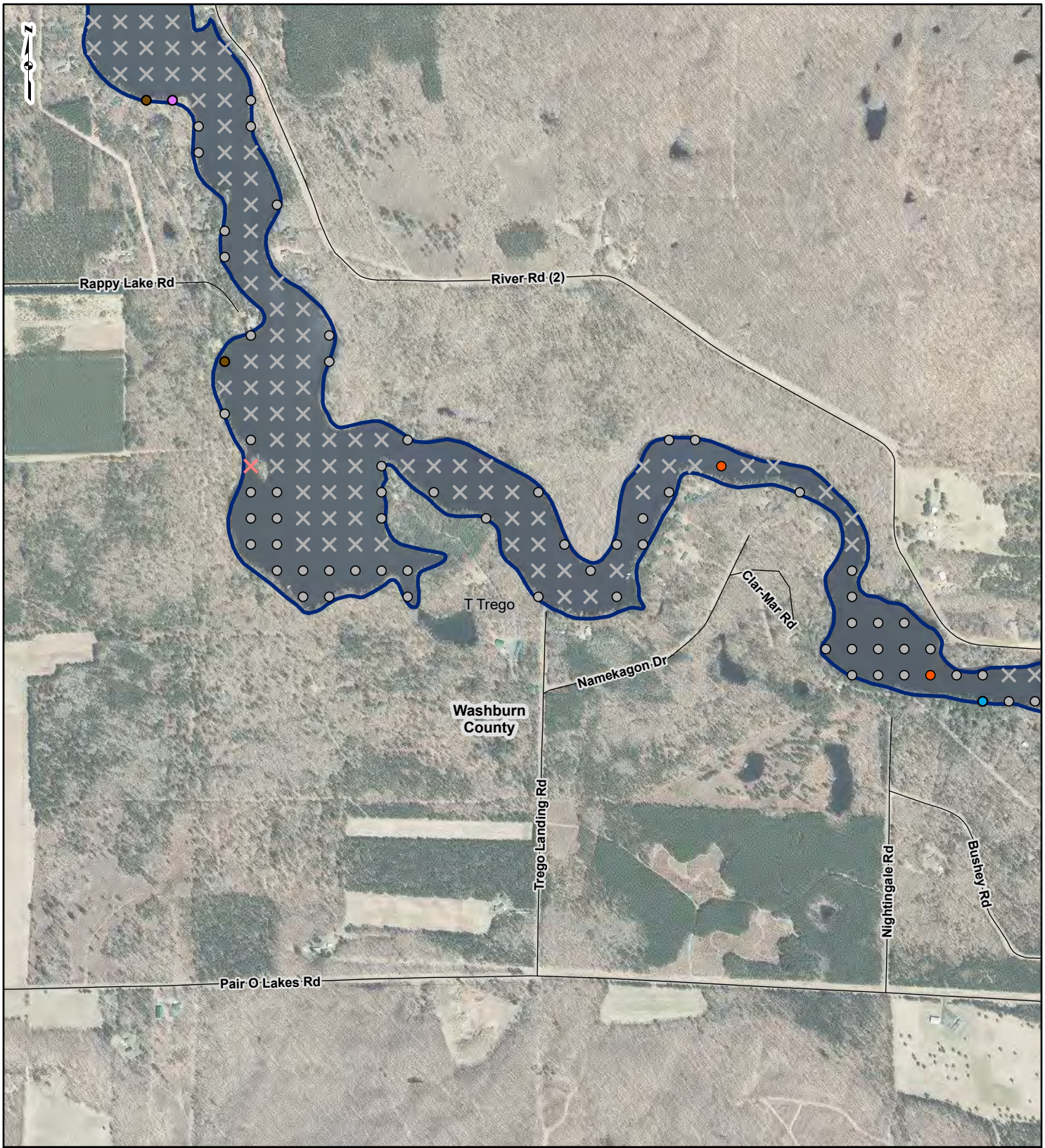
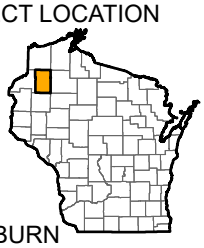
REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx



PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common waterweed
Coontail
Curly-leaf pondweed
Eurasian watermilfoil
Fern pondweed
Flat-stem pondweed
Forked duckweed
Muskgrasses
Nitella
Small duckweed
Water stargrass
Wild celery
Wild rice

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 20
June Predominant Species
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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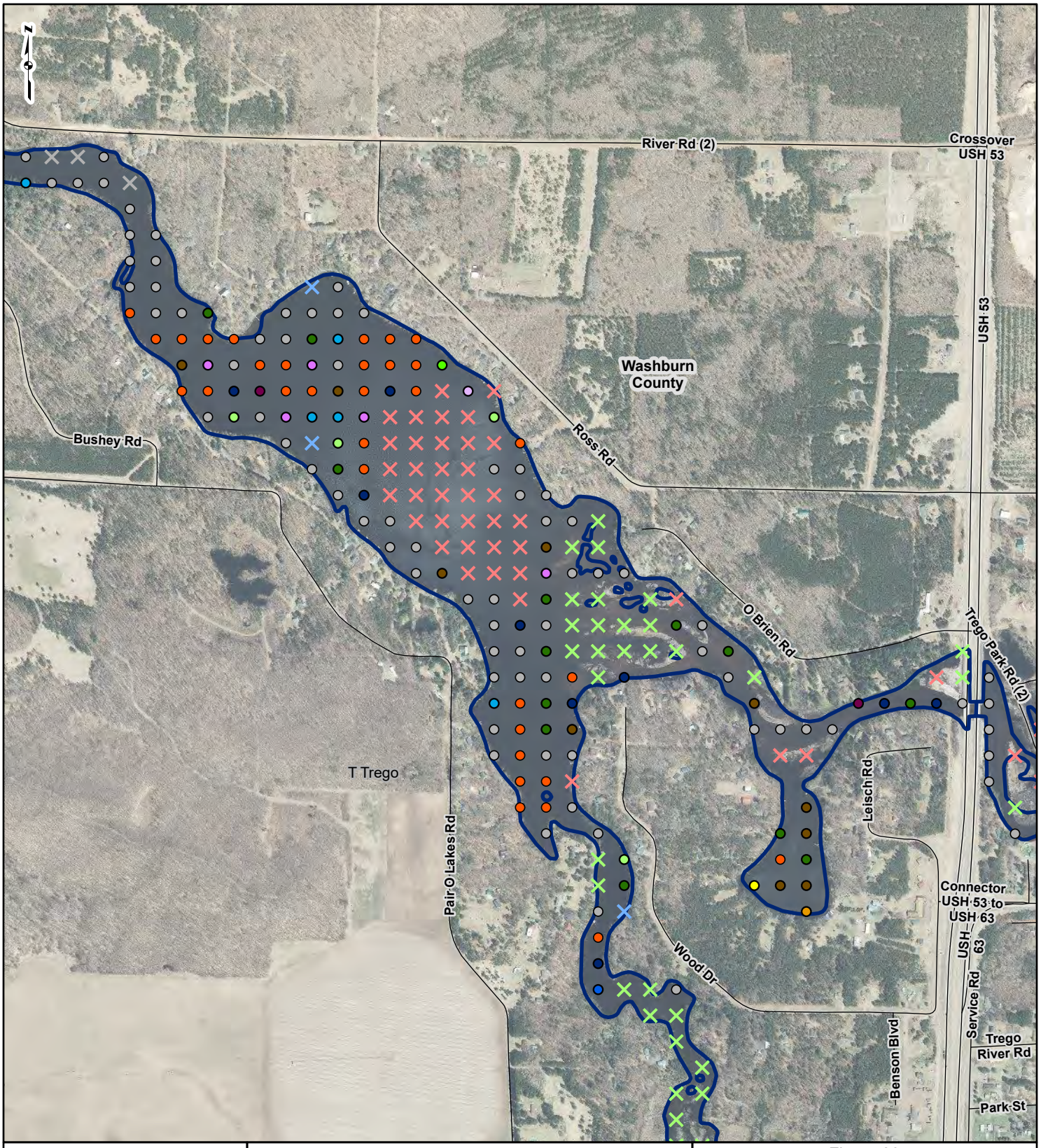
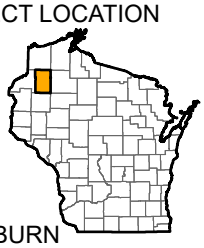
REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx



PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common waterweed
Coontail
Curly-leaf pondweed
Eurasian watermilfoil
Fern pondweed
Flat-stem pondweed
Forked duckweed
Muskgrasses
Nitella
Small duckweed
Water stargrass
Wild celery
Wild rice

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 20
June Predominant Species
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/31/2022
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REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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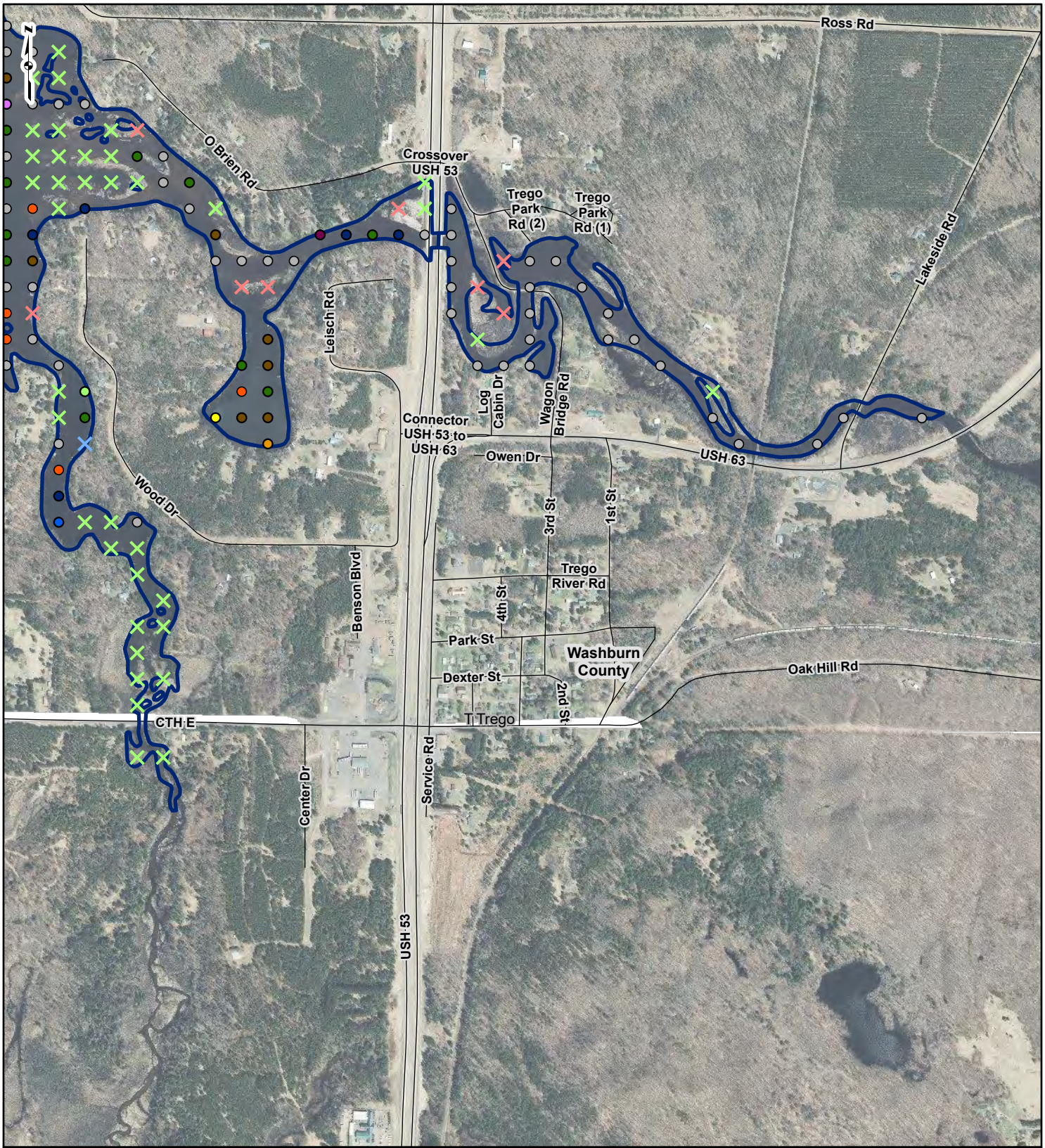

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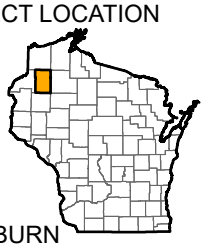

WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common waterweed
Coontail
Curly-leaf pondweed
Eurasian watermilfoil
Fern pondweed
Flat-stem pondweed
Forked duckweed
Muskgrasses
Nitella
Small duckweed
Water stargrass
Wild celery
Wild rice

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 20
June Predominant Species
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

Mead & Hunt

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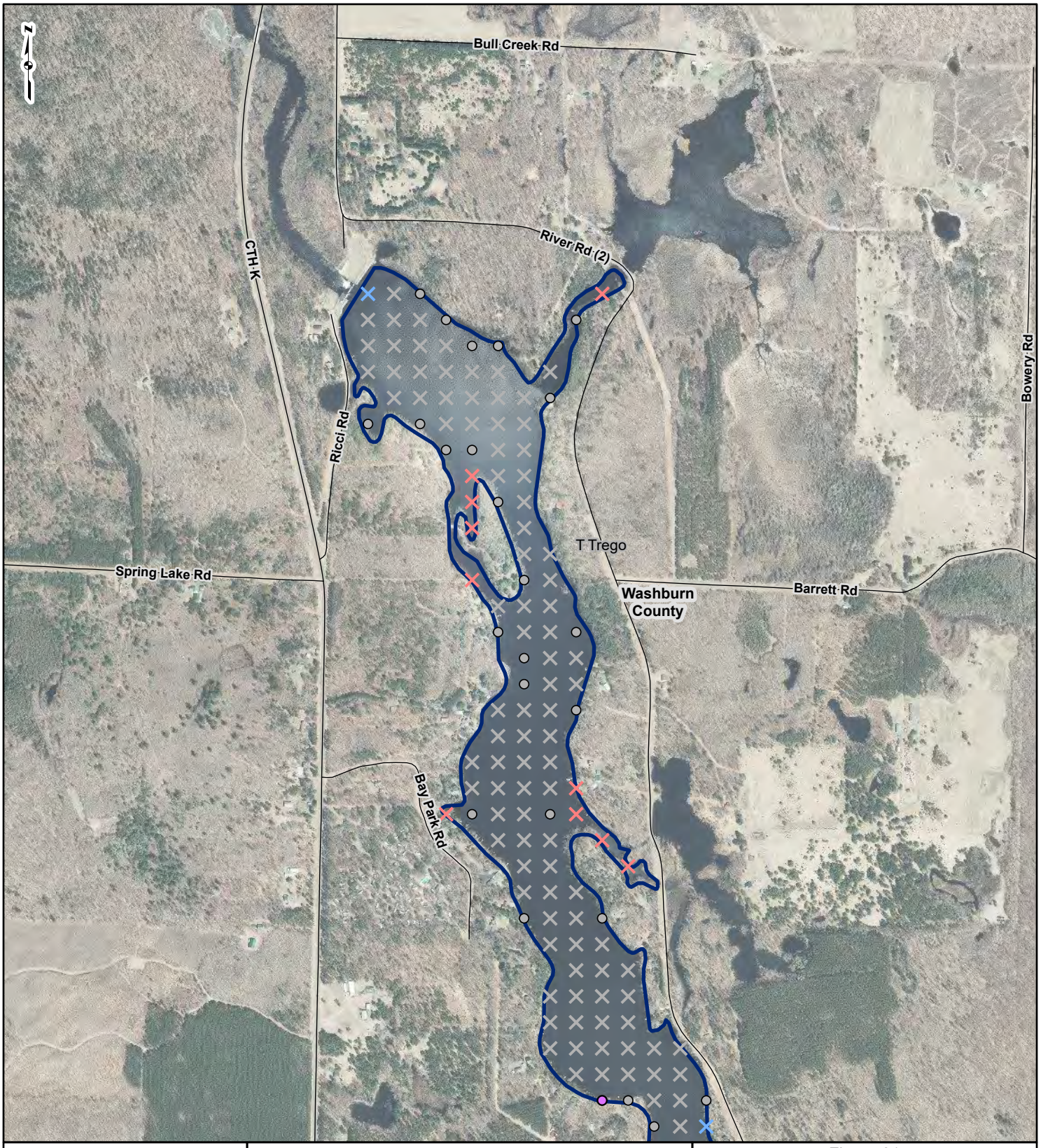
FIGURE 21
Trego July/Aug Predominant Species



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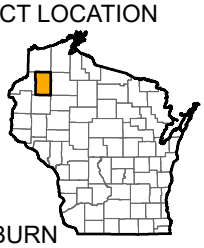

WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common bur-reed
Common waterweed
Coontail
Curly-leaf pondweed
Fern pondweed
Flat-stem pondweed
Forked duckweed
Nitella
Wild celery
Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 21
July/August
Predominant Species
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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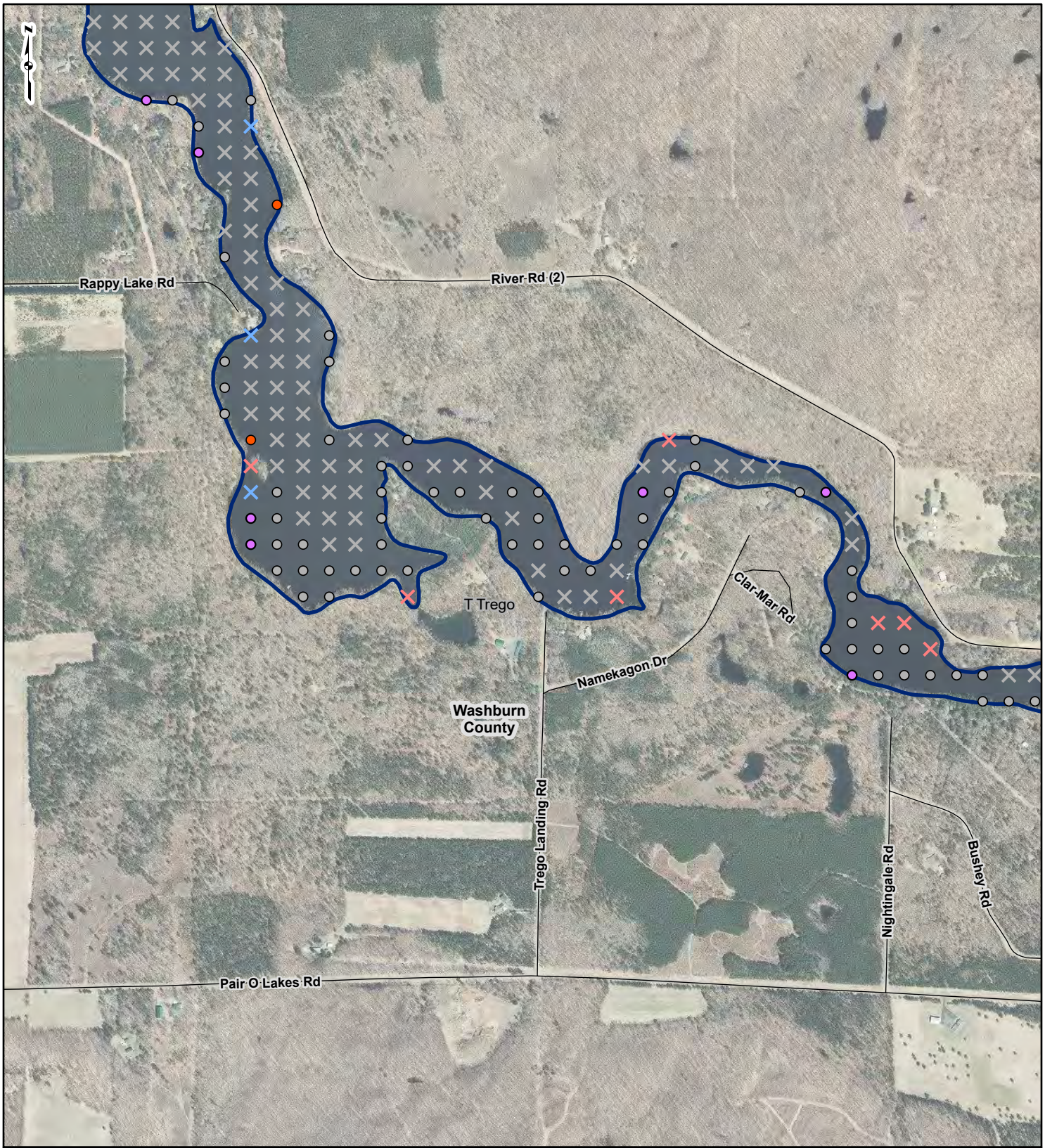

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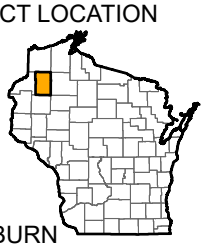

WASHBURN
COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common bur-reed
Common waterweed
Coontail
Curly-leaf pondweed
Fern pondweed
Flat-stem pondweed
Forked duckweed
Nitella
Wild celery
Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 21
July/August
Predominant Species
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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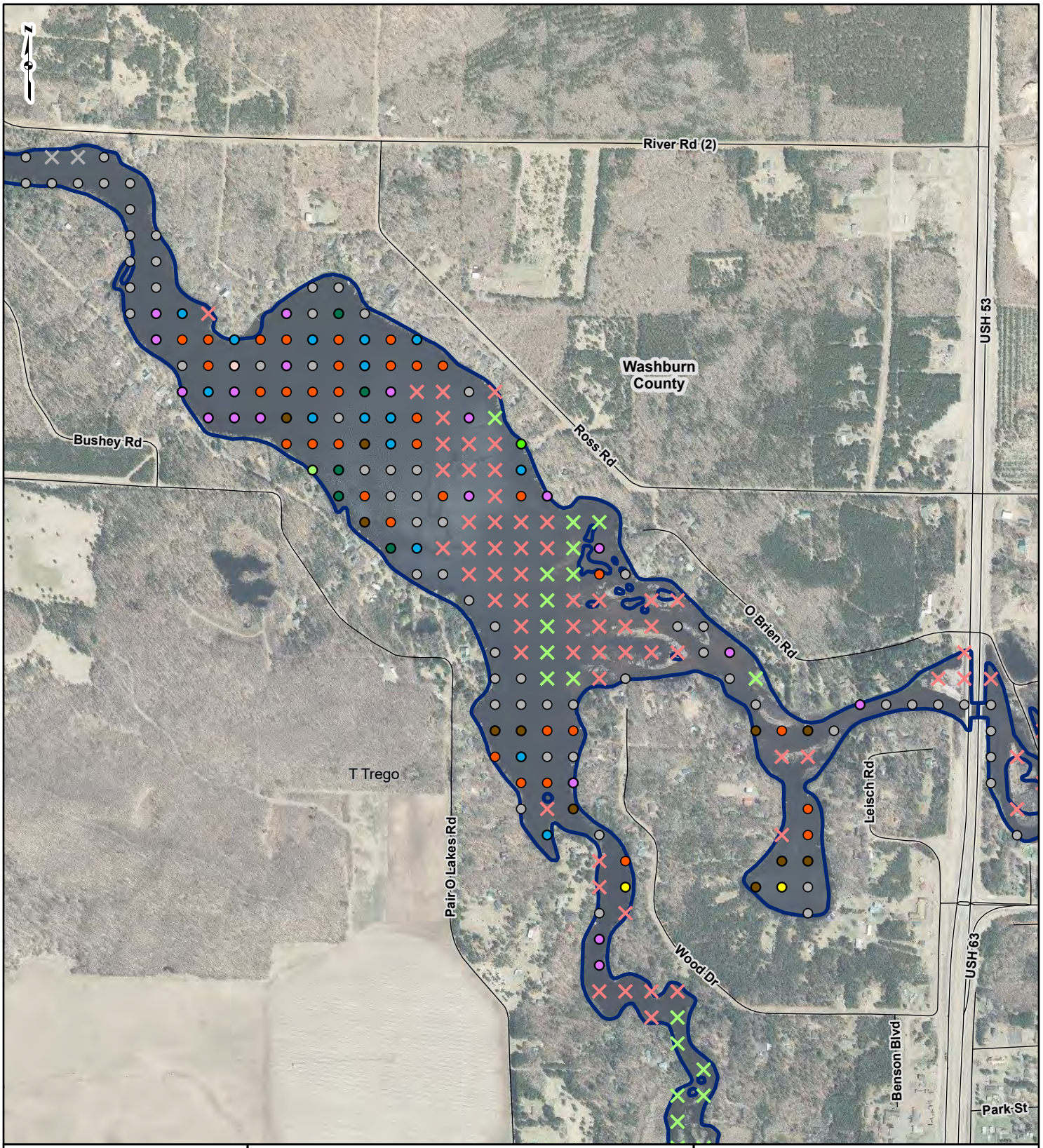

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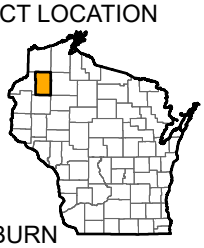

WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common bur-reed
Common waterweed
Coontail
Curly-leaf pondweed
Fern pondweed
Flat-stem pondweed
Forked duckweed
Nitella
Wild celery
Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 21
July/August
Predominant Species
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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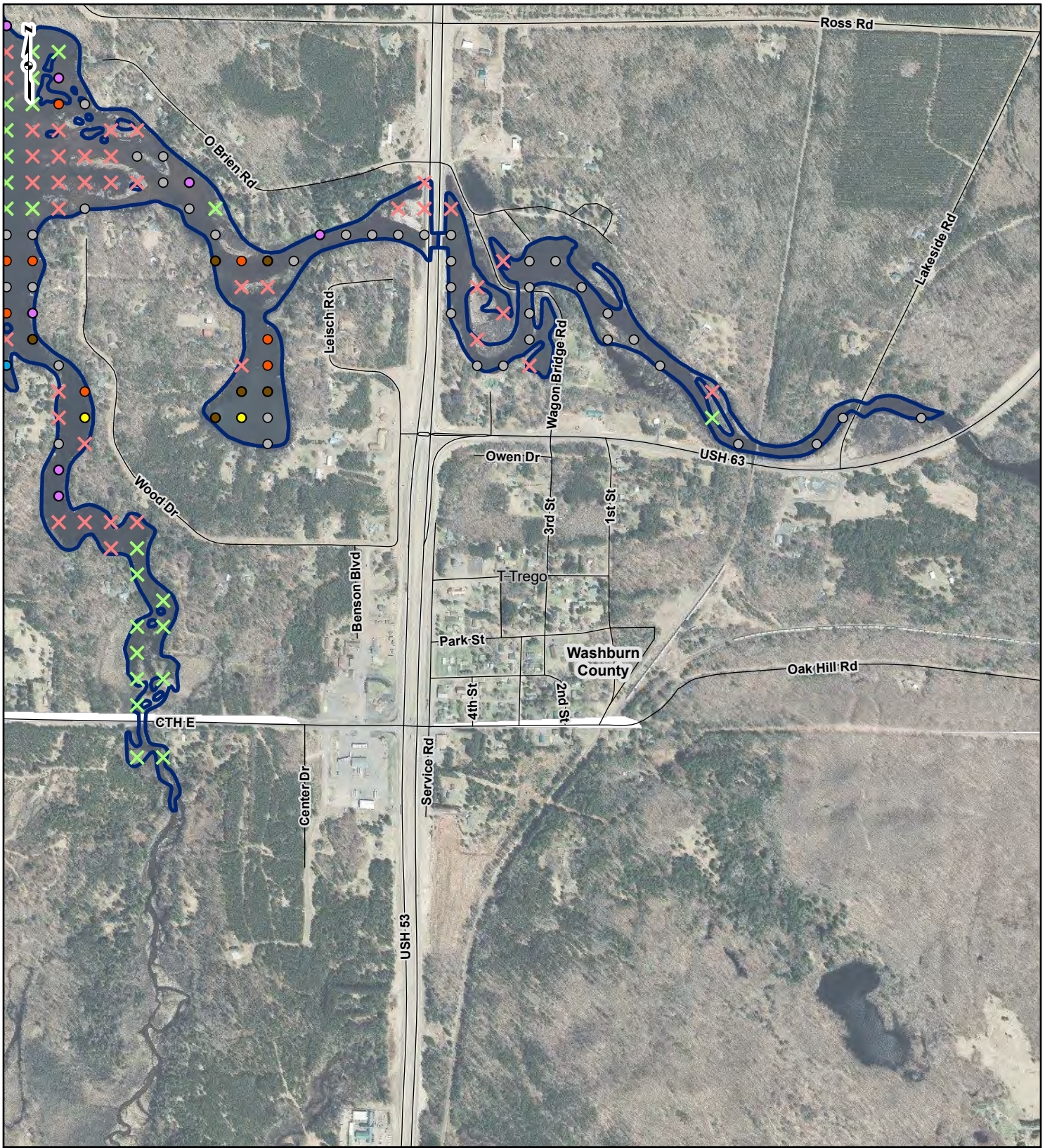
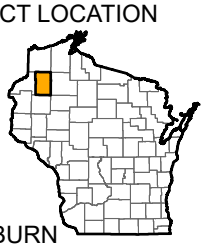


PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow
Other

Predominant Species
None
Common bur-reed
Common waterweed
Coontail
Curly-leaf pondweed
Fern pondweed
Flat-stem pondweed
Forked duckweed
Nitella
Wild celery
Project Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 21
July/August
Predominant Species
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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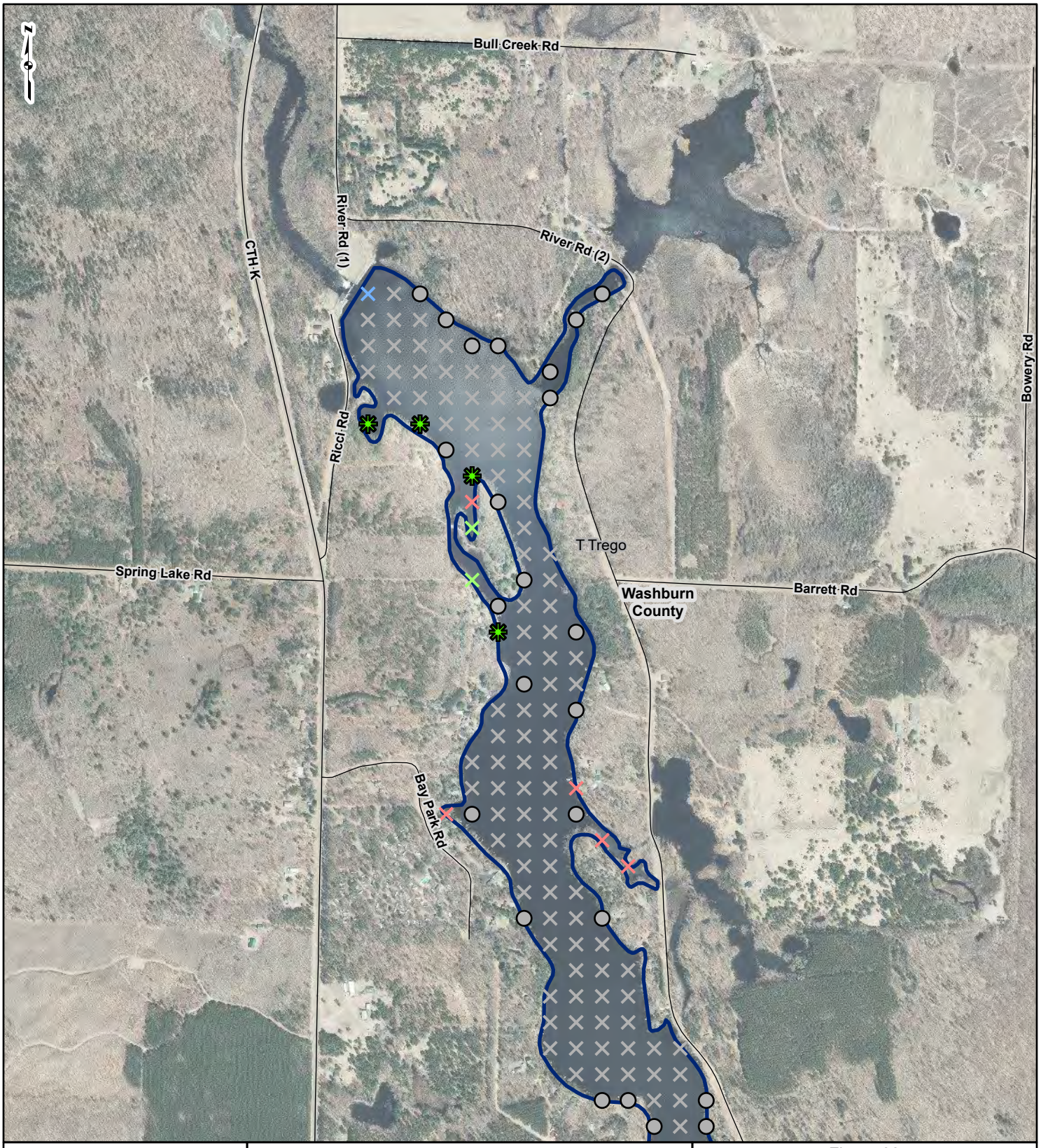
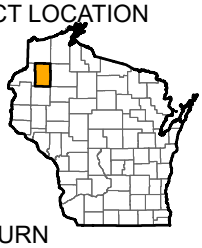
FIGURE 22
Trego June Aquatic Invasive Species



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 22
June
Aquatic Invasive Species
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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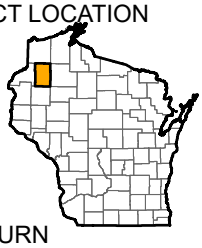
PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 22
June
Aquatic Invasive Species
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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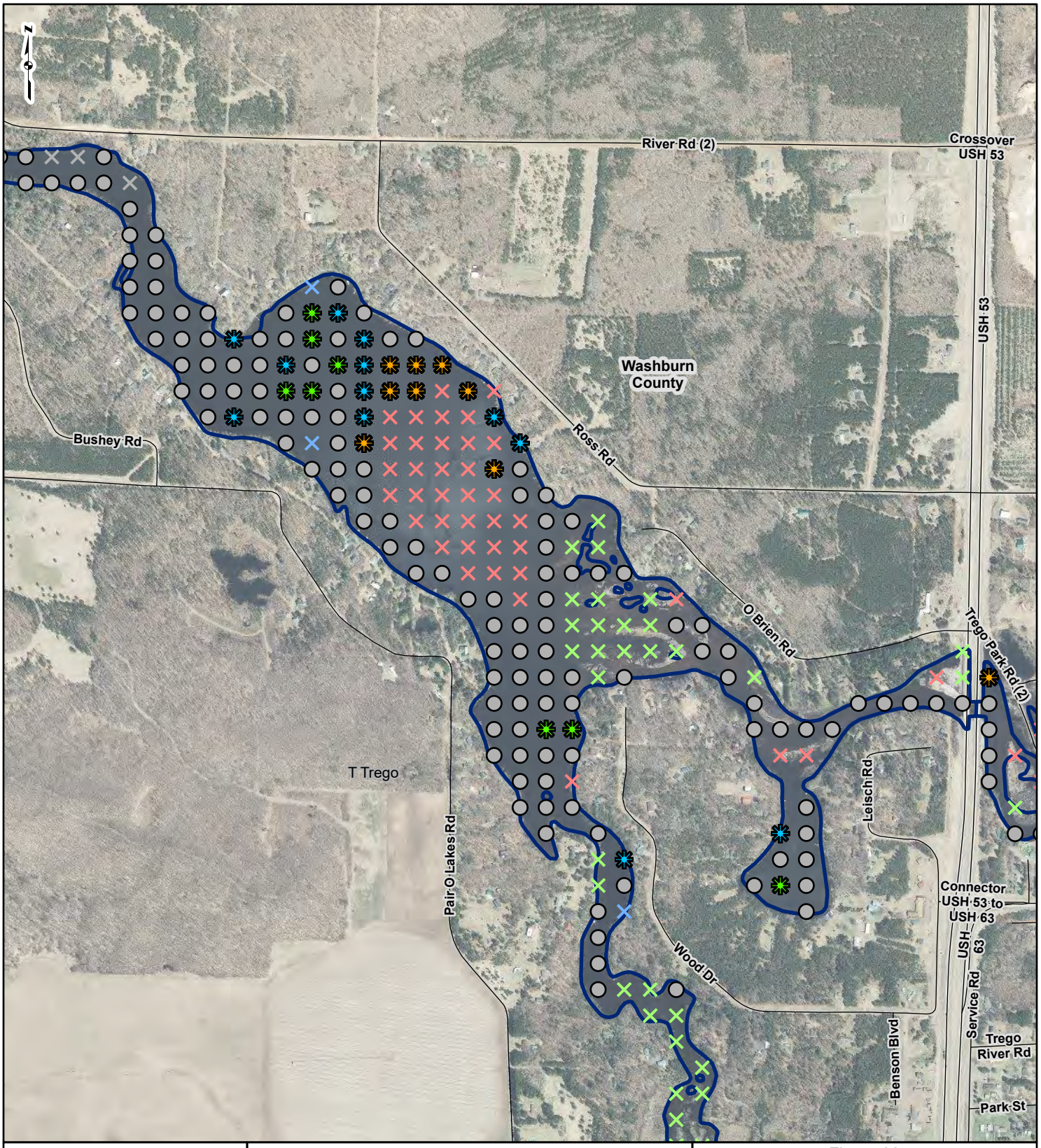

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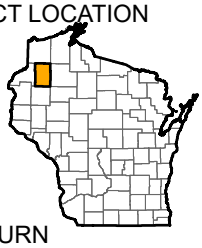

WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 22
June
Aquatic Invasive Species
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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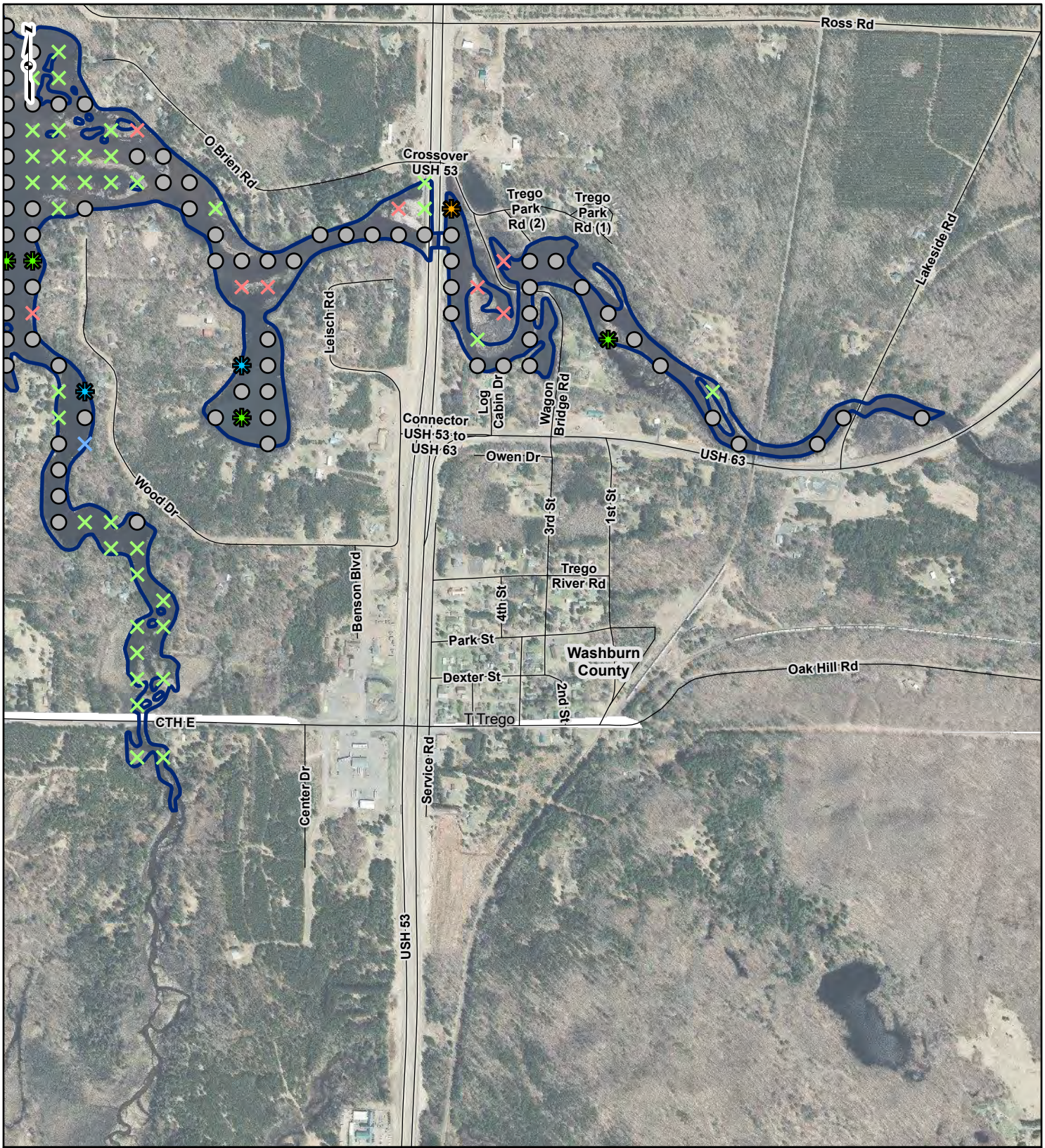

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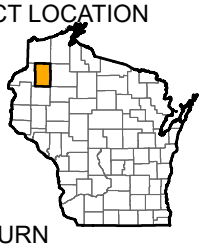

WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Both Invasives Present
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 22
June
Aquatic Invasive Species
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

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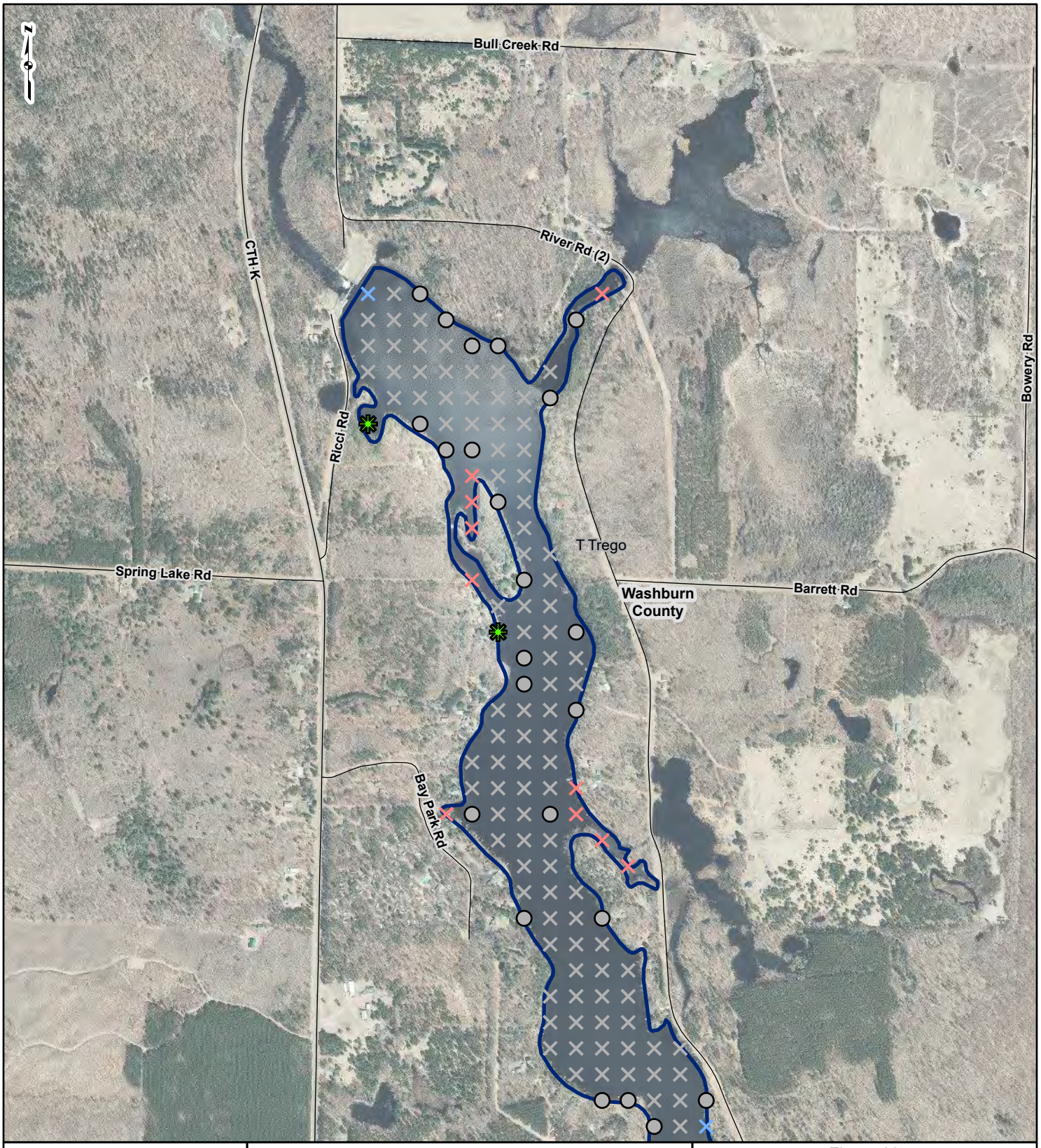
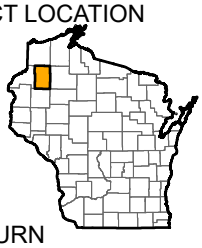
FIGURE 23
Trego July/Aug Aquatic Invasive Species



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 23
July/August
Aquatic Invasive Species
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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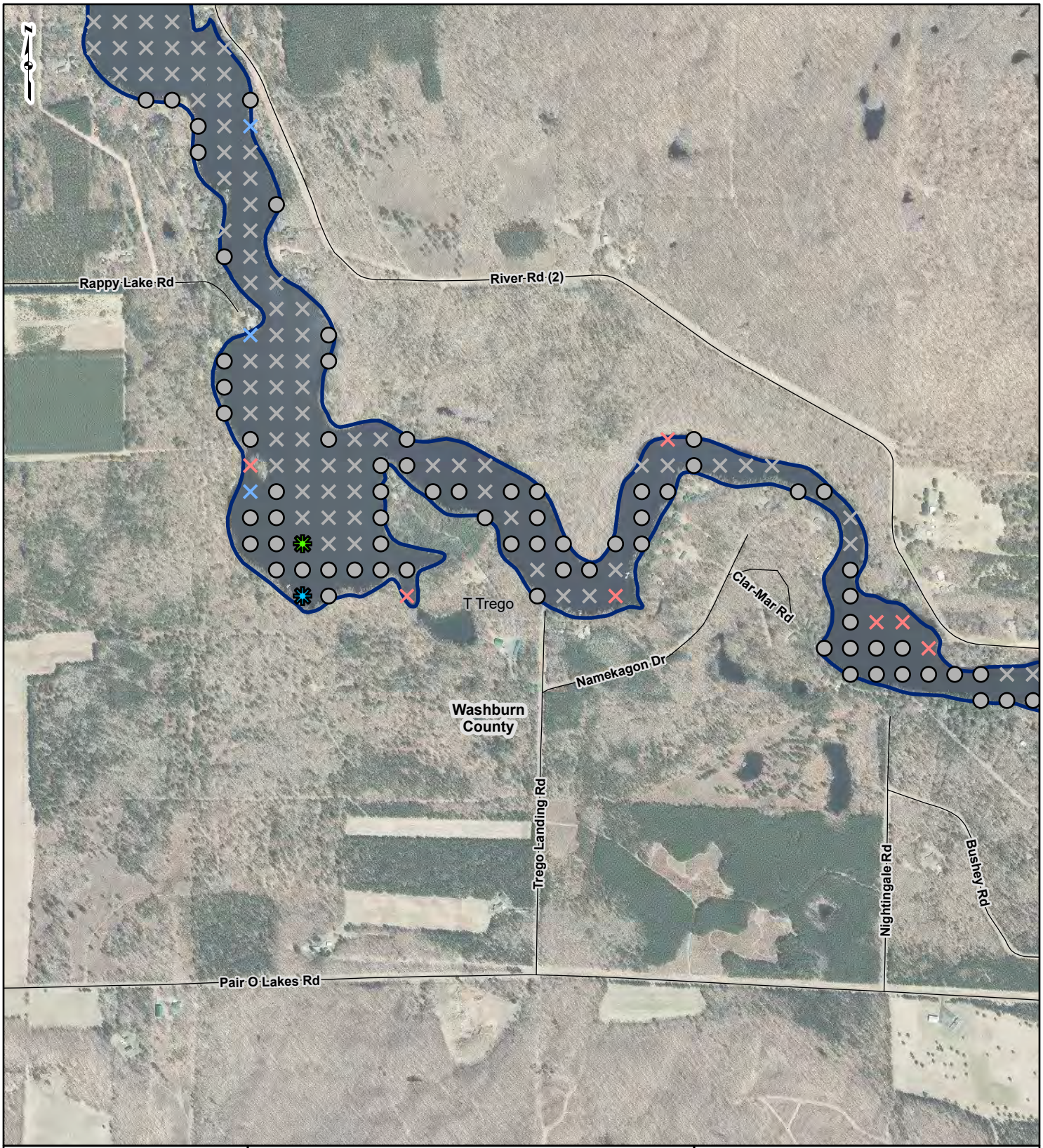
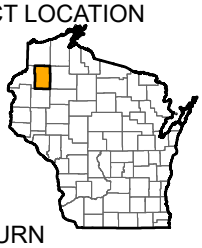


PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other
- No Invasives Present
- Curly-leaf pondweed
- Eurasian watermilfoil
- Point-Intercept Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 23
July/August
Aquatic Invasive Species
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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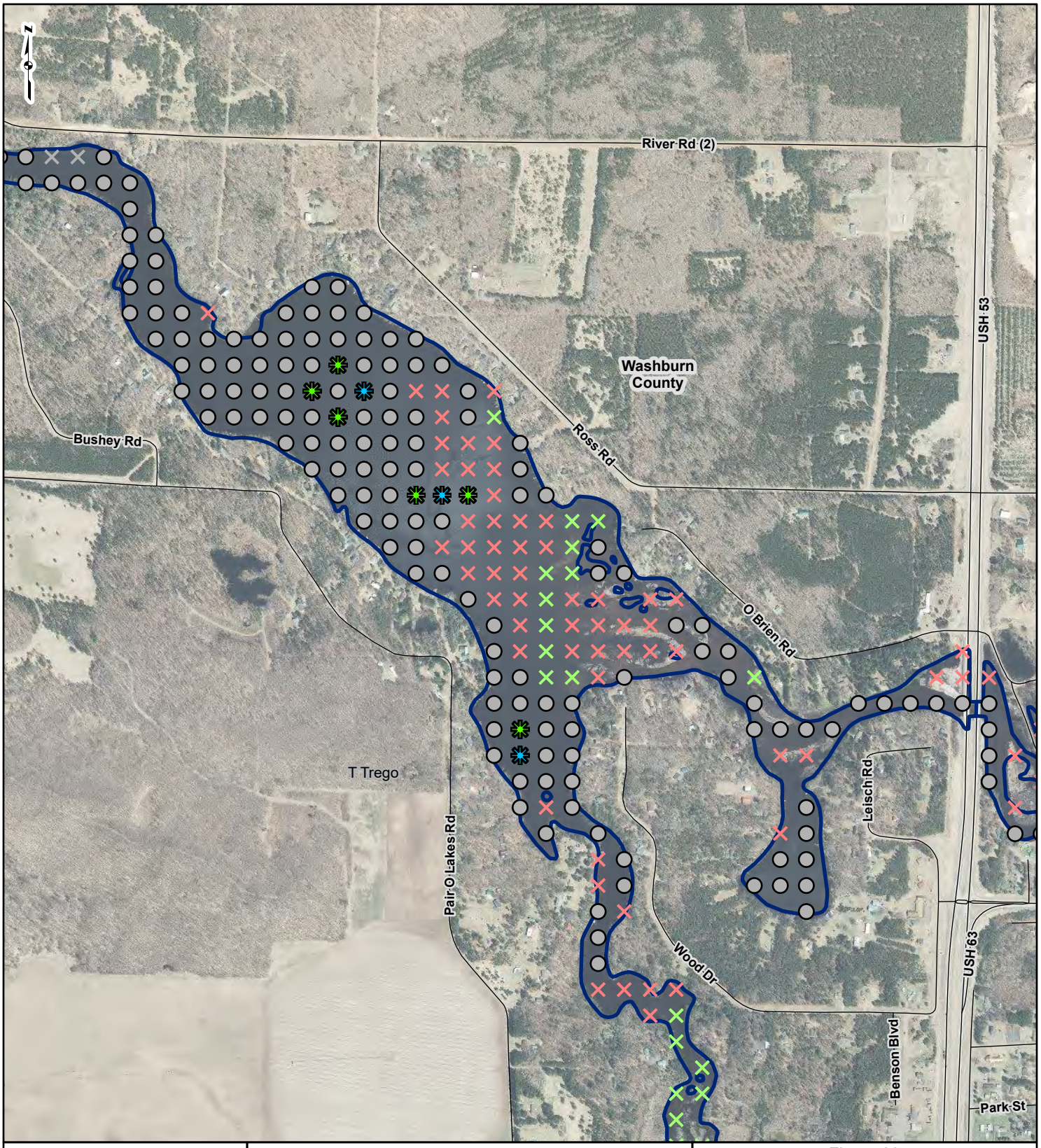
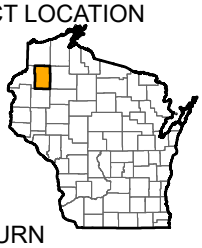


PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
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- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 23
July/August
Aquatic Invasive Species
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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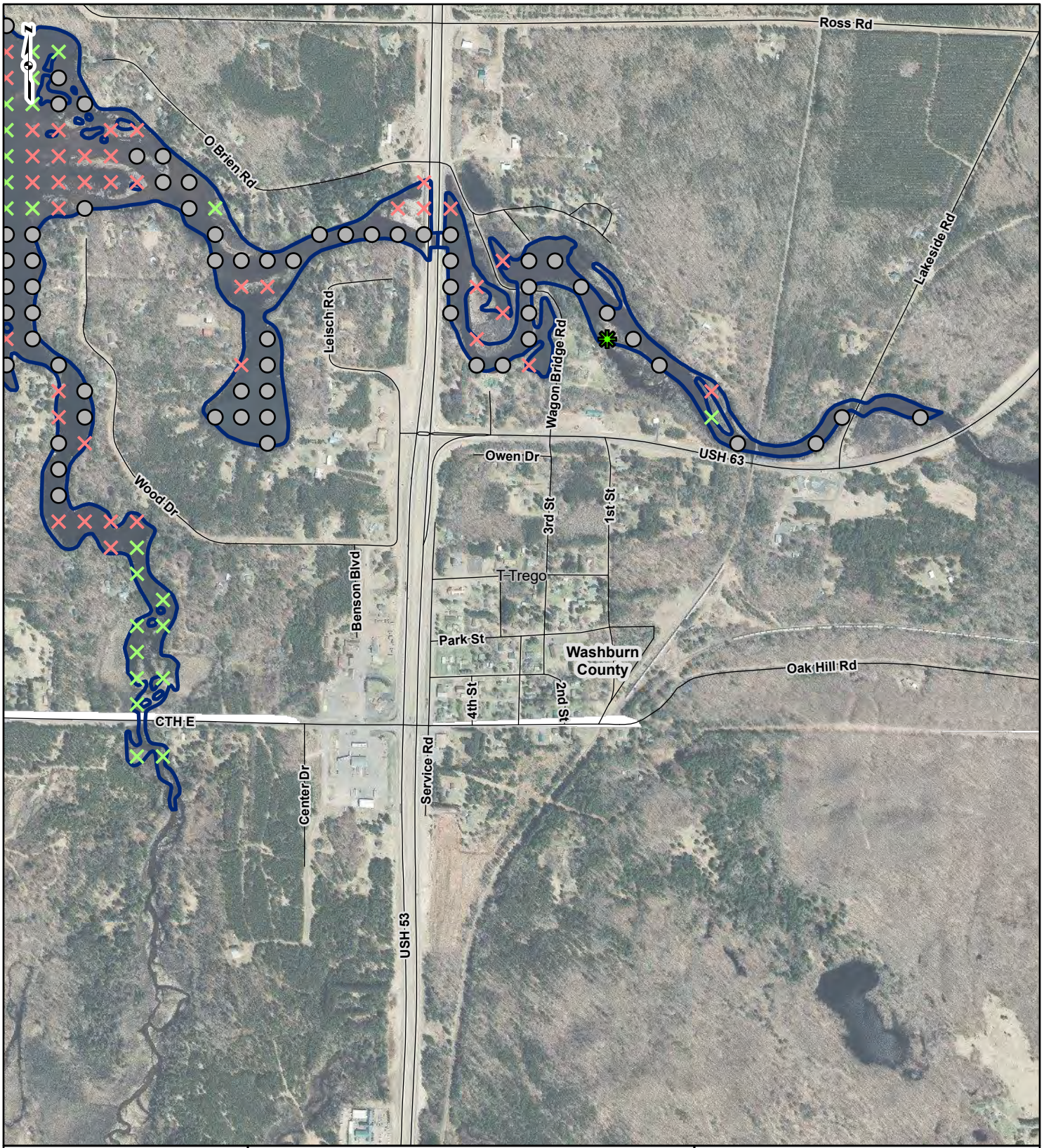
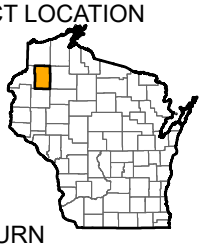


PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
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- Non-Navigable Terrestrial/ Shallow
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- Point-Intercept Project Boundary
- Road Centerline
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- County Boundary

0 500 1,000 2,000 Feet

Figure 23
July/August
Aquatic Invasive Species
Sheet 4 OF 4

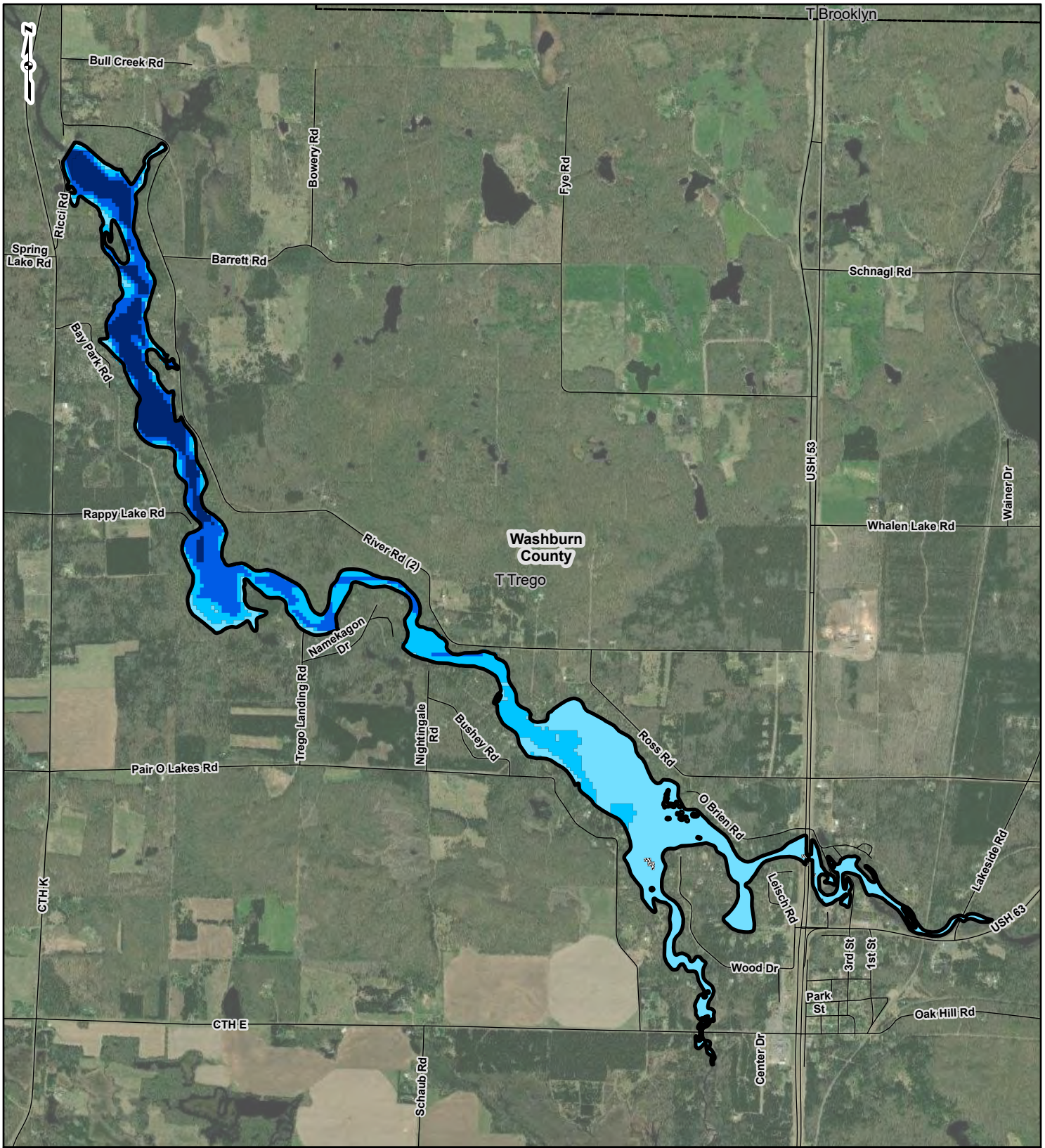
Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

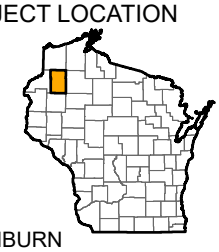
REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx

FIGURE 24
Trego Bathymetric Map



PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Depth
- 0 - 5 ft
- 5 - 10 ft
- 10 - 15 ft
- >15 ft

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 1,375 2,750 5,500 Feet

Figure 24
Trego Bathymetric Map

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

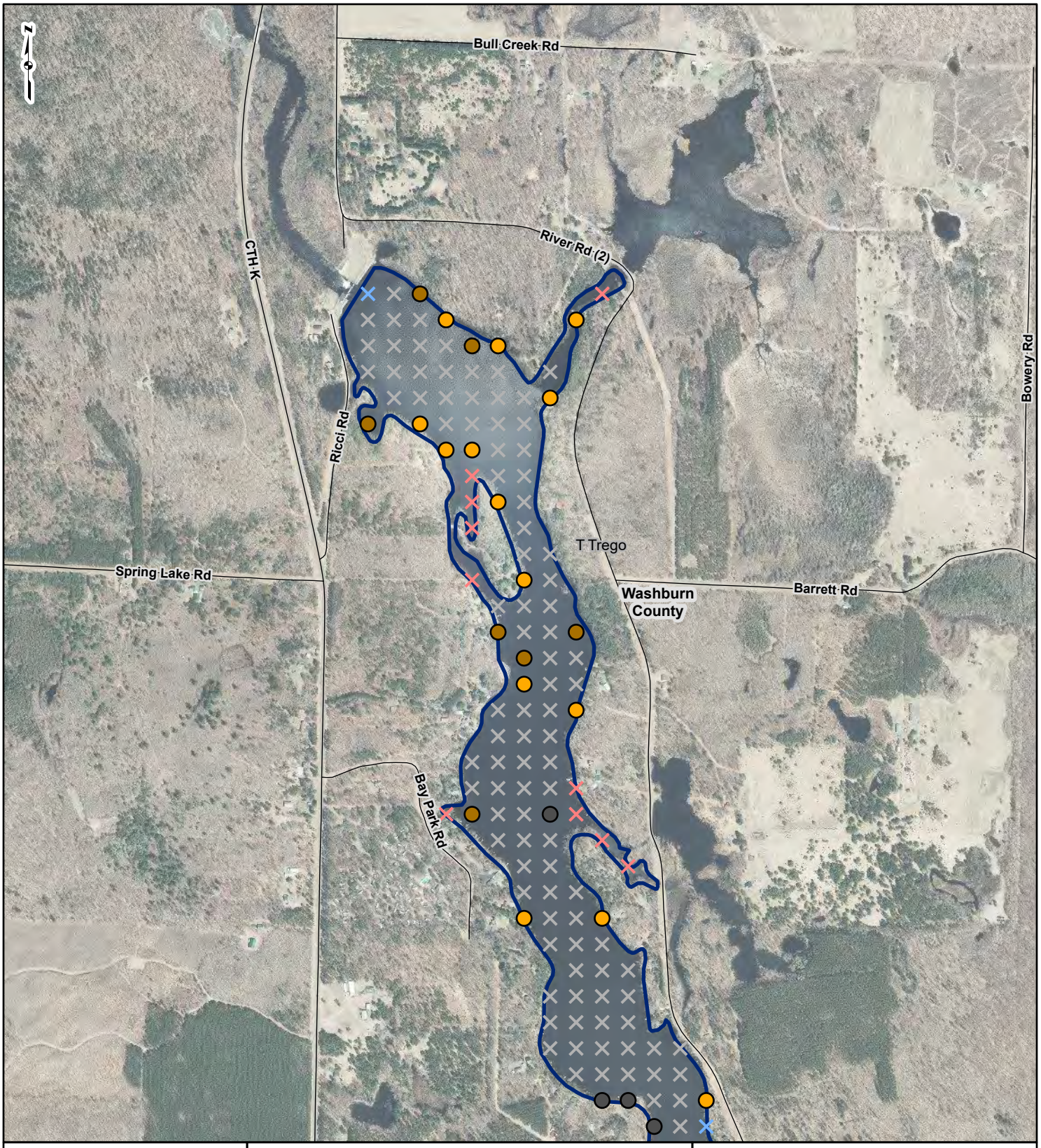
Mead & Hunt

DRAWN BY: EMW DATE: 10/27/22
CHECKED: TDB APPROVED: LLS

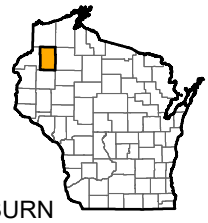
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Depth_Mapping\R220323_Trego_Depth_Mapping\Depth\R220323_00_Trego_Depth_2022_10_27.aprx

FIGURE 25
Trego Substrate Types



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Dominant Substrate
Boulder
Cobble
Gravel
Organic
Sand
Silt

Pnt-Int. Proj Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

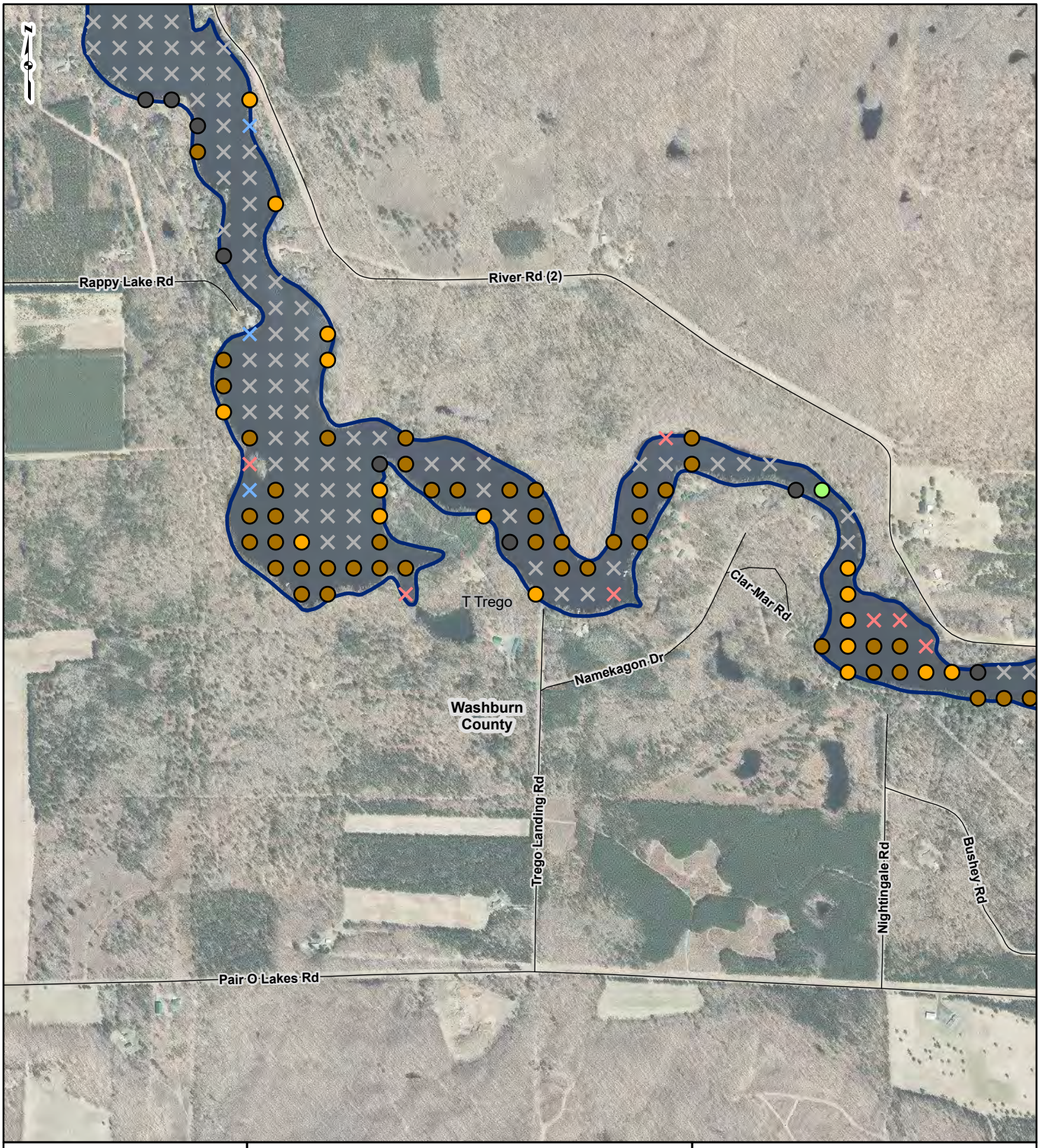
Figure 25
Substrate Types
Sheet 1 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

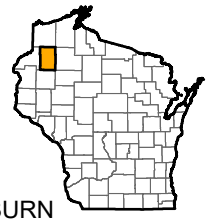
DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx



PROJECT LOCATION



WASHBURN
COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Dominant Substrate
Boulder
Cobble
Gravel
Organic
Sand

Silt
Pnt-Int. Proj Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 25
Substrate Types
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/27/2022
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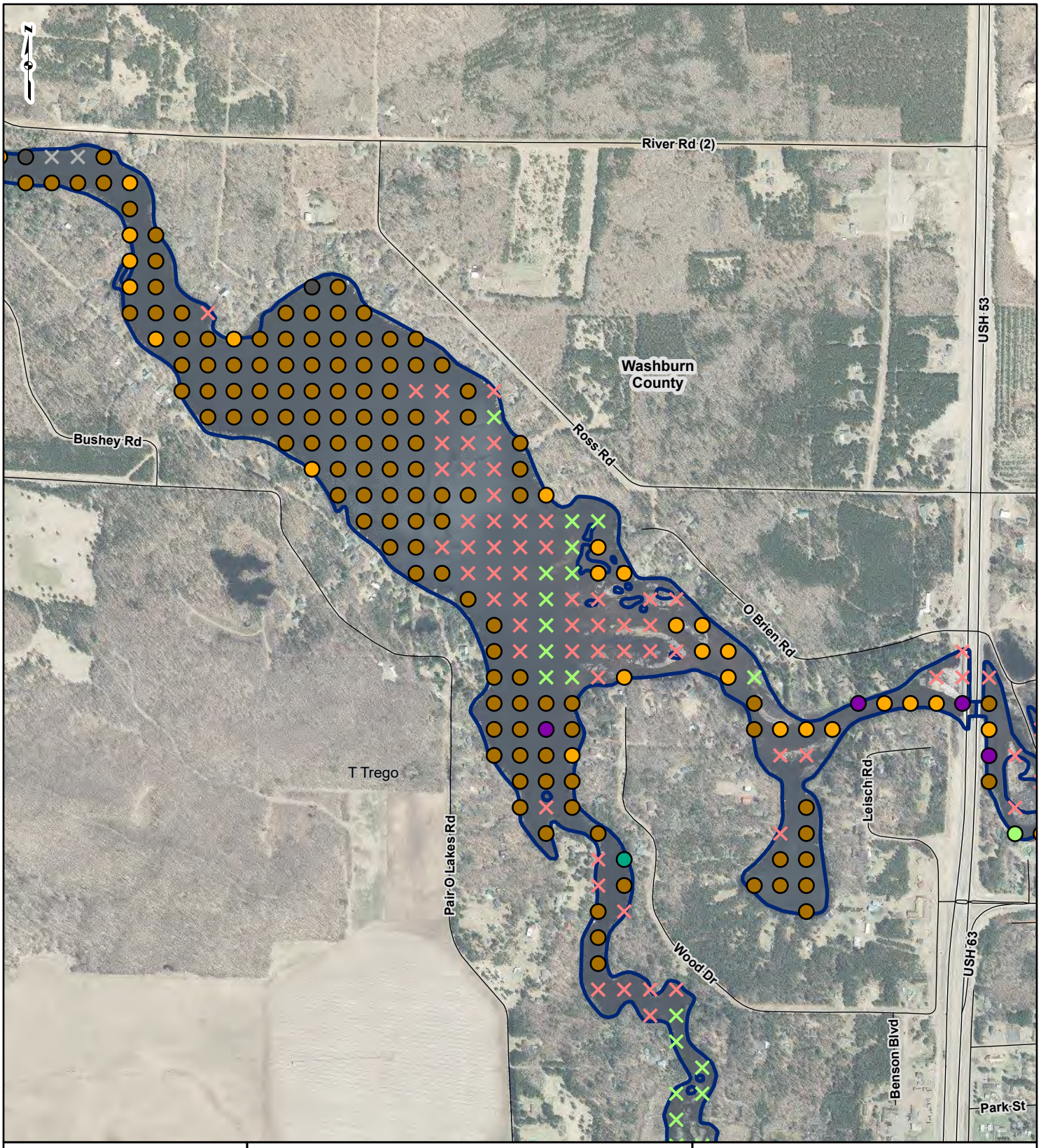
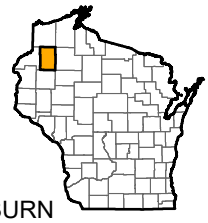
REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Other

Dominant Substrate

- Boulder
- Cobble
- Gravel
- Organic
- Sand
- Silt

- Pnt-Int. Proj Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

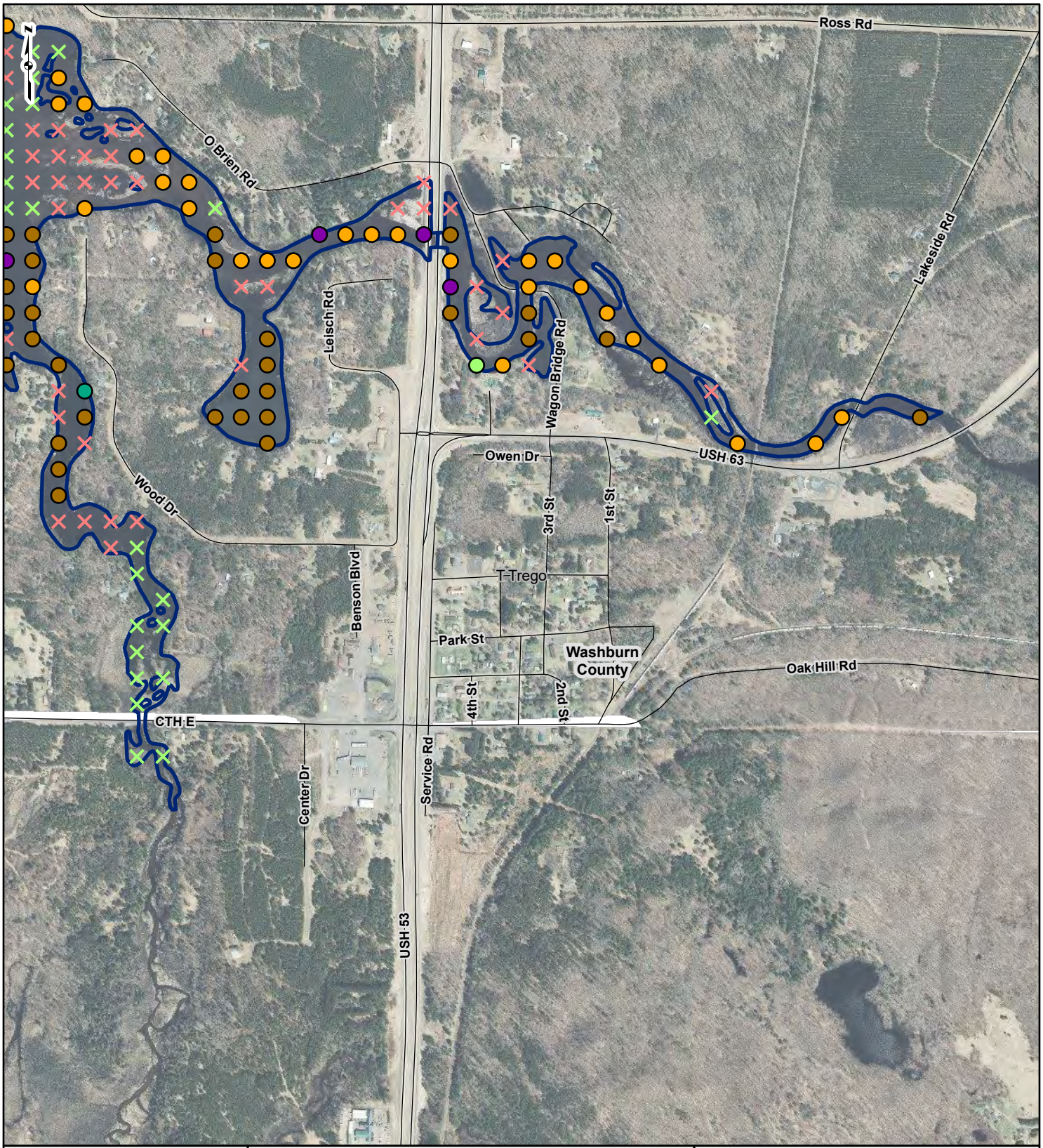
Figure 25
Substrate Types
Sheet 3 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx



PROJECT LOCATION

WASHBURN COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/ Shallow
Other

Dominant Substrate
Boulder
Cobble
Gravel
Organic
Sand
Silt

Pnt-Int. Proj Boundary
Road Centerline
Community Boundary
County Boundary

0 500 1,000 2,000 Feet

Figure 25
Substrate Types
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/27/2022
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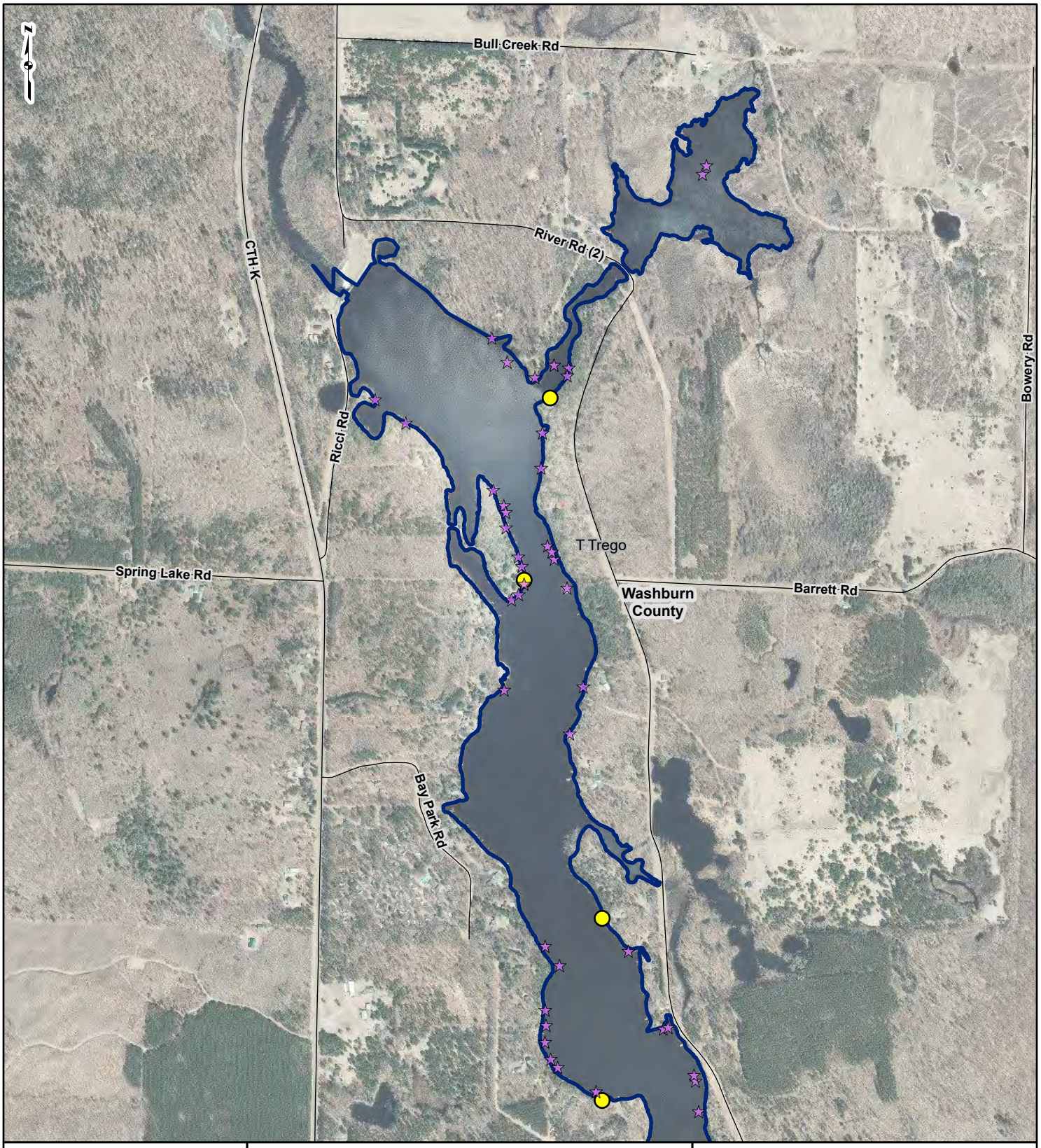
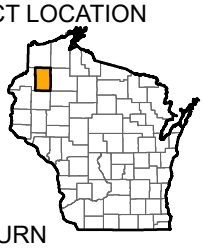
G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\R220323_00_Trego_Inv_Mapping.aprx

FIGURE 26
Trego Coarse Woody Debris/Habitat Map



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 26
Coarse Woody Debris/Habitat
Sheet 1 OF 4

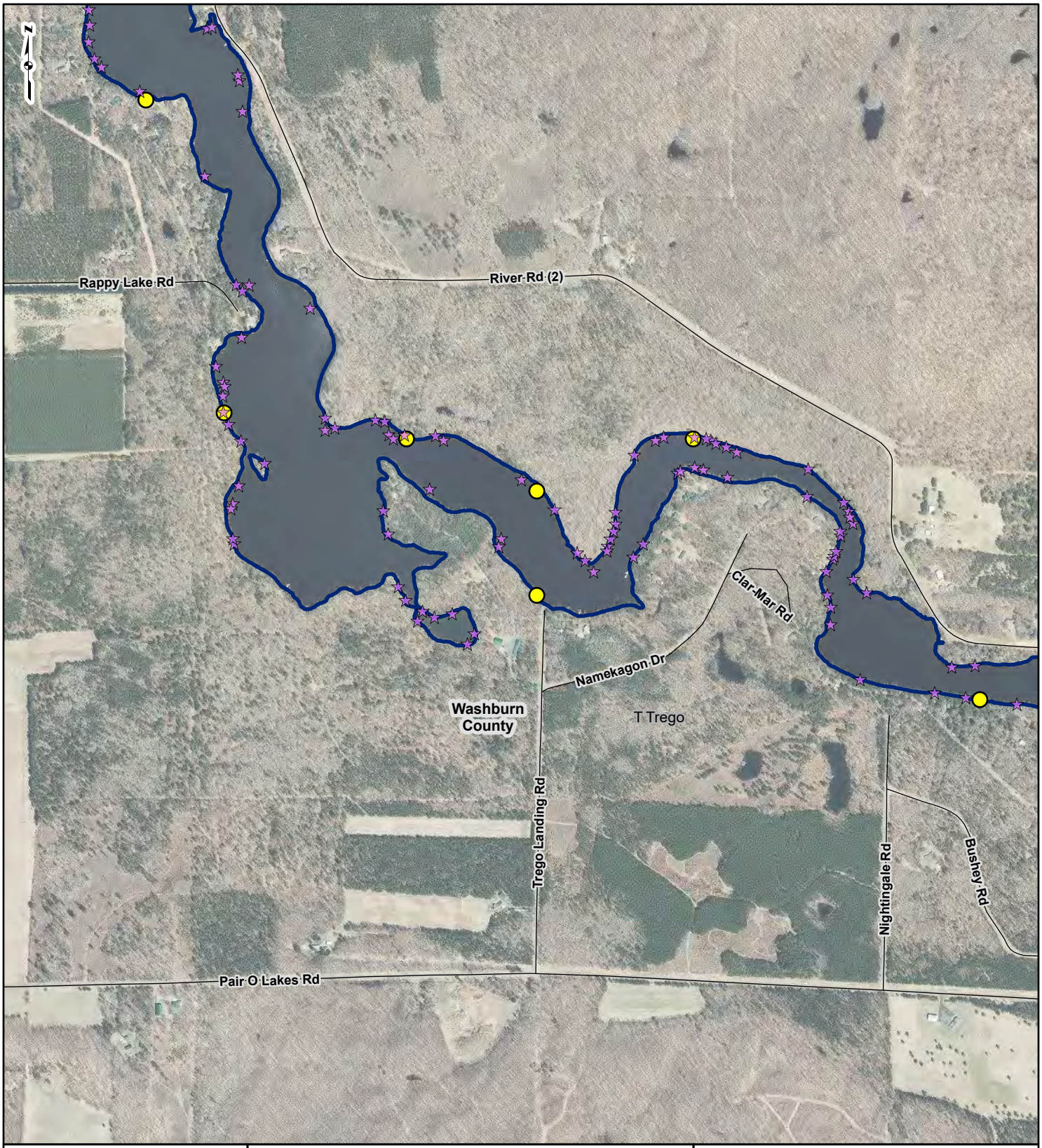
Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

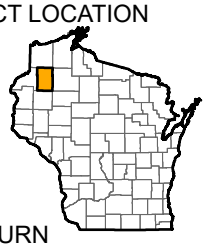
DRAWN BY: EMW DATE: 10/31/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 26
Coarse Woody Debris/Habitat
Sheet 2 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/31/2022
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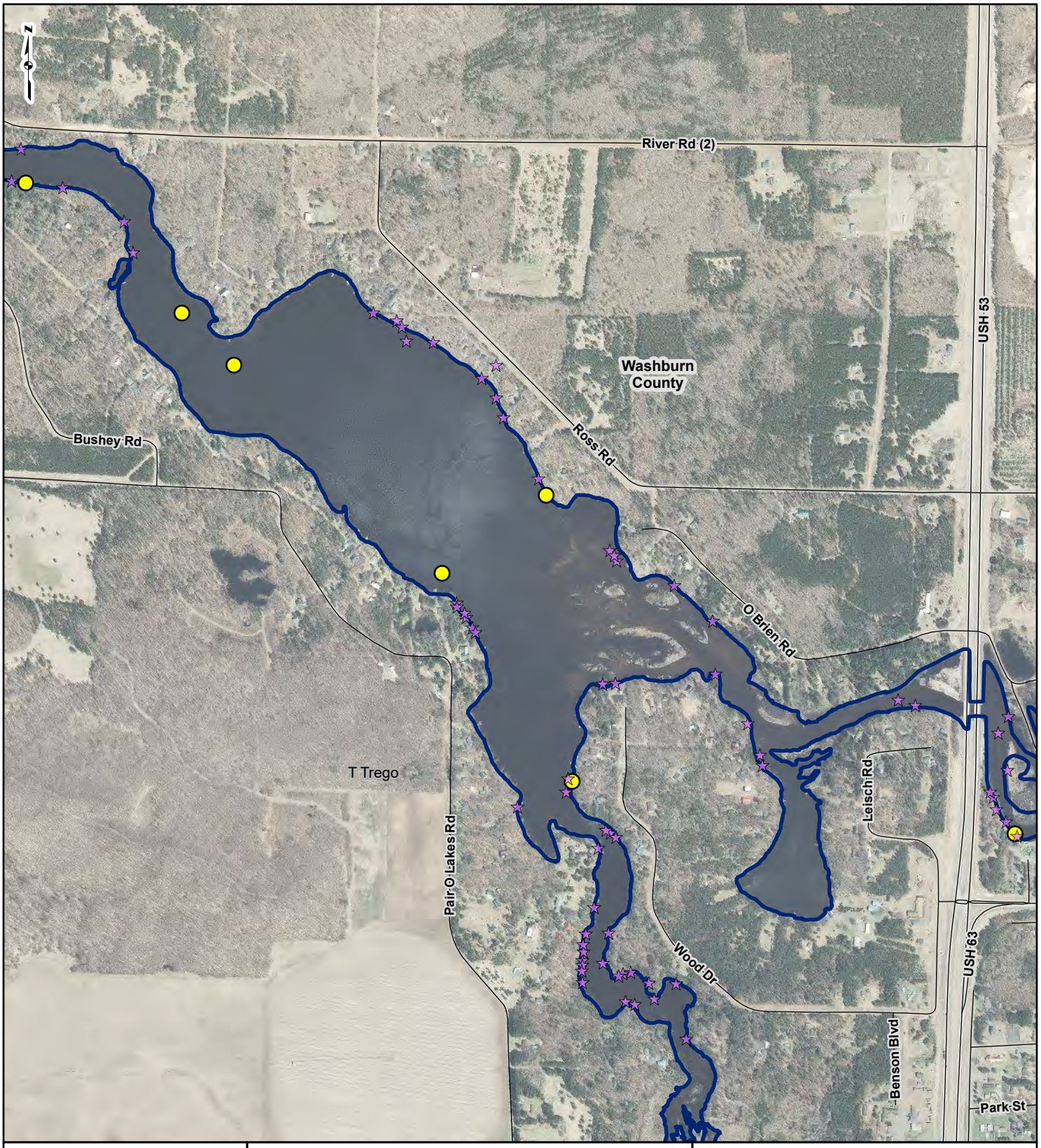
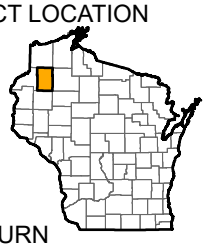
G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx



PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 26
Coarse Woody Debris/Habitat
Sheet 3 OF 4

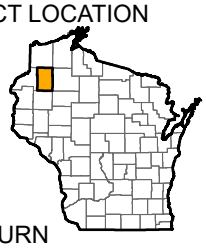
Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

DRAWN BY: EMW DATE: 10/31/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: DW_Image\EN_Image_Basemap_Leaf_Off: Accessed 10/31/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx

PROJECT LOCATION



WASHBURN COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

Figure 26
Coarse Woody Debris/Habitat
Sheet 4 OF 4

Trego Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

Mead & Hunt

DRAWN BY: EMW DATE: 10/31/2022
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G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\Trego\R220323_00_Trego_Inv_Mapping\VOID\R220323_00_Trego_Inv_Mapping_2022_10_30.aprx

ATTACHMENT A

Hayward Point-Intercept/AIS Survey
Field Data Sheets - June

gai consultants
transforming ideas into reality

yellow iris - many indiv and clumps of plant along shoreline.

freshwater sponge

Filamentous Algae

Waterbody/Project: Hayward

Date: 6/7/2022

Crew: Laura Sass, Heather Lutzow, ~~[illegible]~~

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	coarse woody debris (Y/N)	Ceratophyllum demersum	Myriophyllum sibiricum	Myriophyllum spicatum	Sparganium eurycarpum	Potamogeton Richardsonii	Nymphaea odorata	Potamogeton Fresii / gramineus	Potamogeton zosteriformis	Potamogeton Robinsonii	Elodea Canadensis	~~Bidens Beckii~~ Valisneria Americana	Nuphar variegata	Lemna Trisulca	Nitella / Chara	P. crispus	Heteranthera dubia
254	>11	–	–	–	–	–																
285	5.5	R	R	Cobble	Ø	N																
286	>10	–	–	–	–	–																
317	past dam		bouy's	–	–	–																
318	4	S	R	sand	Ø	wood pullings	note - Lots Chinese mystery snails															
255	>10	–	–	–	Ø	–																
256	9.6	R	R	Gravel	Ø																	
224	>10	–	R	–	–	–																
197	5.6	S	R	sand	Ø	N																
288	>10	–	–	–	–	–																
199	2.0	S	R	sand	1	N	1	1	V	1	V											
142	too deep		–	–	–	–																
170	Terrestrial		–	–	–	–																
143	too deep		–	–	–	–																
147	5.2	S	R	Sand	Ø	Y lg																
119	3.0	S	R	Sand	Ø	Y small						V	N									
120	7.5	S	R	Sand	Ø	Y																
104	0.5	S	R	Sand	Ø	N																
97	5.0	S	R	Sand	1	N					1											
76	5.0	M	R	org	1	N			V					1	1	1	1					
105	4.0	M	R	org	1	N			1				1	1	1	1		V	1	1	1	1
75	1.9	S	R	sand	1	N				V	V	V		1	1	V						1
64	4.4	M	R	org	1	N			V							1						1
55	5.5	M	R	org	2	N	1			1			1	1	1	1	1					
45	8.0	M	R	org	2	N	1		2							2					1	
46	8.5	M	R	org	2	N	2		1					1		1						
47	9.0	M	R	org	3	N														3		
37	10.0	M	R	org	3	N														3		

Lake association
Todd Heidi
President Sec/Treas
815-621-0347

PI done last year

Waterbody/Project: Hayward
Date: 6/7/2022
Crew: Laura Sass + Heather Lutzow

Sampling Point	Depth (ft) / CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / Myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Nitella	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. Robbinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Sagittaria spp	P. epihydrus / P. friesii	P. gramineus / Chara	Vallisneria americana
239	7.5 Y	M	R	muck	1				1							1
240	1.5 N	S	R	muck	1				1							
329	6.0 N	M	R	muck	1				1			1				1
330	7.0 N	M	R	muck	1				1			1				1
273	11.0 N	M	R	muck	Ø											
241	5.5 N	M	R	muck	2			1	2							
213	6.5 N	M	R	muck	2	2 1			1							
186	6.5 N	M	R	↓	1	1			1							
185	4.5 N	M	R	↓	3	3					1					
159	3.5 N	M	R	↓	2	1		2	1						1	
135	2.8 N	M	R	↓	1	1			1	V						
160	6.8 N	M	R	↓	2	1					1					
159	2.5 N	M	R	muck	1	1 1	1	1			1	1				
161	4.9 N	M	R	↓	3	1 1		1	1	V	3					
162	4.5 N	M	R	↓	2	2		1		V	3					
137	2.7 N	M	R	↓	1				1	V					1	
163	4.5 N	M	R	↓	3	3		1	2	V						
164	3.4 N	M	R	↓	3	1			1		3	1				
191	4.5 N	M	R	↓	3			3	1		1	1				
190	5.3 N	M	R	↓	3	3		1	1		1					
189	5.4 N	M	R	↓	3	2		3	1		3					
188	6.5 N	M	R	↓	3	2 V		2	1		2					
187	5.9 N	M	R	muck	2	2		1			2	1				
214	5.6 N	M	R	muck	2	2		1			1					
242	6.5 N	M	R	muck	2	1 2			1							
274	10.1 N	M	R	muck	Ø											
3016	11.0 N	M	R	muck	Ø											
349	6.3 Y	M	R	muck	1	1		1				1				1

Waterbody/Project: Hayward Date: 6/7/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic) muck	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum spicatum	M. sibericum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	P. zosteriformis	Nymphaea odorata	Nuphar variegata	P. Robinsii	P. amplifolius	Lemna trisulca	Bidens beckii	P. praelongus	Vallisneria americana	P. epihydrus	P. friesii	P. gramineus	Equisetum spp	Sparganium eurycarpum	Chara	Utricularia vulgaris	Proserpinaca	P. Richardsonii	Sagittaria spp
183	8.0	N	M	R	muck	1	1	1				1																				
182	8.6	N	M	R	muck	2	2							1					1		1											
181	9.0	N	M	R	muck	Ø																										
180	10.0	N	M	R	muck	1						1																				
179	10.4	N	M	R	muck	1						1																				
178	10.4	Y	S	R	sand	Ø																										
175	6.5	N	S	R	sand	Ø																										
174	2.0	N	S	R	sand	1		1											1						1	1						
173	1.5	N	S	R	sand	1		V							V												1					
172	2.5	N	S	R	sand	2							1									1						2				
149	3.5	N	M	R	muck	2	1										1															
148	2.8	N	M	R	muck	1	1								1			1	1													
171	1.5	Y	S	R	sand	1							1		1														1	√		
200	1.5	Y	S	R	sand	/		1				1	1																			
201	4.4	N	S	R	sand	/	1							1					1			1										
207	10.5	N	M	R	muck	1						1																				
208	7.6	N	M	R	muck	1								1							1											
209	8.5	N	M	R	muck	3	3				2			1																		
210	7.5	N	M	R	muck	1		/					1	1																		
211	8.1	N	M	R	muck	2						2																				
212	1.4	Y	S	R	sand	1																									1	
237	7.6	N	M	R	muck	1	1				1	1		1					1													
236	7.0	N	M	R	muck	1					/			1					1		1											
235	8.3	N	M	R	muck	1						1		1																		
234	9.3	Y	M	R	muck	/								1																		
252	5.5	N	M	R	muck	1		V									1															
231	2.5	N	M	R	muck	/							L		1		1		1													/
227	4.0	N	M	R	sand	1	1							1					1									1				

Waterbody/Project: Hayward

Date: 6/7/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft) CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / Myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Utricularia	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. robbinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Vallisneria Americana	P. epihydrus / P. friesii	P. gramineus / Chara	Sagittaria spp / Eleocharis acicularis						
260	4.0 N	M	R	muck	1					V	1	1			1	1						
291	4.0 N	S	R	sand	1	1 1				V		1										
290	8.0 N	M	R	muck	1						1											
289	8.2 N	M	R	muck	1			1				1			1 1	1						
259	4.5 N	S	R	sand	1										1							
319	9.2 N	M	R	muck	2			2			1	L										
346	2.9 Y	M	R	muck	1	1		1			1											
292	2.2 N	S	R	sand	1				1						1	1						
293	3.4 N	S	R	sand	1	1								1	1							
294	4.4 N	M	R	muck	2			2	1							1						
320	2.6 N	S	R	sand	⊘																	
321	6.0 N	M	R	muck	2	1					2	1										
327	4.0 N	S	R	sand	1				1			1		1		1						
369	3.5 N	M	R	muck	1							1					(filamentous)					
368	1.7 N	S	R	sand	1				1	V												
388	2.6 Y	S	R	sand				1						1		1						
387	3.0 Y	M	R	muck	1				1	V				1	1							
348	2.5 N	M	R	muck	1						1	1										
322	1.6 Y	S	R	sand	1											1						
295	9.5 Y	S	R	sand	⊘																	
324	3.4 N	S	R	sand	1				1			1			1							
323	2.5 Y	S	R	sand	⊘	filamentous																
296	10.0 N	M	R	muck	⊘																	
299	3.5 N	S	R	sand	1										1							
326	2.8 Y	S	R	sand	⊘																	
328	8.5 N	S	R	sand	⊘																	
288	8.7 N	M	R	muck	1				1													
270	7.2 N	M	R	muck	1				1				1			1						

Waterbody/Project: Hayward Date: 6/7/2022

Crew: Laura Jass + Heather Lutzow

Sampling Point	Depth (ft)		Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum spicatum	M. sibiricum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	P. zosteriformis	Nymphaea odorata	Nuphar variegata	P. robbinsii	P. amplifolius	Lemna trisulca	Bidens beckii	P. praelongus	Vallisneria americana	P. epihydrus	P. fries.
125	8.3	N	M	R	Muck	1	1	1						1					1					
95	7.2	N	M	R		1																		
97	95	N	M	R		1						1												
96	9.8	N	M	R		1		1				1		1							1	1		
109	8.4	Y	M	R		1								1										
110	10	N	M	R		1						1												
111	8.4	N	M	R		1								1										
110	9.0	M	M	R		3						3												
98	8.5	N	M	R		3	3							1										
99	2.0	Y	S	R	sand	1								1										
113	4.5	N	S	R	sand	2	1				1								1				1	
114	32	N	M	R	muck	0																		
134	1.5	N	S	R	sand	1																1		1
133	4.6	N	S	R	sand	2			1		1			1						1				
132	9.4	N	M	R	muck	3					1	3												
131	9.0	N	M	R	muck	2		2						1										
130	9.0	M	M	R	muck	2	2				1			1										
129	8.5	N	M	R	muck	1		1			1			1										
128	9.5	Y	S	R	sand	0																		
150	4.3	N	S	R	sand	0																		
152	9.4	Y	S	R	sand	0																		
153	6.9	N	M	R	muck	2		2		1				1					1		1			
154	10	Y	M	R	muck	0																		
155	9	N	M	R		1	1	1				1		1							1			
12[illegible]	7.5	N	M	R		2	2	1			1		1								1			
157	3.9	N	M	R		1					1	1		1										
158	5.0	N	S	R	Sand	1	1							1										
18[illegible]	1.0	N	S	R	sand	0																		

69°
Partly Cloudy

Waterbody/Project: Hayward
Date: 6/7/2022
Crew: Laura Sass   Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum sibiricum	M. spicatum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	P. zosteriformis	Sparganium	Nymphaea odorata	Nuphar variegata	P. Robbinsii	P. amplifolius	Lemna trisulca	Bidens Beckii	P. gramineus	Utricularia minor	Vallisneria Americana	P. praelongus	P. [illegible]	
32	6.5	N	M	R	org	3				1				1				3		1							
39	7.9	N	M	R	↓	2	2			1				1													
40	8.4	N	M	R	↓	2				2		1															
48	9.4	N	M	R	↓	2						2															
34	5.5	N	M	R	↓	2	1											2	1								
42	4.4	N	M	R	↓	1					1			1				1		1							
52	4.5	N	M	R	↓	1	1				1							1		1							
51	9.0	N	M	R	↓	1		1						1				1									
41	7.5	N	M	R	↓	2		2		1																	
50	8.5	N	M	R	↓	2	1	1						1				1									
49	9.1	N	M	R	↓	1					1	1															
58	10.6	N	M	R	↓	Ø																					
90	4.5	N	S		sand	Ø																					
59	10.5	Y	S		sand	1	1																				
60	10.5	Y	S		sand	Ø																					
61	10.0	Y	S		sand	2						2															
62	9.5	Y	M		muck	1		1				1															
63	6.0	Y	S		sand	1																1	1				
74	5.9	Y	S		sand	1	1							1										1			
73	8.5	Y	S		sand	1		1		1				1										1			
72	2.8	Y	M		muck						1			1											1	1	
71	>11		-	-	—																						
36	4.0	Y	S		sand	1	1				1			1										1			1
85	8.5	N	M			1								1													
84	10	N	M		org							1		1													
83	11	Y	M		org	Ø																					
91	10.4	Y	S		sand	Ø																					
106	6.5	Y	S		sand	1		1		1			1	1	1									1		1	

Waterbody/Project: Howard   Date: 6/7/2022

Crew: Laura Jess - Heather L

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum spicatum	Myriophyllum sibiricum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	Potamogeton zosteriformis	Sparganium fluitans	Nymphaea odorata	Nuphar variegata	Potamogeton robbinsii	Potamogeton amplifolius	Lemna trisulca	Bidens beckii	Utricularia minor	Potamogeton friesii	Sparganium fluctuans	Potamogeton gramineus
56	9.7	N	M	R	org	3						3													
54	1.5	N	S	R	sand	2																			
53	1.2	N	S	R	sand	1							1	1	V	V									
43	2.1	N	S	R	Sand	1							1												
44	6.4	N	S	R	sand	2	1			1	2														
35	6.1	N	M	R	org	1					1						1								
36	6.5	N	M	R	org	2	2			1				1											
37	7.4	N	M	R	org	3	3			2															
38	8.3	N	M	R	org	2		2		1		1		1											
31	6.5	N	M	R	org	2	1	2			1			1				1							
30	5.9	N	M	R	org	2	2				1			1											
29	5.0	N	M	R	org	2	1	V			2							1							
28	2.8	N	M	R	org	2	1										1	1	1	1	1				
22	2.5	M	M	R	org	1	1										1				1				
23	4.0	N	M	R	org	3		1										3							
24	4.8	N	M	R		3	1				1							3							
19	3.5	N	M	R		3	2			1	1			1				3	1						
18	3.4	N	M	R		3					1							3			1				
17	2.3	N	M	R		3											1	3			1				
13	2.9	N	M	R		2	1		1		1					1		1	1	1		1			
14	2.5	N	M	R		3					1							3							
15	2.5	N	M	R		2		2		1	1			1									1	1	
21	3.0	N	M	R		2												2							
20	3.5	N	M	R		2	1				1			1											
25	5.0	N	M	R		2			1		2			1											
26	3.0	N	M	R		2			1		1			1				1							
27	9.0	N	M	R		1												1							
33	2.5	N	M	R		2	1	V		1				1											1

Waterbody/Project: Hayward Date: 6/8/2022
Crew: Laura Sass, Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum spicatum	M. sibiricum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	P. zosteriformis	Nymphaea odorata	Nuphar variegata	P. Robbinsii	P. amplifolius	Lemna trisulca	Bidens beckii	P. praelongus	Vallisneria americana	P. gramineus	P. friesii	Lemna minor	Spirodela polyrhiza	Wolffia	Ranunculus aquatilis	Eleocharis palustris	Stuckenia pectinata	Potamogeton natans
435	4.3	N	M	P	org	2	1							1			2		1												
445	3.1	N	M	P	org	2											2		1					1							
453	7.4	N	M	P	org	2					1						2		1												
452	3.0	N	M	P	org	2	1				1					V	2		1												
464	3.0	N	M	P	org	2								1	1	V	1		2						1	1	1				
465	7.0	N	M	P	org	2											2		1												
471	5.0	N	M	P	org	2								1			2		1												
473	5.0	N	M	P	org	3	1				1						3		1												
479	2.5	N	M	P	org	2	1				1				1	V								1	1	1	1	1	1		
480	3.0	N	M	P	org	1	1								1	1															
481	2.4	N	M	P	org	0																									
476	3.0	N	M	P	org	1					1		filamentous																	V	
469	2.5	N	M	P	org	1	1				1													1						1	
457	2.5	N	M	P	org	1	1																	1							
458	2.0	N	M	P	org	1	1																								
470	2.0	N	M	P	org	1	1																	1							
475	4.5	N	M	P	org	1	1							1																	
474	4.5	N	M	P	org	2		1			2			1			1														
468	2.5	N	M	P	org	2	1			1	1			1					1	1											
467	6.0	N	M	P	org	2	1				1						1	2													
466	8.2	N	M	P	org	1	1							1							1										
454	7.0	N	M	P	org	1					1			1																	
455	4.6	N	M	P	org	1					1			1		V	1											1			V
252	4.0	N	M	P	org	1								1								1									
253	1.4	N	M	P	org	1	1									V			1												
223	4.6	N	M	P	org	1													1												
196	6.5	N	M	P	org	0																									
167	5.1	N	M	P	org	1	1				1			1																	

Waterbody/Project: Hayward Date: 6/8/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft) CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Nitella	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. Robinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Vallisneria americana	P. gramineus / P. friesii	Lemna minor / Spirodela polyrhiza	Wolffia / Sparganium	P. richardsonii / P. natans					
141	2.0 N	M	P	org	2			2		filamentous												
118	0.8 N	M	P	org	1							1										
101	2.0 Y	M	P	org	1							1				1						
100	3.3 N	M	P	org	1			1	1													
115	2.5 Y	M	P	org	1				1		1	1										
139	2.4 N	M	P	org	1						1	1										
140	3.2 N	M	P	org	1			1	1													
116	7.5 N	S	P	sand	0																	
117	4.1 N	M	P	sand	2	1		2	1													
166	7.2 N	M	P	org	0																	
165	6.5 N	M	P	org	0																	
222	5.5 N	M	P	org	1				1													
221	1.8 N	S	P	sand	1								1				1					
251	3.5 N	M	P	org	1				1		1											
250	3.0 N	M	P	org	1							1										
201	4.0 N	M	P	org	1	1		1	1													
315	7.5 N	M	P	org	0																	
426	6.4 N	M	P	org	1						1											
427	2.7 N	M	P	org	2		1		1	V V	2											
438	4.0 N	M	P	org	2	1		1			2					1						
439	3.5 N	M	P	org	2	2		1			1	1				1						
437	6.5 N	M	P	org	1				1		1											
448	2.6 N	M	P	org	2	1				1 V	1	1										
447	5.0 N	M	P	org	2	1		2														
446	9.6 N	M	P	org	1	1								1								

Waterbody/Project: Hayward   Date: 6/8/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CLP Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / Myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Nitella	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. robbinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Vallisneria americana	[illegible] / P. friesii	P. gramineus / Sparganium eurycarpum							
374	5.6	N	M	R	org	1	1						1			1							
354	9.1	N	M	R	org	Ø																	
336	9.5	N	M	R	org	Ø																	
279	4.6	N	M	R	org	1	1		1	1				1									
280	4.0	N	M	R	org	1			1	1		1	1										
312	10.8	N	M	R	org	Ø																	
337	10.0	N	M	R	org	1	1		1					1									
355	4.8	N	M	R	org	Ø																	
375	4.8	N	M	R	org	1			1						1								
289	5.1	N	M	R	org	2			1	1		2											
403	4.9	N	M	R	org	2			1			2	1		1								
406	3.9	Y	S	R	Sand	1	1		1	1			1	1									
404	3.5	N	M	R	org	3			3	1													
390	10.5	N	M	R	org	Ø																	
376	9.0	N	M	R	org	1	1								1								
356	9.1	N	M	R	org	Ø																	
338	9.6	N	M	R	org	Ø																	
339	5.0	N	M	R	org	2			3														
357	8.5	N	M	R	org	Ø																	
377	7.9	N	M	R	org	Ø																	
391	9.6	N	M	R	org	1							1										
405	5.8	N	M	R	org	1	1 V		1				1	1									
417	5.1	N	M	R	org	2	1		1	1		2	1										
430	1.3	N	S	R	sand	1					V		1				1						
418	5.0	N	M	R	org	2				1		2	1										
406	7.3	N	M	R	org	1				1													
292	8.1	N	M	R	org	Ø																	
378	8.4	N	M	R	org	Ø																	

Waterbody/Project: Hayward

Date: 6/8/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft) CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Myriophyllum spicatum	M. sibiricum	Potamogeton crispus	Elodea canadensis	Nitella	Heteranthera dubia	P. zosteriformis	Nymphaea odorata	Nuphar variegata	P. Robinsii	P. Amplifolius	Lemna trisulca	Bidens beckii	P. praelongus	Vallisneria Americana	P. epihydrus	P. Foliosus	P. pusillus
270	23 Y	S	R	sand	1		1			1			1			1		1						
350	11.0 N	M	R	org	Ø																			
332	10.8 N	M	R	org	Ø																			
307	10.3 N	M	R	org	1						1							1						
275	10.1 N	M	R	org	1						1	+filamentous algae												
243	8.5 N	M	R	org	1																			1
215	7.5 N	M	R	org	2	1	2			1			1											
216	5.4 N	M	R	org	3	1	1			2			1											
244	7.9 M	M	R	org	2	2				1			1					1						
276	9.5 N	M	R	org	1													1						
308	9.6 N	M	R	org	Ø																			
333	10.3 N	M	R	org	Ø																			
$351	10.8 N	M	R	org	Ø																			
375	21 Y	S	R	sand	1	1							1					1						
372	4.0 N	S	R	sand	1	1										1		1	1		1		1	
334	10.0 N	M	R	org	Ø																			
209	5.5 N	M	R	org	1	1	1			1			1			1		1			1			
277	5.5 N	M	R	org	1					1			1			1		1			1			
245	7.1 N	M	R	org	2				2	2			1					1						
217	5.4 N	M	R	org	1	1	1						1					1						
213	5.2 N	M	R	org	2	1	1			2			1			2		1						
219	4.0 N	M	e	org	2	1				2						1		1						
212	1.8 N	M	R	org	2								1			1		2						
248	3.0 N	M	R	org	1													1			1			
247	6.2 N	M	R	org	3	3	V									2		1						
246	5.1 N	M	R	org	2		1			1			1			1	1	1			1			
278	5.6 N	M	R	org	1					1			1					1			1			
375	4.4 N	M	R	org	1	1				1			1			1		1						

Calla palustris growing along shore

Waterbody/Project: Hayward

Date: 6/8/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole [redacted] rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / Myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Nitella	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. robbinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Vallisneria americana	Lemna minor / Spirodela polyrhiza	Wolffia spp. / Sparganium eurycarpum	Sparganium spp. / Ranunculus aquatilis	P. pusillus					
358	8.8	N	M	R	org	Ø																	
340	4.4	N	M	R	org	1			1														
314	1.1	N	S	R	sand	2						1	2 1		1 1	1 1							
341	5.3	N	M	R	org	1	1		1	1			1										
359	8.6	N	M	R	org	Ø																	
379	6.0	N	M	R	org	1			1														
393	6.1	N	M	R	org	1				1 1			1										
407	7.1	N	M	R	org	1							1	1									
419	4.8	N	M	R	org	1				1			1	1									
431	5.2	N	M	R	org	2			2	1		2											
441	1.8	N	M	R	org	2				1	1	2	1				1						
442	1.5	N	S	R	sand	1							1										
432	5.0	N	M	R	org	2	1		2			2											
420	6.3	N	M	R	org	1	1						1	1									
408	6.5	N	M	R	org	Ø																	
394	5.1	N	M	R	org	2	1	1	1	2													
380	6.4	N	M	R	org	Ø																	
360	8.5	N	M	R	org	1												1					
342	4.9	N	M	R	org	2	1			1		1	1										
361	7.8	N	M	R	org	Ø																	
381	5.8	N	M	R	org	1				1 1			1										
395	4.6	N	M	R	org	1				1			1										
409	7.0	N	M	R	org	2			2														
421	4.8	N	M	R	org	3	1		3									1					
433	4.8	N	M	R	org	3	1			1		3	1										
447	1.5	N	M	R	org	2	1			1 1	1	1	1	1									
434	1.5	Y	S	R	sand	2						1	2										
422	2.1	N	S	R	sand	2				1 1		1	1										

Waterbody/Project: Hayward Date: 6/8/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft) / CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum / Myriophyllum spicatum	M. sibiricum / Potamogeton crispus	Elodea canadensis / Nitella	Heteranthera dubia / P. zosteriformis	Nymphaea odorata / Nuphar variegata	P. Robbinsii / P. amplifolius	Lemna trisulca / Bidens beckii	P. praelongus / Vallisneria americana	P. friesii / Lemna minor								
410	4.8 N	M	P	org	3	1		3														
396	5.5 N	M	P	org	1			1	1			1	1									
382	5.5 N	M	P	org	0																	
362	8.0 N	M	P	org	0																	
363	6.5 N	M	P	org	0																	
383	7.0 N	M	P	org	0																	
387	4.0 N	M	P	org	1	1			1	1	1											
311	4.9 N	M	P	org	3	1		2			3	1										
398	3.0 N	M	P	org	1	1		1			1	1										
384	4.0 N	M	P	org	1			1	1			1										
364	10.0 N	M	P	org	0																	
343	3.5 N	M	P	org	1									1								
344	6.3 N	M	P	org	1							1										
565	5.8 N	M	P	org	1			1	1			1										
385	6.5 N	M	P	org	1	1		1														
399	8.3 N	M	P	org	0																	
413	6.8 N	M	P	org	2	2			1		1											
424	6.4 N	M	P	org	3	3		1			2	1										
282	7.0 Y	M	P	org	0																	
316	3.6 N	M	P	org	1	1			1			1		1								
345	6.9 N	M	P	org	1	1		1				1		1								
346	6.8 N	M	P	org	3			3	1													
386	5.6 N	M	P	org	1	1		1	1 1		1	1										
400	5.0 N	M	P	org	1						1	1										
401	3.0 N	M	P	org	1	1			1 1					1								
414	9.0 N	M	P	org	1	1						1										
425	7.3 N	M	P	org	2	1		2	2			1										
436	7.5 N	M	P	org	2	2		1	1													

ATTACHMENT B

Hayward Point-Intercept/AIS Survey
Field Data Sheets – August

gai consultants
transforming ideas into reality

Waterbody/Project: Hayward Lake   Date: 8/2/2022

Crew: Laura Sass, Heather Ludlow

CWD Y/N	Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Najas flexilis	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp. latifolia	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
Y	147	7.6	S	P	Sand	0																																							
-	146	10.6	-	-	-	-																																							
-	145	18.8	-	-	-	-																																							
-	144	16.3	-	-	-	-																																							
N	170	1.8	M	P	org	1															1												1											
N	169	14.4	S	P	Sand	0																																							
N	199	1.8	M	P	org	1					1																	1						1							1			
-	198	17.1	-	-	-	-																																							
-	225	17.8	-	-	-	-																																							
-	257	16.4	-	-	-	-																																							
Y	288	6.0	S	P	Sand	1																																			1			
Y	312	2.5	S	P	Sand	1																											1	1							1			
-	317	NN - past boats				-																																							
-	287	17.6	-	-	-	-																																							
-	226	10.5	-	-	-	-																																							
-	295	NN - past boats				-																																							
-	254	16.3	-	-	-	-																																							
N	255	6.0	S	P	sand	0																																							
N	256	9.8	S	P	sand	0																																							
N	224	10.4	S	P	sand	0																																							
N	197	2.8	S	P	Sand	1									1																										1			
-	168	17.6	-	-	-	-																																							
N	142	13.1	S	P	Sand	0																																							
-	143	15.7	-	-	-	-																																							
-	119	NN + temp obs - fishing people																																											
N	120	6.3	M	P	org	1																																			1			
-	121	15.2	-																																										
-	122	16.2	-																																										
-	102	15.5	-																																										
N	103	14.5	S	P	sand	0																																							
-	88	15.3	-	-	-	-																																							
N	87	3.5	S	P	sand	1			1																																1			
N	76	5.5	M	P	org	2								2													1														2			
N	75	1.7	M	P	org	1					1			1	1						1			1						1	1			1										
N	64	4.0	M	P	org.	2					1			1	1			1																							2			

entered HL 8/24/22

Waterbody/Project: Hayward Lake Date: 8/2/2022

Crew: Laura Sass, Heather Ludlow

CUDDY IN

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM- Myriophyllum spicatum	CLP- Potamogeton crispus	Bidens beckii - Nias flexilis	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium sp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
05	5.5	M	P	Dig	2							2	1													1	1																
09	15.3	-	-	-	-																																						
38	13.2	S	P	Sand	0																																						
77	12.2	M	P	Dig	1												1																										
04	11.3	M	P	Dig	1												1																										
07	10.5	M	P	org	0																																						
08	11.8	M	P	wood	0																																						
02	10.5	M	P	org	1			1									1		1																								
07	10.0	M	P	Dig	3												3																										
06	9.5	M	P	Dig	2												2																										
05	1.6	S	P	Sand	1			1			1																1												1				
04	1.5	S	P	Sand	0																																						
44	2.4	S	P	Sand	0																																						
43	2.5	M	P	Dig	2				1			1															1												2				
53	NN-Temp	Obstr			-																																						
25	3.5	M	P	Dig	2			1				1	1				1																										
24	7.0	M	P	Sand	2				2																	1	1												1				
45	8.0	M	P	Silt	3	1			3																																		
23	4.0	M	P	Silt	3			1				1														1																	
50	3.0	M	P	Silt	2	1		1	1										1							1																
29	5.5	M	P	Silt	3							3														1																
28	4.6	M	P	Silt	2			1	1			1							1							1	1															
30	5.0	M	P	Silt	2							3														1																
24	4.5	M	P	Silt	3							3														3																
18	3.5	M	P	Silt	3			2				3	1													2												1				
19	3.6	M	P	Silt	3							3														2	1															
20	3.5	M	P	Silt	3	1						3															2															
21	3.5	M	P	Silt	2																					2	2															
25	5.0	M	P	Silt	3							3														2																
26	4.5	M	P	Silt	3				1			3														1																
29	4.3	M	P	Silt	2				1			2											1			1																
34	10.5	M	P	Silt	3	2			2																		1												1				
33	7.7	M	P	Silt	3	1			2																	3	2															
32	10.5	M	P	Silt	3				1																		2															
21	6.5	M	P	Silt	3				2																		2															

entered - HC 8/24

Waterbody/Project: Hayward Lake Date: 8/2/2022

Crew: Laura Joss, Heather Luttrow

CWD Y/N

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Elatine triandra	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium sp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
37	7.5	M	P	S-Org	3	1				3								1								2																
38	8.0	M	P	S-Org	2	1				2																1																
46	2.5	M	P	Silt	3													3																								
47	9.0	M	P	Silt	2													2																								
48	9.0	M	P	Silt	2													2								1																
39	9.5	M	P	Silt	3	3																																			
40	8.5	M	P	Silt	2	2												1																								
41	8.0	M	P	Silt	3					3																																
42	3.0	M	P	Silt	3		2			2		1												1															2			
49	9.5	M	P	Silt	2					1								2																								
50	8.5	M	P	Silt	3	3				1																1																
51	6.0	M	P	Silt	2	2				1								1		1				1																		
52	4.5	M	P	Silt	2							2																											2			
106	8.0	M	P	Silt	3															2																			2			
125	7.5	M	P	Silt	2	2				1		1						1																								
133	9.2	M	P	Silt	1													1																								
127	15.0	–	–	–	–																																				
161	11.1	M	P	Org	0																																				
150	3.0	S	P	Sand	1							1		1										1																		
195	8.0	M	P	Org	2																																				
194	1.8	M	P	org	2					2								1		1																			2			
173	1.5	M	P	org	1																	1																			
149	4.5	M	P	org	3		1																			3												2			
172	2.0	M	P	org	2		1					1		1				1																				2			
200	2.2	M	P	Org	2		1					1		1				1																				1			
201	6.0	M	P	Org	2		1					1		2																								1			
208	10.0	M	P	Org	2	1				2				1				1																							
227	1.8	S	P	Sand	1							1		1																							1				
260	3.10	M	P	Org	2							1		1				1																			1				
259	5.3	S	P	Sand	1							1		1																							1				
252	5.9	M	P	Org	2									1												2											1				
289	4.0	M	P	org	2		1							1												1											1				
290	8.0	M	P	Org	2	1								1												2											1				
291	5.0	M	P	Org	2		1							1																											
219	2.0	M	P	Org	2					1																2															

entered HL 8/24

Waterbody/Project: Hayward Lake Date: 8/21/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi - Water shield	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
341	2.0	M	P	org	2																			1																		
292	2.0	S	P	sand	1				1																												2					
293	5.0	M	P	org	2	1				1		2			1									1																		
320	2.0	S	P	sand	1	1						1																														
247	4.0	M	P	org	1			1		1					1									1																		
409	4.0	M	P	org	1	1				1		1			1						1																					
389	2.0	S	P	sand	1															1																						
402	3.6	M	P	org	2	1		1				1								1				2																		
387	2.7	M	P	org	1	1				1		1	1										1																			
421	5.5	M	P	org	2					1					1									2																		
294	4.5	M	P	org	2			1				1																										2				
261	11.8	M	P	org	0																																					
229	11.6	M	P	org	0																																					
228	10.5	S	P	sand	0																																					
203	14.5	M	P	org	0																																					
176	15.0	-	-	-	-																																					
104	2.5	S	P	sand	1																																					
90	8.0	M	P	org	1	1						1																											1			
91	11.5	M	P	org	0																																		1			
80	14.7	M	P	org	0																																					
79	16.9	-	-	-	-																																					
69	17.0	-	-	-	-																																					
59	10.5	M	P	org	1													1																								
100	11.0	M	P	org	2													2																								
101	10.5	M	P	org	2													2																								
69	10.0	M	P	org	2													2																								
63	9.2	M	P	org	2				1																												2				
74	7.7	M	P	org	2	1			2																												2				
73	8.5	M	P	org	1	1																		1			1									1					
72	8.0	M	P	org	2	1			1			1			1									2			1									1					
91	10.0	M	P	wood	1										1																										
81	13.3	M	P	org	0																																					
42	15.2	-	-	-	-																																					
83	6.0	M	P	org	2							1			1									1														2				
84	9.5	M	P	org	3				2						1			2																								

entered - HL 8/24

Waterbody/Project: Hayward Lake Date: 8/3/2022
Crew: Laura

CWD Y/N	Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.
N	85	8.5	M	P	S+Org	1	1				1						1		1
N	86	7.2	M	P	S+Org	2					2						1		
Y	98	7.0	M	P	org	2					2						1		
Y	99	6.5	S	P	sand	1								1					
N	97	8.7	M	P	org	2	2												
N	96	9.5	M	P	S+Org	2					2						1		
N	95	7.8	M	P	S+Org	3	1				1			1					
–	94	15.5	–	–	–	–													
[illegible]	93	12.3	M	P	org	0													
[illegible]	92	12.8	M	P	org	0													
N	107	12.4	M	P	org	0													
–	102	15.0	–	–	–	–													
N	109	9.5	M	P	org	1	1							1					1
Y	110	9.5	M	P	org	1	1										1		1
N	111	8.2	M	P	org	2	2										1		1
N	112	9.2	M	P	S+Org	2													2
N	113	4.3	M	P	org	2	1				2			1			1		1
Y	117	3.5	M	P	S+Org	2					1			1			1		
N	134	1.5	S	P	sand	1													
N	133	5.0	M	P	org	2								2			1		1
N	132	9.0	M	P	org	1													1
N	131	8.5	M	P	org	2											1		
N	130	8.7	M	P	org	1	1												
N	129	8.8	M	P	S+Org	2	1				2			1			1		
N	128	10.3	M	P	org	1											1		1
N	152	10.5	M	P	S+Org	1											1		1
N	153	10.5	M	P	S+Org	2								1			1		
N	154	10.0	M	P	S+Org	2													2
N	155	9.0	M	P	org	2	1				2								
N	156	8.0	M	P	org	1					1			1			1		
N	157	8.0	M	P	org	2	1										1		
N	158	5.0	M	P	org	3	2				2								
N	184	1.3	S	P	sand	1													
N	183	7.8	M	P	org	1													
N	182	8.0	M	P	org	2					2			1					

Sampling Point	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	~~[crossed out]~~ Najas flexilis	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
85																									
86												1										2			
98												1										1			
99																									
97																									
96																									
95								2				1													
94																									
93																									
92																									
107																									
102																									
109																						1			
110												1													
111												2													
112																									
113																						2			
117											1											2			
134															1			1							
133												1													
132																									
131								1				2													
130												1													
129												1													
128																						1			
152																									
153								1				1										1			
154								1				1													
155																									
156								1				1													
157								1				1													
158																						2			
184																		1							
183																						1			
182												1													

entered - HL 8/29/22

Waterbody/Project: Hayward Lake Date: 8/3/2022
Crew: Lauren Joss Heather Lutzow

CWD? (Y/N)	Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	~~Brasenia schreberi~~ Najas flexilis	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
N	208	8.0	M	P	org	2					1																1				1													
N	209	8.9	M	P	org	2		1			1								2																									
N	210	7.8	M	P	silt/org	3					2			1													2				1										1			
N	211	8.5	M	P	silt/org	1											1		1																						1			
N	212	1.0	S	P	sand	1	1			1																																		
N	237	7.0	M	P	silt/org	1					1																				1										1			
N	236	7.9	M	P	silt/org	1											1														1										1			
N	235	8.0	M	P	silt/org	3					3			1			1		1									1			1										1			
N	248	10.5	M	P	silt/org	1													1																						1			
N	269	9.0	M	P	org	2																									1										2			
N	302	12.8	M	P	silt/org	0																																						
N	270	10.8	M	P	silt/org	2								1			1										1														2			
N	238	8.0	M	P	silt/org	1											1																								1			
N	239	2.0	S	P	sand	1																																			1			
N	271	13.4	M	P	silt/org	0																																						
N	308	11.0	M	P	org	1					1						1														1													
N	329	5.0	M	P	silt/org	2								1			1																								2			
N	304	11.9	M	P	silt/org	0																																						
N	272	14.1	M	P	org	0																																						
N	240	2.0	S	P	sand	0																																						
X	241	6.0	M	P	org	2	1		1		1			1								1									1										1			
N	213	6.0	M	P	silt/org	3					2			2															1		1													
N	252	3.5	M	P	silt/org	1								1	1						1										1													
N	223	4.5	M	P	org	0																																						
N	222	5.5	M	P	org	2								1																	1										1			
N	196	10.5	M	P	org	1								1																														
N	167	5.5	M	P	silt/org	2								2		1																									1			
N	140	5.5	M	P	silt/org	3																																			2			
N	116	7.2	S	P	sand	0																																						
N	100	3.5	M	P	silt/org	1	1				1						1																				V				1			
N	101	2.5	M	P	silt/org	1								1			1																											
N	117	3.5	M	P	silt/org	3								3																														
Y	118	1.0	M	P	org	1					1			1			1																								1			
Y	141	2.8	M	P	silt/org	3								3																														
Y	139	2.5	M	P	silt/org	3								2																	2										1			

entered 8/29 - HL

Waterbody/Project: Hayward Lake Date: 8/3/2022

Crew: Laura Sass Heather Hilgendorf

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton nusillus	Potamogeton richardsonii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium sp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
100	7.0	M	P	org	2																																						
195	6.8	M	P	org	2																																							
221	6.5	R	P	gravel	0																																						
251	6.4	M	P	org	0																																						
282	7.4	M	P	org	0																																						
310	4.0	M	P	org-clay	2																																						
315	6.0	M	P	clay	2																																						
343	6.4	M	P	silt	2																																						
344	7.0	M	P	silt	0																																						
345	7.0	M	P	silt	1																																						
209	7.0	M	P	silt	3																																						
209	6.5	M	P	silt	3																																						
400	4.0	M	P	silt	3																																						
401	4.1	M	P	silt	3																																						
414	9.0	M	P	silt	1																																						
429	7.5	M	P	silt	3																																						
426	5.5	M	P	silt	2																																						
439	4.5	M	P	silt	2																																						
441	3.0	M	P	silt	2																																						
447	5.0	M	P	silt	3																																						
455	5.5	M	P	silt	3																																						
467	6.5	M	P	silt	3	1																																					
474	5.5	M	P	org	3	2																																					
473	5.0	M	P	org	2	1																																					
466	2.5	M	P	org	1																																						
460	6.0	M	P	org	3			1																																			
471	6.0	M	P	org	3																																						
454	7.0	M	P	org	3																																						
453	6.3	M	P	org	3	1																																					
445	6.5	M	P	org	2																																						
446	9.0	M	P	org	1																																						
436	6.5	M	P	org	3																																						
435	5.3	M	P	org	2																																						
424	6.8	M	P	org	2																																						
413	8.3	M	P	org	1																																						

entered 8/29 - HL

Waterbody/Project: Hayward Lake Date: 8/3/2022

Crew: Laura Sass Heather Lutzow

CLOUDY/N

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM- Myriophyllum spicatum	CLP- Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium sp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
181	9.0	M	P	org	2					2					1		1																								
180	10.0	M	P	org	1	1									1		1																									
179	10.8	M	P	org	1												1																									
178	10.9	M	P	org	1												1																									
177	13.3	M	P	org	0																																				
204	14.6	M	P	org	0																																				
205	13.2	M	P	org	0																																				
206	12.4	M	P	org	0																																				
207	10.5	M	P	org	1	1											1																								
573	12.8	M	P	org	0																																				
566	12.8	M	P	org	0																																				
298	13.0	M	P	org	0																																				
297	12.2	M	P	org	0																																				
296	10.4	M	P	org	0																																				
293	8.5	M	P	org	1	1							1		1								1																		
322	2.5	S	P	sand	1											1																									
262	12.6	M	P	org	0																																				
230	14.5	M	P	org	0																																				
231	[illegible]	—	—	-	-																																				
263	12.5	M	P	org	0																																				
264	13.9	M	P	org	0																																				
263	13.8	M	P	org	0																																				
324	1.5	S	P	sand	1										1	1																									
324	2.2	S	P	sand	1					1	1		1		1								1																	
325	3.5	S	P	Sand	1					1																														
326	2.3	S	P	sand	1	1																																		
327	13.6	S	P	sand	0																																				
328	1.0	S	P	Sand	1						1				1																									
301	11.0	M	P	org	1	1				1			1				1										1													
300	11.5	M	P	org	0																																				
399	12.9	M	P	org	0						1																														
2103	14.3	M	P	org	0																																				
2107	11.4	M	P	org	0																																				
~~2109~~	~~NO~~	~~-~~	~~-~~	~~-~~	~~-~~																																				
234	9.10	M	P	org	1												1																								

entered 8/29 - HL

Waterbody/Project: _____ Hayward Lake _____ Date: 8/31/22

Crew: Laura Sass Heather Lutzow

CWD (Y/N)

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM- Myriophyllum sibiricum	CLP- Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton oakesianus	Potamogeton pusillus	P. richardsonii	P. zosteriformis	Potamogeton robbinsii	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium sp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
399	8.6	M	P	org	2				2			2															1																
385	6.5	M	P	org	2				1			2			1												1																
395	6.5	M	P	org	3				1			3															1																
384	4.5	M	P	org	2							1			1						1			1																			
398	3.5	M	P	org	3				1			3															1																
397	3.5	M	P	org	3				1			3	1														1																
411	4.0	M	P	org	3							3														2																	
422	3.0	M	P	org	3		1		1			3			1											1	2																
421	4.5	M	P	org	3				1			3	1		1											1	2																
433	5.0	M	P	org	2		1		2			1														2	2																
432	5.0	M	P	org	3							3														1	1																
417	3.5	S	P	sand	2				2			1	1		2											1	1	1															
431	5.0	M	P	org	3		3		1																																		
416	3.0	M	P	org	3			1	2			2			1											1	1																
417	5.0	M	P	org	3		1		2			3	1													1	1																
418	5.0	M	P	org	3				2			2			1											1	1																
419	4.8	M	P	org	3				2			3														1	1																
420	5.0	M	P	org	3				2			1																															
409	6.5	M	P	org	2											1							1					1															
410	4.5	M	P	org	2				1			2																															
394	5.5	M	P	org	3	1						1		1	1											1	3	2															
422	5.5	M	P	org	2							1																															
393	8.0	M	P	org	2							1																												2			
382	7.1	M	P	org	1							1																															
402	2.0	M	P	org	0																																					
401	9.0	M	P	org	1							1			1		1										1																
381	5.0	M	P	org	1							1																															
395	5.0	M	P	org	3																						2															
408	7.0	M	P	org	1							1				1																											
394	5.0	M	P	org	2				1			1															2																
380	6.5	M	P	org	2																						1															
340	8.5	M	P	org	2							1			1												1																
342	4.5	M	P	org	2	1																																1				
341	4.5	M	P	org	1										1		1																										

entered HL 8/30

Waterbody/Project: Hayward Lake Date: 8/31/2022

Crew: Laura Sass Heather Lutzow

CWDD(Y/N)

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Elatine sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
359	8.5	M	P	org	0																																						
379	7.5	M	P	org	1								1		1	1																												
393	6.2	M	P	org	3				1				1																														
407	7.5	M	P	org	1								1		1													2																
406	7.5	M	P	org	1											1																												
398	7.5	M	P	org	1	1									1																												
378	8.0	M	P	org	1										1																												
358	8.5	M	P	org	1											1																												
410	4.0	M	P	org	2								2															1																
339	5.0	M	P	org	2				1				1			1													1													2		
387	8.2	M	P	org	2																																						
397	8.0	M	P	org	2																																						
394	9.5	M	P	org	1				1				1		1																												
391	9.0	M	P	org	1										1																												
405	5.0	M	P	org	3	2			3						1													1															
409	3.5	M	P	org	3																																						
403	5.0	M	P	org	3			1	2		1	1	1											1				1															
338	8.5	M	P	org	0				1																															2		
352	9.0	M	P	org	0																																						
374	9.0	M	P	org	1											1																												
369	5.5	M	P	org	2																																						
345	4.5	M	P	org	3				3				2		1											2																	
253	6.0	M	P	org	2								1															2															
337	7.5	M	P	org	1																							1													2		
312	10.0	M	P	org	1				1																																	
220	4.5	M	P	org	2								1																														
248	3.5	M	P	org	2	1							2					1																							2		
249	4.0	M	P	org	3			1	2				2														1	1															
247	6.5	M	P	org	1				1				1		1																												
279	4.5	M	P	org	1								3															1															
311	10.5	M	P	org	1				1				1																														
236	9.0	M	P	org	2																							1															
364	6.0	M	P	org	2				2				1		1													1															
374	5.5	M	P	org	2								1																												2		
372	4.5	M	P	org	0				2				2															1															

entered - HL 8/30

Waterbody/Project: Hayward Lake   Date: 8/3/2022

Crew: Laura Sass Heather Lutzow

CWD (Y/N)	Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: Myriophyllum spicatum	CLP: Potamogeton crispus	Bidens beckii	Brasenia schreberi	Ceratophyllum demersum	Chara sp.	Eleocharis acicularis	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata
N	359	11.5	M	P	org	1													1		
N	335	11.4	M	P	org	0															
N	310	6.5	M	P	org	2								1			1				
N	278	6.5	M	P	org	1	1				1			1							
N	281	5.5	M	P	org	2	2				1			1							
N	212	5.5	M	P	org	3					3			1			1				
N	191	4.5	M	P	org	3			1		1			3	1						
N	190	5.5	M	P	org	3					3			2							
N	164	3.5	M	P	org	3			1		2			1							1
N	163	4.0	M	P	org	3			2					3							
N	189	5.5	M	P	org	2	1				2			1							
N	211	5.8	M	P	org	3					1			1			1				
N	[illegible]	5.4	M	P	org	2					1						1				
N	247	7.5	M	P	org	2	1				2						1				
N	[illegible]	4.5	M	P	org	2					1			1			1				
N	[illegible]	10.0	M	P	org	0															
N	[illegible]	12.0	M	P	org	0															
N	[illegible]	[illegible]	M	P	org	0															
N	372	6.5	M	P	org	2					1			1							
N	371	[illegible]	M	P	org	0															
N	[illegible]	[illegible]	M	P	org	0															
N	[illegible]	10.0	M	P	org	1					1										
N	303	9.7	M	P	org	1								1			1		1		
N	216	7.9	M	P	org	2					2										
N	241	8.0	M	P	org	2	2				1			1			1		1		
N	215	7.3	M	P	org	3	3				2						1				
N	188	6.9	M	P	org	3					3			1			1				
N	162	4.8	M	P	org	3					1			3							
N	161	4.8	M	P	org	3	2				3			2							
N	160	6.5	M	P	org	3	1				1			1							
N	159	2.3	M	P	org	1	1				1			1						V	1
N	185	5.5	M	P	org	3					2			2			1				
N	186	6.0	M	P	org	3					1										
N	187	6.0	M	P	org	3	1				3										
N	214	6.3	M	P	org	3	2				2			2							

Sampling Point	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton friesii	Potamogeton gramineus	Potamogeton natans	Potamogeton praelongus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	P. zosteriformis	Ranunculus aquatilis	Sagittaria sp.	Sparganium eurycarpum	Sparganium fluctuans	Sparganium spp.	Spirodela polyrhiza	Stuckenia pectinata	Utricularia minor	Utricularia vulgaris	Vallisneria americana	Filamentous algae	Equisetum sp.	Wolffia sp.
359																							
335																							
310	1									2										1			
278										1										1			
281										1										2			
212									1	1													
191										1													
190																							
164										2													
163										1													
189						1			1	1													
211									3	1										1			
[illegible]										1										2			
247																							
[illegible]										1										2			
[illegible]																							
[illegible]																							
[illegible]																							
372																				2			
371																							
[illegible]																							
[illegible]																				1			
303																							
216										1										2			
241																							
215																							
188									2														
162										1													
161																							
160									2	1													
159									2	1						1				1			
185										1													
186									3	1													
187																							
214										1													

entered · HL 5/31

Waterbody/Project: Hayward Lake Date: 8/3/2022

Crew: Laura Sass Heather Lutzow

CLWD (Y/N)	Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	EWM: *Myriophyllum spicatum*	CLP: *Potamogeton crispus*	*Bidens beckii*	*Brasenia schreberi*	*Ceratophyllum demersum*	*Chara sp.*	*Eleocharis acicularis*	*Elodea canadensis*	*Heteranthera dubia*	*Lemna minor*	*Lemna trisulca*	*Myriophyllum sibiricum*	*Nitella sp.*	*Nuphar variegata*	*Nymphaea odorata*
N	242	10.5	M	P	org	3															
N	243	8.5	M	P	org	2	1							2					1		
N	275	10.5	M	P	org	2													2		
N	307	10.5	M	P	org	1													1		
N	332	11.0	M	P	org	0															
N	350	12.4	M	P	org	0															
N	370	1.5	S	P	sand	1	1										1				
N	349	7.5	M	P	org	1	1														
N	331	13.4	M	P	org	0															
N	306	11.0	M	P	org	0															
N	274	10.3	M	P	org	1											1		1		
N	273	13.4	M	P	org	0															
N	305	12.9	M	P	org	0															
N	[illegible]	5.2	M	P	org	2								1			1				

Sampling Point	*Potamogeton amplifolius*	*Potamogeton epihydrus*	*Potamogeton friesii*	*Potamogeton gramineus*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Potamogeton robbinsii*	*P. zosteriformis*	*Ranunculus aquatilis*	*Sagittaria sp.*	*Sparganium eurycarpum*	*Sparganium fluctuans*	*Sparganium spp.*	*Spirodela polyrhiza*	*Stuckenia pectinata*	*Utricularia minor*	*Utricularia vulgaris*	*Vallisneria americana*	*Filamentous algae*	*Equisetum sp.*	*Wolffia sp.*
242																				3			
243																							
275																				1			
307																							
332																							
350																							
370																							
349										1													
331																							
306																							
274																							
273																							
305																							
[illegible]						2				1										1			

entered - HL 8/31

ATTACHMENT C

Trego Point-Intercept/AIS Survey Field Data Sheets - June

gai consultants
transforming ideas into reality

(1)

Waterbody/Project: Trego Date: 6/9/2022

Crew: Lavia Sass Heather Lutzow

Sampling Point	Depth (ft) CLOD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Potamogeton cf. sp.	myriophyllum spicatum	Nuphar variegata	Potamogeton zosteriformis	Elodea canadensis	Utricularia vulgaris	Nymphaea odorata	Lemna minor	Sparganium fluctuans	Vallisneria americana	.	.	.	.	.	.	.	.	.	.	.	.
31	2.0 N	M	P	org	0																						
36	1.8 N	M	P	org	1	1			1																		
37	3.4 N	M	P	org	0																						
40	2.1 N	M	P	org	1	1			1																		
35	1.5 N	M	P	org	1	1																					
39	2.9 N	M	P	org	1	1			1	1		1															
42	2.1 N	M	P	sand	0					V	V																
43	3.9 N	M	P	org	1	1																					
44	3.0 N	M	P	org	0																						
45	2.5 N	S	P	sand	0																						
51	3.5 N	M	P	org	2		1		2																		
50	3.5 N	M	P	org	1		1		1	1																	
49	3.3 N	M	P	org	1	1			1	1																	
48	4.0 N	M	P	org	0																						
56	4.3 N	M	P	org	1						1																
57	4.1 N	M	P	org	1	1																					
67	4.0 N	M	P	org	1				1																		
66	2.5 N	M	P	org	1							1															
76	4.9 N	M	P	org	1	1							1														
77	3.0 N	M	P	org	1				1			1															
88	1.3 N	M	P	org	1							1															
87	3.9 N	M	P	org	1				1																		
97	3.0 N	S	P	sand	1				1			1															
96	5.0 N	S	P	sand	1				1			1															
105	5.0 N	M	P	org	1				1																		
104	4.8 N	M	P	org	1				1			1															
113	5.5 N	M	P	org	1				1																		
114	4.9 N	M	P	org	1							1															

(2)

Waterbody/Project: Trego Date: 6/9/2022

Crew: Laura Stes Heather Lutzow

Sampling Point	Depth (ft)	cloud Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Potamogeton crispus	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	N. variegata	N. flexilis	N. americana	Lemna trisulca	Lemna minor	Nitella	Ranunculus aquatilis	Potamogeton robbinsii									
123	4.9 N	M	P	org		1							1																	
122	7.6 N	M	P	org		1			1																					
132	6.0 N	M	P	org		1			1			1																		
133	5.4 N	M	P	org		1			1																					
142	7.4 N	M	P	org		0																								
141	6.0 N	S	P	sand		1							1	1	1															
150	3.5 N	M	P	org		1			1																					
1104	5.0 N	M	P	org		2			2																					
1103	9.7 N	M	P	org		0																								
1102	5.0 N	M	P	org		0																								
1101	3.5 N	M	P	org		3	1	3			1			1		1														
1100	5.0 N	M	P	org		1	1							1																
172	6.8 N	S	P	sand		1	1							1		1														
173	4.5 N	M	P	org		0																								
174	6.5 N	M	P	org		0																								
175	6.8 N	M	P	org		0																								
176	5.0 N	M	P	org		2	1	1	1	1				1		1														
177	5.4 N	M	P	org		1	1	1	1	1			1	1																
178	5.4 N	M	P	org		1	1		1	1				1																
165	5.0 N	M	P	org		1								1		1														
191	5.4 N	M	P	org		1		1	1					1		1														
192	4.8 N	M	P	org		1	1	1	1					1																
179	4.5 N	M	P	org		3		3																						
1106	4.3 N	M	P	org		1		1	1					1																
153	4.5 N	M	P	org		2		2	1		1		1			1														
152	1.0 N	M	P	org		0																								
143	4.5 N	M	P	org		2			1							2														
180	4.0 N	M	P	org		3	1	3	1	1																				

(3)

Waterbody/Project: Trego Date: 6/9/2022

Crew: Laura Lass Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	S. fluitans	V. americana	L. trisulca	P. robbinsii	P. aqueatilis	P. Richardsonii										
181	3.0 N	M	P	Silt	3	3 V	V	1																				
193	4.0 N	M	P	silt	1	1 V	V																					
194	3.5 N	M	P	silt	1	1 V	V	1																				
195	3.5 N	M	P	silt	3	1 3	1																					
185	2.8 N	M	P	silt	2	1 2	1	1 1																				
171	2.5 N	M	P	silt	3	3																						
159	3.0 N	M	P	org	2	1		1 1				1																
148	3.0 N	M	P	org	0	V	V																					
149	5.0 N	M	P	org	1							1																
139	1.8 N	M	P	org	1							1																
206	3.1 Y	M	P	org	1							1 1																
205	4.0 N	M	P	org	1	1		1				1	1															
204	4.1 N	M	P	org	3	1 1		3																				
214	3.9 N	M	P	org	1			1					1	1														
218	3.8 N	M	P	org	1	1																						
213	4.3 N	M	P	org	2	2 1		1						1														
203	4.5 N	M	P	org	1	1		1				1	1															
202	4.6 N	M	P	org	1	1	1					1		1														
190	5.5 N	M	P	org	1							1	1															
189	5.5 N	M	P	org	1	1						1		1														
201	4.6 N	M	P	org	1	1							1															
212	4.1 N	M	P	org	3	1	3	1							1													
211	4.0 N	S	P	sand	1	1		1																				
200	2.6 N	S	P	sand	1							1			1													
188	6.3 N	M	P	org	1							1	1															
187	7.0 N	S	P	sand	1								1															
191	2.8 Y	S	P	sand	1	1 1		1 1	1																			
184	8.0 N	M	P	org	0																							

(4)

Waterbody/Project: Trego Date: 6/9/2022

Crew: Laura Sass Heather Luttrell

Sampling Point	Depth (ft)	CWD (Y/N)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	R. crispus	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	V. variegata	V. americana	nitella												
185	8.5 N	S	P	Sand	Ø																							
196	8.9 N	S	P	Sand	Ø																							
197	7.0 N	S	P	Sand	Ø																							
198	6.5 N	S	P	Sand	1	1																						
210	1.5 N	M	P	org	Ø					V																		
209	5.5 N	M	P	org	1	1																						
208	6.8 N	S	P	Sand	Ø																							
207	9.7 N	M	P	muck	Ø																							
217	9.7 N	S	P	sand	Ø																							
216	5.5 N	S	P	Sand	1						1	1																
220	7.1 N	S	P	Sand	Ø																							
219	1.3 N	S	P	sand	Ø																							
221	5.5 N	S	P	sand	Ø																							
222	1.8 N	S	P	Sand	1	1																						
223	9.0 N	R	P	Cobble	Ø																							
228	9.5 N	S	P	Sand	Ø																							
227	5.0 N	S	P	Sand	Ø																							
237	8.5 N	S	P	sand	Ø																							
236	10.5 N	S	P	Sand	Ø																							
226	5.0 N	S	P	Sand	Ø																							
225	5.0 N	S	P	Sand	Ø																							
238	10.8 Y	S	P	wood	Ø																							
224	5.0 N	S	P	sand	Ø																							
233	12.0 Y	S	P	Sand	Ø																							
232	10.0 N	S	P	Sand	Ø																							
231	10.3 N	S	P	Sand	Ø																							
230	9.0 N	S	P	Sand	Ø																							
229	3.8 N	S	P	Sand	1						1																	

(5)

Waterbody/Project: Trego
Crew: Laura Sass Heather Lutzow
Date: 6/9/2022

Sampling Point	Depth (ft)	CWD (Y/N)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	R. cispus	M. spicatum	S. bicirrum	R. zosteriformis	E. canadensis	N. odorata	N. vaccegata	Utricularia sp.	Lemna trisulca	Spirodela polyrhiza											
238	7.2 N	M	P	org	0																							
239	10.0 N	S	P	sand	0																							
240	7.2 N	S	P	sand	0																							
241	4.1 N	M	P	org	1	1			1																			
242	2.4 N	M	P	org	1	1			1																			
245	2.2 N	M	P	silt	1							1	1	1														
244	4.3 N	M	P	org	1	1			1																			
243	9.0 N	S	P	sand	0																							
253	8.0 N	S	P	sand	0																							
264	7.2 N	S	P	sand	0																							
302	>11 Y	=	P	—	—																							
301	2.5 Y	R	P	gravel	0																							
316	10.0 N	M	P	org	0																							
327	2.5 Y	S	P	sand	0																							
326	4.4 Y	M	P	org	1	1			1																			
300	5.2 N	M	P	org	1	1			1																			
299	10.5 N	S	P	sand	0																							
296	6.0 N	M	P	org	0																							
275	4.0 N	S	P	sand	0																							
274	8.6 Y	S	P	wood	0																							
252	2.4 N	R	P	cobble	0																							
262	6.0 N	M	P	org	1				1																			
249	2.0 Y	S	P	sand	1	1																						
273	8.5 Y	S	P	sand	0																							
298	9.0 Y	S	P	sand	0																							
225	5.0 Y	S	P	wood	0																							
340	7.0 Y	R	P	gravel	0																							
344	9.0 Y	S	P	sand	0																							

(6)

Waterbody/Project: Treco

Date: 6/9/2022

Crew: Laura Sass Heather Luttow

Sampling Point	Depth (ft)	CWD (Y/N)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	P. crispus	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	N. variegata	V. americana	P. robbinsii	P. Sparganium eurycarpum	P. natans	P. praelongus	Bidens beckii
354	2.9	N	S	P	sand	Ø														
362	2.9	Y	S	P	sand	Ø									V					
367	1.5	N	S	P	sand	Ø					V									
396	4.0	Y	S	P	sand	Ø														
412	2.5	N	M	P	org	2	2				1	1		V						
428	2.0	Y	S	P	sand	1					V	1				1				
438	10.0	N	S	P	sand	Ø														
471	6.5	Y	S	P	sand	1	1													
478	7.0	Y	S	P	sand	Ø														
484	7.5	Y	M	P	org	3	3				1									
483	4.9	N	S	P	sand	2	2								1					
488	3.9	N	S	P	sand	2	2				1	1			2					
492	5.1	Y	S	P	sand	1	1					1			1					
459	7.9	Y	M	P	org	1			V			1								
460	3.9	Y	S	P	sand	1			1						1				V	
455	2.3	N	S	P	sand	1						1								
452	2.0	N	S	P	sand	1	1		1	V						1	1	V		
450	3.0	N	S	P	sand	Ø														
445	11.0	Y	S	P	sand	Ø														
413	6.0	Y	S	P	sand	Ø														
439	2.9	N	M	P	org	1	1				1		1							
435	2.9	N	R	P	gravel	1			1			1							V	
429	6.0	N	S	P	sand						1								V	
408	3.9	N	S	P	sand	1	1													1
393	3.5	N	R	P	cobble	Ø														
363	2.0	Y	R	P	cobble	Ø														
364	4.0	Y	R	P	cobble	Ø														
360	9.8	N	R	P	cobble	Ø														

(7)

Waterbody/Project: Trego Date: 6/9/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD Y/N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	P. crispus	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	N. variegata	V. americana	P. richardsonii	H. dubia	S. eurycarpum	L. Trisulca											
357	9.0	Y	S	P	sand	0																								
351	8.6	N	S	P	sand	0																								
349	7.8	Y	S	P	sand	0																								
341	6.8	Y	R	P	cobble	1									1															
336	9.6	Y	M	P	org	0																								
332	10.5	Y	M	P	org	0																								
328	2.6	Y	S	P	sand	0				V																				
319	10	Y	M	P	org	0																								
289	7.0	M	M	P	org	0																								
288	9.6	N	M	P	org	1									1															
277	10.0	N	M	P	org	1									1															
278	10.2	N	M	P	org	0																								
266	10.0	N	M	P	org	0																								
265	9.5	N	M	P	org	0																								
254	3.4	Y	S	P	Sand	1				1						1														
255	10.3	N	M	P	org	1									1															
246	2.8	Y	S	P	sand	1	1			1	1			1		1														
247	8.0	Y	S	P	Sand	1	1										1													
256	5.5	N	M	P	org	1	1			1	1																			
257	8.5	N	M	P	org	2	2										1													
258	4.0	N	S	P	sand	2	2			1	1																			
259	4.6	N	M	P	org	1	1																							
248	1.8	Y	S	P	sand	1	1																							
270	10.8	N	S	P	sand	0																								
282	2.4	N	S	P	sand	0	V			V																				
293	5.0	N	S	P	Sand	1									1															
308	3.0	N	S	P	Sand	0																								
309	10.8	N	M	P	org	0																								

357 thru 314 → "M" → Bottom 1 - 4 cm organic debris

(8)

Waterbody/Project: Trego Date:

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	R. crispus	M. spicatum	M. sibiricum	P. zosteriformis	E. canadensis	N. odorata	N. variegata	Het. Dubia	S. eurycarpum	L. Trisulca	P. Friesii										
514	2 N	S	P	sand	1								1														
515	1.5 N	S	P	Sand	0																						
518	3 N	S	P	Sand	0																						
519	2 N	S	P	Sand	0																						
520	4 N	S	P	Sand	0																						
521	2.5 N	M	P	Org.	1				1																		
517	2 Y	M	P	Org.	1				1				1														
513	1.5 N	M	P	Org.	1	1	V						1														
511	3 N	S	P	Sand	0																						
512	1 N	S	P	Sand	0																						
505	3 N	M	P	Org.	0																						
510	1.5 N	S	P	Sand	0																						
506	1.5 N	S	P	Sand	0																						
507	1.5 N	S	P	Sand	0																						
508	3 N	S	P	Org.	0																						
509	2 N	M	P	Org.	1	1			1	1	1			1													
504	1.5 N	S	P	Sand	0																						
501	16 Y	R	P	Rock	0																						
498	1.5 Y	M	P	Org.	0																						
497	2 N	R	P	cobble	0																						
496	2.5 N	S	P	sand	0																						
495	3 N	M	P	Org.	0																						
494	3.5 N	M	P	Org.	2	2	V		1					1													
65	5 N	R	P	Rock	0																						
64	3 N	S	P	sand	0																						
63	2.5	S	P	Sand	0																						
62	2.5	S	P	Sand	0																						
61	3	S	P	cobble	1						1																

(9)

Waterbody/Project: Trego Date:

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD (Y/N)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum	P. crispus	M. spicatum	M. sibiricum	P. foliosus	E. canadensis	N. odorata	P. vaseyi	P. Robbinsii	Chara sp.	N. flexilis sp.	V. americana	S. fluctuans										
55	2 N	S	P	Sand	0																								
54	3 N	S	P	Sand	0																								
53	2 N	S	P	Sand	0																								
38	4 N	M	P	Org.	3	1			3																				
34	4 N	M	P	Org	3	1		1	2		2	1																	
30	4 N	M	P	Org	2				1 1		1	1																	
26	4.5 N	M	P	Org.	3				3		1		1																
21	4 N	M	P	Org.	1			V			1																		
25	4.5 N	M	P	Org.	3	1	1		1 3		1																		
24	3 N	M	P	Org.	3	1			1 1		2																		
29	3.5 N	M	P	Org.	3	2			1		1																		
33	0.5 N	M	P	Org.	1		1		1 1																				
52	8 N	R	P	Rock	0																								
50	1 N	S	P	Sand	1				1								1												
72	3 N	S	P	Sand	0																								
85	0.5 N	S	P	Sand	0																								
95	1 N	S	P	sand	0																								
112	2 N	S	P	sand	0																								
130	2 N	M	P	Org.	1				1 1								1												
140	1 N	S	P	Sand	1												1												
129	1.5 N	M	P	Org.	1				1 1								1												
119	1.5 N	M	P	Org.	1				1								1												
109	1 N	M	P	Org.	1												1												
99	1 N	M	P	Org.	1												1												
89	1 N	M	P	Org.	1				1								1												
78	3.5 N	M	P	Org.	1												1												
68	2 N	M	P	Org.	1												1												
58	3.5 N	M	P	Org.	1				1								1												

Invertebrates - Tropha sp.

(10)

Non-nav points are noted on the PI map.

Waterbody/Project: Trego

Date:

Crew: Laura Sass Heather Luzzow

Sampling Point	Depth (ft) CWD (Y/N)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	C. demersum / P. crispus	M. spicatum / M. sibiricum	P. zosteriformis / E. canadensis	N. odorata / N. variegata	L. trisulca / S. fluviatans	L. minor											
32	3.5 N	M	P	Org.	0																	
19	2.5 N	M	P	Org.	0																	
18	3.5 N	M	P	Org.	1	1		1		1												
17	1.5 N	M	P	Org.	1					1												
13	1 N	M	P	Org	1						1											
16	1.5 N	M	P	Org.	0																	
23	3.5 N	M	P	Org	1			1														
28	3 N	M	P	Org.	1	1					1											
59	1.5 N	M	P	Org.	1					1												
69	0.5 N	M	P	Org	0																	
71	2.5 N	S	P	Sand	0																	
84	3 N	S	P	Sand	0																	
94	2.5 N	S	P	Sand	0																	
111	1.5 N	S	P	Sand	0																	
110	1.5 N	S	P	Sand	0																	

NN = Non-nav.

Waterbody/Project: Trego Flowage Date: 6/9/2022

Crew: Laura Sass, Heather Lutzow, Kellen Black

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Woody Debris? YES(Y)/NO(N)	Ceratophyllum demersum	Potamogeton zosteriformis	Elodea Canadensis	Myriophyllum sibiricum	Utricularia vulgaris	Potamogeton amplifolius	Lemna Trisulca	Nuphar Variegata								
493	4.0	M	P	org	2	Y	1	1	1	1	V.	V	V	V								
489	7.5	R	P	gravel	0	N																
13	NN	—	—	—	—	—																
294	9.4	S	P	wood	0	Y																
283	3.4	S	P	sand	0	Y																
271	10.5	S	P	sand	0	N																

ATTACHMENT D

Trego Point-Intercept/AIS Survey Field Data Sheets – July/August

gai consultants
transforming ideas into reality

Waterbody/Project: Trego Lake Date: 7-20-22
Crew: Sass / Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.
19	2	N	M	P	Org.	1						1		1	1		
23	3	N	m	P	Org	1								1	1		
29	2.8	N	M	P	Silt	1				1		1		1	1		1
32	2.5	N	m	P	org.	1								1			1
37	3	N	m	P	org	1				1							1
41	2	Yes	m	P	Org.	1				1		1					
46	2.5	N	m	P	Org.	1				1		1					1
39	3	N	m	P	Org.	1				1		1					1
35	2.5	N	m	P	Org	3				3		1		1			1
31	2.5	N	M	P	Org	2				1		2		1			
42	1.8	N	M	P	Org.	2				1	1	1		1	1		1
43	3.5	N	m	P	Org.	2		1		2					1		
24	3.8	N	m	P	Org	3				1	1						3
45	1	N	S	P	Sand	Ø											
51	3.5	N	m	P	Org.	1						1					1
52	3.5	N	m	P	Org	1						1					1
49	3.5	N	M	P	Org	3	1					3		1			
48	4	N	m	P	Org	1						1	1				1
56	4	N	m	P	Org.	1				1							1
57	4.7	N	m	P	Org	1				1		1					
58	2	N	m	P	Org.	Ø											
59	1.3	N	M	P	Org	Ø											
125	3.5	N	m	P	Org.	1											
137	3.5	N	m	P	Org	1	1			1		1					
170	3.5	N	m	P	Org	Ø											
159	3.5	N	m	P	Org	3				3		1					
149	4.5	N	M	P	Org	1						1					
139	2.5	N	m	P	Org	Ø											
140	1.5	Y	S	P	Sand	1											
121	0.2	N	S	P	Sand	1							1				
111	1	N	S	P	Sand	Ø											
112	2	N	S	P	Sand	Ø											
506	1	N	S	P	Sand	Ø											
505	2.5	N	S	P	Sand	1						1					

Sampling Point	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana	Wolffia	C. echinatum [illegible]	F. Algae	N. flexilis	Tolypella intricata
19				1					1				1			1	1				
23				1																	
29													1			1		1			
32													1								
37																					
41		1							1				1								
46													1								
39													1						1		
35													2								
31									1												
42													1			2	1			1	
43								1					1								
24								1	1												1
45																					
51				1									1								
52																			1		
49									1	1											
48																					1
56																1					
57									1				1						1		1
58																					
59																					
125																					
137									1							1					
170																					
159									2												
149									1												
139																					
140				1					1												
121																					
111																					
112																					
506																					
505																					

↳ Visual on Zizania

Waterbody/Project: _____ Trego Lake _____ Date: 7-20-22

Crew: SASS / Lutgen

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana	Zizania sp.
507	1.5	N	M	P	Org.	0																												
508	2.5	N	M	P	Org.	0																												
504	2.5	N	S	P	Sand	0																												
501	5.5	N	R	P	Boulder	0																												
498	2	N	M	P	Org.	3																		3								2		
497	6.5	N	R	P	cobble	1																										1		
496	3.5	N	S	P	Sand	0																												
495	4.5	N	M	P	Org.	0																												
165	5.5	N	R	P	cobble	0																												
164	3.5	N	S	P	Sand	0																												
163	2.5	N	S	P	Sand	0																												
162	2.5	N	S	P	Sand	0																												
161	3.5	N	R	P	cobble	0																												
155	1.5	N	S	P	Sand	0																												
154	3	N	S	P	Sand	0																												
53	2	N	S	P	Sand	0																												
28	3.5	N	M	P	Org.	2			2		1						1					1									1			
25	3.5	N	M	P	Org.	2			1		2												1											
24	2.5	N	M	P	Org.	3			2		1			V			V					V	3					V						
21	2.5	N	M	P	Org.	3				3	1																							
26	3.5	N	M	P	Org.	3					1											1	3								1			
30	3.5	N	M	P	Org.	2					2												1								1			
34	4	N	M	P	Org.	3			1	1	3												2											
38	4	N	M	P	Org.	3			2		3						1					1	1											
52	7	N	R	P	cobble	0																												
160	1.5	N	M	P	Org.	1					1													1								1		
72	2	N	S	P	Sand	0																												
85	1.5	N	S	P	Sand	0																												
95	1	N	S	P	Sand	0																												
84	3	N	S	P	Sand	0																												
44	2	N	S	P	Sand	0																												
71	2	N	S	P	Sand	0																												
19	2	N	M	P	Org.	0																												
18	3	N	M	P	Org	1																										1		

JAK

Waterbody/Project: Trego Date: 8/1/2022

Crew: Laura Sass, Kollen Black

Sampling Point	Depth (ft)	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Elodea canadensis	Spirodella polyrhiza	Sagittaria latifolia	Sparganium Eurycarpum	Nuphar variegata	Heteranthera dubia	Lemna minor	Potamogeton zosteriformis	Ceratophyllum demersum	Myriophyllum spicatum (EWM)
521	1.4	M	P	org	3	3	1	v	v	V					
520	2.9	S	P	sand	1						1				
519	1.2	S	P	sand	Ø										
518	2.2	S	P	sand	Ø										
517	NN - Terrestrial			—	—										
516	NN - Plants			—	—										
515	1.5	S	P	Sand	Ø										
514	1.5	S	P	Sand	Ø										
513	1.4	M	P	org	2		V		1	V		V	1		1
512	1.9	S	P	sand	Ø										
511	1.5	S	P	sand	Ø										
510	2.4	S	P	sand	Ø										

Incidentals: Sagittaria cristata

✓JAK

Waterbody/Project: Trego Lake Date: 8/4/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana
255	10.0	N	M	P	org	3										3																	
3007	2.5	N	S	P	sand	1	1			1		1											1								1		
279	13.0	N	M	P	org	Ø																											
280	13.5	N	M	P	org	Ø																											
248	13.0	N	M	P	org	3																											
256	5.5	N	M	P	org	3			3		3																						
247	1.5	N	M	P	org	3					1													3									
257	11.0	N	M	P	org	Ø																											
258	6.8	N	M	P	org	2			2													1								2			
259	4.0	N	M	P	org	2			2												1	1								2			
270	9.0	N	M	P	org	2			2																								
269	13.5	N	M	P	org	Ø																											
281	11.3	N	M	P	org	Ø																											
282	2.0	N	S	P	sand	1			1		1																			1			
293	1.0	N	S	P	Sand	1																								1			
308	2.8	N	R	P	grav	Ø																											
309	10.5	N	M	P	org	Ø																											
294	8.7	N	M	P	org	Ø																											
295	9.5	N	M	P	org	1										1																	
283	5.7	N	M	P	sand	Ø																											
284	NA	N	M	P	org	Ø																											
271	10.0	N	R	P	grav	Ø																											
260	13.5	N	M	P	org	Ø																											
249	1.5	Y	S	P	sand	1																								1			

JAK

Waterbody/Project: Trego Lake # Date: 8/4/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana
459	4.5	N	M	P	org	2					1												1								1		
460	3.5	N	S	P	Sand	0					1																				0		
455	8.0	N	S	P	Sand	1			1		1																				1		
452a	11.0	N	S	P	Sand	1			1																								
450	1.5	N	S	P	sand	2																									2		
445	16.0	-	-	-	—	1																											
443	3.5	Y	S	P	sand	0																											
435	2.5	N	M	P	org	2	1		1		2		1										1			1							
432	5.0	N	M	P	org	3			2														1								2		
429	6.0	N	S	P	Sand	2			2																						2		
425	13.4	N	S	P	Sand	0																											
408	6.5	N	M	P	org	3			2														1								3		
413	16.0	-	-	-	—	-																											
393	3.0	N	S	P	Sand	0																											
363	3.0	Y	R	P	gravel	0																											
361	8.5	N	R	P	Gravel	0																											
360	7.0	N	R	P	Gravel	0																											
357	5.5	N	M	P	org	0																											
351	11.5	Y	S	P	Sand	0																											
349	7.8	N	R	P	grav	0																											
334	10.0	N	M	P	org	0																											
332	10.9	N	M	P	org	0																											
288	11.5	Y	S	P	Sand	0																											
219	8.0	N	M	P	org	1																									1		
304	13.5	N	M	P	org	0																											
289	10.5	N	M	P	org	0																											
290	13.5	N	M	P	org	0																											
205	19.5	N	M	P	org	0																											
280	14.5	N	M	P	org	0																											
277	10.0	N	M	P	org	2									2																		
265	8.5	N	M	P	org	3			3																								
266	10.0	N	M	P	org	2									2																		
254	4.0	N	M	P	org	3			3																								
246	7.5	N	M	P	org	2	1		1		1																				1		

✓ JAK

Waterbody/Project: _____ Trego Lake _____ Date: 8/4/2022

Crew: Laura Sass, Heather Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana
325	5.0	Y	M	P	org	0																											
324	13.0	N	M	P	org	0																											
303	14.5	N	M	P	org	0																											
307	13.0	N	M	P	org	0																											
892	12.6	N	M	P	org	0																											
891	12.7	N	M	P	org	0																											
306	13.0	N	M	P	org	0																											
320	10.3	N	[illegible]	P	org	0																											
321	13.6	N	M	P	org	0																											
331	12.5	N	M	P	org	0																											
335	12.7	N	M	P	org	0																											
339	13.7	N	M	P	org	0																											
340	4.0	N	S	P	Sand	0																										V	
341	11.0	N	S	P	Sand	0																											
343	13.3	N	M	P	org	0																											
346	15.2	-	-	-	-	-																											
348	12.4	-	-	-	-	-																											
364	2.5	N	S	P	Sand	3																										2	
367	1.3	N	S	P	Sand	0																											
378	15.4	-	-	-	-	-																											
389	12.2	N	M	P	org	0																											
396	2.9	Y	S	P	Sand	3																										3	
411	2.5	N	R	P	grav	3																										3	
422	2.0	N	S	P	Sand	0																										0	
438	10.0	N	M	P	org	0																											
446	12.0	N	S	P	Sand	0																											
471	5.0	Y	S	P	Sand	0																											
478	13.5	N	R	P	grav	0																											
484	2.5	N	S	P	Sand	2			5		1																						
484	10.0	N	S	P	Sand	3			3																								
483	5.5	N	M	P	Org	3			2																								
488	3.0	N	S	P	Sand	2					2																						
492	7.2	N	M	P	org	2			1		1																						
278	10.0	N	M	P	org	0																	1										

✓JAK

Waterbody/Project: Trego Lake Date: 8/4/2022

Crew: Laura Jass & Heather Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana
260	13.2	N	M	P	org	0																											
261	11.9	N	M	P	org	0																											
262	11.2	N	M	P	org	0																											
274	11.0	N	M	P	org	1				1																							
275	7.1	N	M	P	org	0																											
280	6.0	N	M	P	org	0																											
299	8.0	N	M	P	org	0																											
300	6.5	N	M	P	org	0																											
314	12.3	N	S	P	Sand	0																											
317	13.3	N	R	P	gravel	0																											
315	11.0	N	M	P	org	0																											
316	11.6	N	M	P	org	0																											
317	12.6	N	S	P	sand	0																											
318	12.0	N	R	P	gravel	0																											
301	0.5	N	R	P	gravel	0																											
302	11.0	N	R	P	Bould	0																											
287	13.5	N	R	P	cobble	0																											
276	11.5	N	S	P	Sand	0																											
264	7.5	N	S	P	sand	0																											
253	10.0	N	S	P	sand	0																											
242	8.8	N	S	P	sand	0																											
238	7.3	N	M	P	org	0																											
229	3.5	N	S	P	sand	1																					1						
230	9.0	N	M	P	org	0																											
241	10.5	N	M	P	org	0																											
252	10.5	N	S	P	sand	0																											
239	11.0	N	S	P	sand	0																											
224	5.5	Y	M	P	org	1				1																							
225	5.0	N	M	P	org	0				1																							
226	6.5	N	M	P	org	1										1																	
227	5.5	N	M	P	org	1				1						1																	
223	9.0	N	M	P	org	0																									1		
221	3.5	N	S	P	Sand	1																									1		
29	0.8	N	S	P	Sand	1						1																			1		

✓JAK

Waterbody/Project: Trego Lake Date: 8/4/2022

Crew: Laura Sass Heather Nitzel

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	*Myriophyllum spicatum*, EWM	*Potamogeton crispus*, CLP	*Bidens beckii*	*Ceratophyllum demersum*	*Chara* sp.	*Elodea canadensis*	*Heteranthera dubia*	*Lemna minor*	*Lemna trisulca*	*Myriophyllum sibiricum*	*Nitella* sp.	*Nuphar variegata*	*Nymphaea odorata*	*Potamogeton amplifolius*	*Potamogeton friesii*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton richardsonii*	*Potamogeton robbinsii*	*Potamogeton zosteriformis*	*Ranunculus aquatilis*	*Sparganium eurycarpum*	*Sparganium fluctuans*	*Spirodela polyrhiza*	*Stuckenia pectinata*	*Utricularia vulgaris*	*Vallisneria americana*
218	3.8	N	M	P	org	1			1		1			1	1																	
217	4.0	N	R	P	gravel	0																										
212	4.1	N	M	P	org	2					1			1		2																
211	3.9	N	M	P	org	2			1	1						2							1							1		
208	3.2	N	M	P	org	1			1										1													
187	7.5	Y	M	D	org	1			1						1																	
199	1.5	N	S	P	sand	1																								1		
186	8.4	N	M	P	org	0																	1							1		
198	6.4	N	M	P	org	1			1																							
209	7.0	N	M	P	org	0																										
208	7.2	N	M	P	org	1										1																
210	10.0	N	M	P	org	3										1														3		
200	10.0	N	M	P	org	1										1							1									
202	4.3	N	M	P	org	1			1																							
209	9.5	N	S	P	sand	0																										
237	6.9	N	M	P	org	3			1																					3		
240	11.5	N	S	P	sand	0																										
235	12.0	N	S	P	sand	0																										
234	10.0	N	R	P	gravel	0									1																	
241	10.0	N	M	P	org	1			1																							
240	7.0	N	M	P	org	2										2																
239	10.5	N	S	P	sand	0																										
207	5.8	N	M	P	org	1																	1									
242	5.5	N	M	P	org	3			3																					3		
241	5.8	N	M	P	org	3																										
273	8.5	N	M	P	org	0																										
272	8.0	N	M	P	org	1										1																
285	9.0	N	M	P	org	1										1																
298	9.6	N	M	P	org	0																										
297	10.0	N	M	P	org	0																										
296	14.5	N	M	P	org	0																										
313	12.5	N	M	P	org	0																										
311	13.3	N	M	P	org	0																										
310	11.5	N	M	P	org	0																										

JAK

Waterbody/Project: Trego Lake Date: 8/4/2022
Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana	Zizania sp.	
115	9.0	N	S	P	sand	0																													
107	9.8	N	M	P	org	0																													
196	9.0	N	S	P	sand	0																													
197	7.0	N	M	P	org	1										1																			
185	8.0	N	M	P	org	0																													
172	6.5	N	M	P	org	1			1				1																						
173	4.0	N	M	P	org	1				1			1			1																1				
160	5.0	N	M	P	org	1				1			1			1																1				
161	3.5	N	M	P	org	2			1	1			2			1																				
162	3.9	N	M	P	org	0																													
150	2.5	N	M	P	org	0																													
151	9.0	N	M	P	org	0																													
141	1.0	N	M	P	sand	0																													
132	3.0	N	M	P	org	0																													
122	8.0	N	M	P	org	1							1																						
113	5.0	N	M	P	org	2																1				1					8				
104	4.5	N	M	P	org	2										1						1									2				
105	5.5	N	M	P	org	0																									4				
96	6.4	N	M	P	org	1																													
87	4.0	N	M	P	org	1																1										1			
116	4.5	N	M	P	org	3																									3				
116	3.5	N	M	P	org	1			1													1									1				
107	3.8	N	M	P	org	1				1																					1				
114	4.4	N	M	P	org	1																													
123	5.0	N	M	P	org	0																													
124	3.8	N	M	P	org	2			1				1									1													
135	3.8	N	M	P	org	1	1									1																			
136	3.5	N	M	P	org	1		1		1																									
145	8.3	N	M	P	org	1										1																			
144	3.8	N	M	P	org	1				1			1			1																			
134	4.0	N	M	P	org	0																													
133	5.7	N	M	P	org	0																													
142	7.5	N	M	P	org	0																													
143	4.1	N	M	P	org	1										1																			

JAK

Waterbody/Project: Trego Lake Date: 8/4/2022

Crew: Laura Sass Heather Lutrell

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Myriophyllum spicatum, EWM	Potamogeton crispus, CLP	Bidens beckii	Ceratophyllum demersum	Chara sp.	Elodea canadensis	Heteranthera dubia	Lemna minor	Lemna trisulca	Myriophyllum sibiricum	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton friesii	Potamogeton natans	Potamogeton praelongus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton zosteriformis	Ranunculus aquatilis	Sparganium eurycarpum	Sparganium fluctuans	Spirodela polyrhiza	Stuckenia pectinata	Utricularia vulgaris	Vallisneria americana
152	6.5	N	M	P	org	1									1																1		
153	4.4	N	M	P	org	0																											
154	4.0	N	M	P	org	1					1				1																		
155	4.0	N	M	P	org	1			1																								
168	3.5	N	M	P	org	2			1															1									
167	4.1	N	M	P	org	1																		1									
166	4.1	N	M	P	org	3							1											3									
165	5.0	N	M	P	org	1	1		1				1											1							1		
164	6.6	N	M	P	org	1																											
163	9.5	N	M	P	org	0																											
174	8.0	N	M	P	org	0																											
175	7.4	N	M	P	org	0																											
176	4.5	N	M	P	org	1			1		1		1		1																1		
177	5.6	N	M	P	org	2	1		2				1																				
178	5.5	N	M	P	org	1							1																		1		
179	4.5	N	M	P	org	1	1																										
180	4.0	N	M	P	org	2			1		1													2							1		
194	3.0	N	M	P	org	0																											
195	3.5	N	M	P	org	1					1																						
192	2.5	N	M	P	org	0																											
193	4.0	N	M	P	org	1																											
92	4.5	N	M	P	org	1					1		1		1																		
91	5.0	N	M	P	org	1	1		1				1		1																1		
90	5.0	N	M	P	org	1							1		1																		
189	5.0	N	M	P	org	1			1				1		1						1												
188	6.3	N	M	P	org	1							1		1						1												
201	4.4	N	M	P	org	1																									1		
202	4.5	N	M	P	org	1					1		1																				
203	4.4	N	M	P	org	1							1		1																1		
204	3.8	N	M	P	org	1					1		1																		1		
205	3.5	N	M	P	org	1					1		1																		1		
206	3.0	N	M	P	org	1					1		1		1																		
214	3.5	N	M	P	org	1			1		1		1		1																		
213	3.7	N	M	P	org	1			1		1		1		1									1							1		

JAK

Trego Depths

Waterbody/Project: Gile Flowage Date: 8/4

Crew:

Sampling Point	Depth (ft)	CWD? Y or N	Dominant sediment type (M=muck, S=sand, R=Rock)	Sampled holding rake pole (P) or rake rope (R)?	Additional Info - Dominant Substrate type (Clay, Silt, Sand, Gravel, Cobble, Boulder, Bedrock, Wood, Organic)	Total Rake Fullness	Ceratophyllum demersum	Elatine minima	Elodea canadensis	Elodea nuttallii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum verticillatum	Nitella sp.	Persicaria amphibia (Polygonum amphibium)	Potamogeton alpinus	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton nodosus	Potamogeton pusillus	Ranunculus flammula	Sagittaria sp.	Schoenoplectus subterminalis	Sparganium fluctuans	Zizania sp.	Aquatic moss
252	NN	Plants			350	18.1																					
242	NN	Plants			352	16.2																					
77	NN	Rock			353	17.7																					
88	NN	R Qa			356	20.9																					
97	NN	R Q			359	21.9																					
115	NN	Rock			372	16.6																					
210	NN	plants			377	19.3																					
326	NN	plants			376	21.9																					
307	Dock				382	21.8																					
					386	17.3																					
					388	20.7																					
					392	19.3																					
					395	21.5																					
					399	16.7																					
					401	23.2																					
					405	21.3																					
					416	21.5																					
					421	15.8																					
					424	23.3																					
					407	25.0																					
					431	15.3																					

Jane/HL ✓

ATTACHMENT E
Photo Log

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Hayward and Trego Aquatic and Terrestrial Species Study Report Photo Log

	
Yellow iris growing along the Hayward Lake shoreline, near the WI-77 bridge. 46.0105333, -91.45753611, June 8, 2022	Purple loosestrife near the Hayward Lake public boat launch. 46.00919, -91.479261, August 2, 2022
	
Recording aquatic plant data during the point-intercept survey in a heavily vegetated area. 46.0044666, -91.461097222, June 8, 2022	Japanese mystery snail found in Hayward Lake. 46.0095888, -91.4727555, June 7, 2022

	
Narrow-leaved cattail growing in Trego Lake. 45.91019444, -91.8340527778, July 20, 2022	Purple loosestrife being removed on Trego Lake. 45.910374, -91.833862, July 20, 2022
	
Yellow iris growing along the shoreline of Trego Lake. 45.9175749972, -91.848052775, June 6, 2022	An assortment of snails found near boat launches during the sediment sampling at Trego Lake. 45.909531, -91.824674, June 10, 2022

Dense honeysuckle and buckthorn near the downstream Hayward Dam during a terrestrial meander.
46.006645, -91.485340, August 3, 2022

Dense knapweed on NSPW-owned land near the Hayward Dam.
46.007639, -91.485386, August 3, 2022

Bay at northeast end of Trego Lake with purple loosestrife along much of the shoreline.
45.949049, -91.879788, August 5, 2022

Large, dense beds of wild rice near the south end of Trego Lake.
45.912055, -91.843041, August 4, 2022

Dense bed of aquatic forget-me-not and emergent species in the east portion Hayward Lake.
46.004454, -91.453852, August 5, 2022

ATTACHMENT F
Hayward WDNR Incident Report Forms

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State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Hayward Lake	Hayward	Sawyer

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-7-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?

Pale yellow iris - observed in many shoreline locations throughout the lake (photo available on the next page)

Latitude:	Longitude:

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☐ One or a few beds
- ☒ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Hayward Lake	Hayward	Sawyer

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-8-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?

This is to report aquatic forget-me-not; found in 2 locations along shore, nearby to GPS coordinates below. Photo documentation not feasible due to access limitations.

Latitude: 46.00855915795532 Longitude: -91.45869357790528

Approximately how large an area do the plants occupy?

- ☒ A Few Plants
- ☐ One or a few beds
- ☐ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

ATTACHMENT G
Hayward Terrestrial Survey Field Data

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Terrestrial Invasive Species Monitoring Form

		Site #	Landcover Classification	Starting latitude	Starting longitude	Abundance = Daubenmire Scale; Length = ft.	Common buckthorn	Eurasian honeysuckle	Spotted knapweed	Narrow-leaf cattail	Yellow Iris	Tansy	Glossy buckthorn	Purple loosestrife	Aquatic forget-me-not	
Project	Hayward					Relative Abundance		2	1		1	1	2	1		
County	Sawyer	1	Developed - Residential	46.0087073	-91.48209123	Length of Shoreline		342	60		35	65	332	15		
Date	8/2/2022; 8/3/2022					Relative Abundance	2	2	1	1	1	1	1	1	1	
Field Crew	Kellen Black	2	Developed - Residential / Northern Mesic Forest	46.0093846	-91.46804122	Length of Shoreline	2506	4130	583	79	311	25	1299	1781	2204	
	Heather Lutzow					Relative Abundance	2	2	2			1	2			
	Laura Sass		Hayward Lake Boat Landing and Hayward City Beach	46.0092070	-91.47778859	Length of Shoreline	1075	1095	783			138	328			
						Relative Abundance	2	3	3			1	3	1	2	
			East and South of Dam	46.0058979	-91.48425677	Length of Shoreline	508	1279	2218			229	1279	5	290	
						Relative Abundance	3	3				1	3	1		
			West and South of Dam	46.0051798	-91.48626946	Length of Shoreline	2301	3105				5	2291	25		
						Relative Abundance										
						Length of Shoreline										
						Relative Abundance										
						Length of Shoreline										
						Relative Abundance										
						Length of Shoreline										
						Relative Abundance										
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						Relative Abundance										
						Length of Shoreline										

ATTACHMENT H
Trego WDNR Incident Report Forms

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State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Laura Sass	920-328-0980	L.Sass@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Trego Lake	Trego	Washburn

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
6-6-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?
Pale yellow iris; Observed in many shoreline locations throughout the lake (photo on next page)

Latitude:	Longitude:

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☐ One or a few beds
- ☒ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Heather Lutzow	920-366-2897	H.Lutzow@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Trego Lake	Trego	Washburn

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
7-20-2022	late afternoon	

Narrow-leaf cattail

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☐ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?
Several large beds appear to be present and will be mapped in more detail during next survey visit. GPS coordinates below are for the first one positively ID'ed

Latitude:	Longitude:
45.910182	-91.834023

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☐ One or a few beds
- ☒ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Heather Lutzow	920-366-2897	H.Lutzow@gaiconsultants.com

Monitoring Location

Waterbody Name	Township Name	County
Trego Lake	Trego	Washburn

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
7-20-2022		

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

- ☐ Curly-leaf Pondweed
- ☐ Eurasian Water-milfoil
- ☒ Purple Loosestrife
- ☐ Brittle Naiad
- ☐ Hydrilla
- ☐ Brazilian Waterweed
- ☐ Yellow Floating Heart

Where did you find the invasive plant?
One established purple loosestrife plant was located along the shoreline, and as much as possible was pulled, taking care to first bag the flower heads

Latitude:	Longitude:
45.910325	-91.833892

Approximately how large an area do the plants occupy?

- ☐ A Few Plants
- ☒ One or a few beds
- ☐ Many beds
- ☐ A Whole Bay or Portion of Lake
- ☐ Widespread, covering most shallow areas of lake
- ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

- ☐ Floating
- ☒ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

- ☐ Rhinelander
- ☐ Spooner
- ☐ Green Bay
- ☐ Oshkosh
- ☒ Did not take plant sample to a DNR office
- ☐ Fitchburg
- ☐ Waukesha
- ☐ Eau Claire
- ☐ Superior
- ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No — If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

ATTACHMENT I
Trego Terrestrial Survey Field Data

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Terrestrial Invasive Species Monitoring Form

		Site #	Landcover Classification	Starting latitude	Starting longitude	Abundance = Daubenmire Scale; Length = ft.	Common buckthorn	Eurasian honeysuckle	Spotted knapweed	Narrow-leaf cattail	Yellow Iris	Japanese knotweed	Purple loosestrife	Aquatic forget-me-not	
Project	Trego		Northern Mesic Forest / Developed			Relative Abundance			2	3	1		3		
County	Washburn	1	- Residential	45.9095981	-91.82714982	Length of Shoreline			936	4834	198		4531		
Date	8/1/2022; 8/4/2022		Northern Mesic Forest / Developed			Relative Abundance			1	1	1	1			
Field Crew	Kellen Black	2	- Residential	45.9058197	91.83177378	Length of Shoreline			480	197	123	62			
	Heather Lutzow		Northern Mesic Forest / Developed			Relative Abundance					1				
	Laura Sass	3	- Residential	45.9201186	-91.85647773	Length of Shoreline					5				
			Northern Mesic Forest / Developed			Relative Abundance			1	2	1		2		
		4	- Residential	45.9248628	-91.86401172	Length of Shoreline			138	2471	50		4526		
			Northern Mesic Forest / Developed			Relative Abundance			1		1			1	
		5	- Residential	45.9318298	-91.87885816	Length of Shoreline			10		10			10	
						Relative Abundance			1						
			Trego Landing Road Boat Landing	45.9212136	-91.86836159	Length of Shoreline			10						
						Relative Abundance		1							
			Cash Road Boat Landing	45.9098279	-91.82513304	Length of Shoreline		5							
						Relative Abundance	1	1	2						
			North Side of Dam	45.9484061	-91.88620636	Length of Shoreline	5	20	1207						
						Relative Abundance		1	4						
			South Side of Dam	45.9455827	-91.88822835	Length of Shoreline		33	3858						
						Relative Abundance									
						Length of Shoreline									
						Relative Abundance									
						Length of Shoreline									
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						Length of Shoreline									
						Relative Abundance									
						Length of Shoreline									

ATTACHMENT J
Hayward Water Sample Results

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Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 636482003

Report To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: HAYWARD-RES,ZM
Project No:
Collection End: 8/3/2022 6:15:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 583131
Sample Location: HAYWARD LAKE - DEEP HOLE
Sample Description: DNR'S DEEP HOLE STATION
Sample Type: SU-SURFACE WATER
Waterbody: 2725500
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 58

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/18/22 00:00	Analysis Date: 10/18/22 00:00				
Mussel Veliger Screen	Mussel Veliger-WDNR	Absent			

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 636482003

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

LOD = Level of detection
LOQ = Level of quantification (for PFAS the LOQ = MRL)
ND = None detected. Results are less than the LOD
F next to result = Result is between LOD and LOQ
Z next to result = Result is between 0 (zero) and LOD
if LOD=LOQ, Limits were not statistically derived

Test results for NELAP accredited tests are certified to meet the requirements of the NELAC standards. For a list of accredited analytes
see http://www.slh.wisc.edu/about/compliance/nelac-laboratory-accreditation
Results, LOD and LOQ values have been adjusted for analytical dilutions and percent moisture where applicable.
Results relate only to the items tested.

The water microbiology unit analyzes samples as received and not all samples are tested for preservation before analysis is performed.

Responsible Party

Inorganic Chemistry: Graham Anderson, Supervisor 608-224-6281
Metals: Graham Anderson, Supervisor 608-224-6281
Organics: Erin Mani, Supervisor 608-224-6269
Environmental Toxicology: Dawn Perkins, Supervisor 608-224-6230
Water Microbiology: Martin Collins, Supervisor 608-224-6239
Radiochemistry: David Webb, Division Director 608-224-6227

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 636482004

Report To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: HAYWARD-TAIL,ZM
Project No:

Collection End: 8/3/2022 7:15:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10009811
Sample Location: NAMEKAGON 120 (BELOW LAKE HAYWARD DAM)
Sample Description: POOL BELOW DAM
Sample Type: SU-SURFACE WATER
Waterbody:
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 58

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/18/22 00:00	Analysis Date: 10/18/22 00:00				
Mussel Veliger Screen	Mussel Veliger-WDNR	Absent			

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 636482004

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

LOD = Level of detection
LOQ = Level of quantification (for PFAS the LOQ = MRL)
ND = None detected. Results are less than the LOD
F next to result = Result is between LOD and LOQ
Z next to result = Result is between 0 (zero) and LOD
if LOD=LOQ, Limits were not statistically derived

Test results for NELAP accredited tests are certified to meet the requirements of the NELAC standards. For a list of accredited analytes
see http://www.slh.wisc.edu/about/compliance/nelac-laboratory-accreditation
Results, LOD and LOQ values have been adjusted for analytical dilutions and percent moisture where applicable.
Results relate only to the items tested.
This Laboratory Report shall not be reproduced except in full, without written approval of the laboratory.
The water microbiology unit analyzes samples as received and not all samples are tested for preservation before analysis is performed.

Responsible Party

Inorganic Chemistry: Graham Anderson, Supervisor 608-224-6281
Metals: Graham Anderson, Supervisor 608-224-6281
Organics: Erin Mani, Supervisor 608-224-6269
Environmental Toxicology: Dawn Perkins, Supervisor 608-224-6230
Water Microbiology: Martin Collins, Supervisor 608-224-6239
Radiochemistry: David Webb, Division Director 608-224-6227

Wisconsin State Laboratory of Hygiene
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Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 637981003

Report To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: Hayward - Res, WF
Project No:
Collection End: 8/3/2022 6:30:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 583131
Sample Location: HAYWARD LAKE - DEEP HOLE
Sample Description: DNR'S DEEP HOLE STATION
Sample Type: SU-SURFACE WATER
Waterbody: 2725500
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 58

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/19/22 00:00	Analysis Date: 10/19/22 00:00				
Spiny Waterflea	Waterflea-WDNR	Absent			

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 637981003

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

LOD = Level of detection
LOQ = Level of quantification (for PFAS the LOQ = MRL)
ND = None detected. Results are less than the LOD
F next to result = Result is between LOD and LOQ
Z next to result = Result is between 0 (zero) and LOD
if LOD=LOQ, Limits were not statistically derived

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see http://www.slh.wisc.edu/about/compliance/nelac-laboratory-accreditation
Results, LOD and LOQ values have been adjusted for analytical dilutions and percent moisture where applicable.
Results relate only to the items tested.

The water microbiology unit analyzes samples as received and not all samples are tested for preservation before analysis is performed.

Responsible Party

Inorganic Chemistry: Graham Anderson, Supervisor 608-224-6281
Metals: Graham Anderson, Supervisor 608-224-6281
Organics: Erin Mani, Supervisor 608-224-6269
Environmental Toxicology: Dawn Perkins, Supervisor 608-224-6230
Water Microbiology: Martin Collins, Supervisor 608-224-6239
Radiochemistry: David Webb, Division Director 608-224-6227

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 637981004

Report To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: Hayward - Tail, WF
Project No:

Collection End: 8/3/2022 7:25:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10009811
Sample Location: NAMEKAGON 120 (BELOW LAKE HAYWARD DAM)
Sample Description: POOL BELOW DAM
Sample Type: SU-SURFACE WATER
Waterbody:
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 58

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/19/22 00:00	Analysis Date: 10/19/22 00:00				
Spiny Waterflea	Waterflea-WDNR	Absent			

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 637981004

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

LOD = Level of detection
LOQ = Level of quantification (for PFAS the LOQ = MRL)
ND = None detected. Results are less than the LOD
F next to result = Result is between LOD and LOQ
Z next to result = Result is between 0 (zero) and LOD
if LOD=LOQ, Limits were not statistically derived

Test results for NELAP accredited tests are certified to meet the requirements of the NELAC standards. For a list of accredited analytes
see http://www.slh.wisc.edu/about/compliance/nelac-laboratory-accreditation
Results, LOD and LOQ values have been adjusted for analytical dilutions and percent moisture where applicable.
Results relate only to the items tested.

The water microbiology unit analyzes samples as received and not all samples are tested for preservation before analysis is performed.

Responsible Party

Inorganic Chemistry: Graham Anderson, Supervisor 608-224-6281
Metals: Graham Anderson, Supervisor 608-224-6281
Organics: Erin Mani, Supervisor 608-224-6269
Environmental Toxicology: Dawn Perkins, Supervisor 608-224-6230
Water Microbiology: Martin Collins, Supervisor 608-224-6239
Radiochemistry: David Webb, Division Director 608-224-6227

ATTACHMENT K
Trego Water Sample Results

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Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
http://www.slh.wisc.edu

Laboratory Report

Environmental Health Division

WSLH Sample: 636482001

Report To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: TREGO-RES,ZM
Project No:

Collection End: 8/4/2022 3:15:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 663162
Sample Location: TREGO LAKE - DEEP HOLE NEAR DAM
Sample Description: RESEROIR ABOVE DAM
Sample Type: SU-SURFACE WATER
Waterbody: 2712000
Point or Outfall:
Sample Depth:
Program Code: FH
Region Code: 7
County: 66

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 08/15/22 00:00	Analysis Date: 08/15/22 00:00				
Mussel Veliger Screen	Mussel Veliger-WDNR	Absent			

Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive, PO Box 7996
Madison, WI 53707-7996
(800)442-4618 - FAX (608)224-6213
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Laboratory Report

Environmental Health Division

WSLH Sample: 636482001

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

LOD = Level of detection
LOQ = Level of quantification (for PFAS the LOQ = MRL)
ND = None detected. Results are less than the LOD
F next to result = Result is between LOD and LOQ
Z next to result = Result is between 0 (zero) and LOD
if LOD=LOQ, Limits were not statistically derived

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Metals: Graham Anderson, Supervisor 608-224-6281
Organics: Erin Mani, Supervisor 608-224-6269
Environmental Toxicology: Dawn Perkins, Supervisor 608-224-6230
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Laboratory Report

Environmental Health Division

WSLH Sample: 636482002

Report To:

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HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: TREGO-TAIL,ZM
Project No:

Collection End: 8/4/2022 3:45:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 663170
Sample Location: NAMEKAGON RIVER DOWNSTREAM CTH K NEAR TREGO WI
Sample Description: TAILWATER, NEARDAM
Sample Type: SU-SURFACE WATER
Waterbody:
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 66

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 08/15/22 00:00	Analysis Date: 08/15/22 00:00				
Mussel Veliger Screen	Mussel Veliger-WDNR	Absent			

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Laboratory Report

Environmental Health Division

WSLH Sample: 636482002

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

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Laboratory Report

Environmental Health Division

WSLH Sample: 637981001

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Invoice To:

HEATHER LUTZOW
GAI CONSULTANTS
3313 S PACKERLAND DR SUITE E
DE PERE, WI 54115

Customer ID: 356553

Field #: Trego-Res, WF
Project No:

Collection End: 8/4/2022 3:00:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 663162
Sample Location: TREGO LAKE - DEEP HOLE NEAR DAM
Sample Description: RESEROIR ABOVE DAM
Sample Type: SU-SURFACE WATER
Waterbody: 2712000
Point or Outfall:
Sample Depth:
Program Code: FH
Region Code: 7
County: 66

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/19/22 00:00	Analysis Date: 10/19/22 00:00				
Spiny Waterflea	Waterflea-WDNR	Absent			

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Laboratory Report

Environmental Health Division

WSLH Sample: 637981001

WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

List of Abbreviations:

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LOQ = Level of quantification (for PFAS the LOQ = MRL)
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Laboratory Report

Environmental Health Division

WSLH Sample: 637981002

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Invoice To:

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DE PERE, WI 54115

Customer ID: 356553

Field #: Trego- Tail, WF
Project No:

Collection End: 8/4/2022 3:30:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 663170
Sample Location: NAMEKAGON RIVER DOWNSTREAM CTH K NEAR TREGO WI
Sample Description: TAILWATER, NEARDAM
Sample Type: SU-SURFACE WATER
Waterbody:
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 66

Environmental Toxicology

Analyte	Analysis Method	Result	Units	LOD	LOQ
Prep Date: 10/19/22 00:00	Analysis Date: 10/19/22 00:00				
Spiny Waterflea	Waterflea-WDNR	Absent			

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Laboratory Report

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WDNR LAB ID:113133790 NELAP LAB ID:2091 EPA LAB ID:WI00007, WI00008 WI DATCP ID:105-415

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MUSSEL STUDY REPORTS

FRESHWATER MUSSEL STUDY FOR THE HAYWARD HYDROELECTRIC PROJECT

FERC No. 2417

Prepared for:

Mead & Hunt

1702 Lawrence Drive
De Pere, WI 54115

Project No.: 16082
Date: 1/25/2023

Prepared by:

EnviroScience
Excellence In Any Environment

5070 Stow Rd.
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Freshwater Mussel Study for the Hayward Hydroelectric Project Initial Study Report Document Date: 1/25/2023 Project No.: 16082		Prepared for:	Mr. Shawn Puzen Mead & Hunt

Authorization for Release

The analyses, opinions, and conclusions in this document are based entirely on EnviroScience's unbiased, professional judgment. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study.

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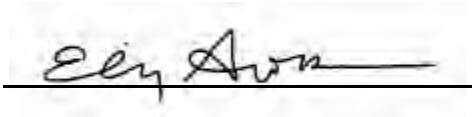
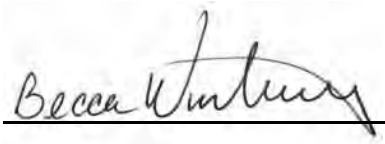


Emily Grossman
Senior Scientist | Field Manager



Becca Winterringer
Senior Scientist | Project Manager

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ACKNOWLEDGEMENTS

Xcel Energy provided funding for the project through Mead & Hunt. Mr. Shawn Puzen was the point of contact for Mead & Hunt, and Mr. Matthew Miller was the point of contact for Xcel Energy. The project manager for EnviroScience, Inc. was Ms. Becca Winterringer. Wisconsin permitted malacologist Ms. Emily Grossman led the survey effort. Also assisting with the survey effort were Mr. Robert Williams, Mr. Ben Ebert, Mr. Paul Moreno, and Mr. Matt Gilkay. Ms. Grossman authored the report, which was reviewed by Ms. Winterringer and Ms. Melissa Vaccarino.

1.0 INTRODUCTION

EnviroScience, Inc. was contracted by Mead & Hunt to perform freshwater mussel studies at the Hayward Hydroelectric Project (Project) in Sawyer County, Wisconsin. The Project is located on the Namekagon River in Hayward, Wisconsin (Figure 1). Northern States Power Company – Wisconsin, a Wisconsin corporation (NSPW or Licensee/Applicant), operates and maintains the Project under a Federal Energy Regulatory Commission (FERC) license, which expires in November 2025. NSPW must submit a final license application no later than November 30, 2023, to obtain a subsequent license for continued operation of the Project (FERC Project No. 2417).

The Namekagon River is a tributary of the St. Croix River and harbors a diverse mussel assemblage. Thirteen (13) species have been reported from the Namekagon River in Sawyer County, including one Wisconsin species of special concern (Elktoe [*Alasmidonta marginata*]); however, all observations are dated on or before 1995. No recent survey information was available at the time of this report (Table 1; WDNR, 2018). No federally listed threatened or endangered species are known to occur in this reach of the Namekagon River (Table 1).

Freshwater mussels residing near the Project may be affected by continued operation of the facility. Flow modifications upstream or downstream of the Project may alter habitat for mussels, and mussels occurring in the reservoir may become stranded during drawdown events. The Wisconsin Department of Natural Resources (WDNR) requested that a mussel survey be completed as part of the FERC relicensing process. The objective of the survey was to characterize mussel habitat and determine mussel abundance and species richness in the Project vicinity. Data collected from this survey provides information on the baseline conditions for mussel density, diversity, and habitat in the Project area.

2.0 METHODS

Mussel survey methods were developed in accordance with the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). Mussel studies included field surveys of two riverine reaches, one above and one below the Hayward Dam. Surveys were led by a Wisconsin permitted malacologist and were conducted according to the survey plan approved by WDNR (Appendix A).

2.1 RIVERINE SURVEYS

Mussel studies were conducted within riverine habitat near the Project. Reach 1 (upstream reach) began approximately 430 meters (m) upstream of the State Highway 77 bridge and extended 1,000 m upstream. Reach 2 (downstream reach) began at the canoe portage put-in (near the intersection of S. 1st St. and S. Florida Ave.) downstream of the tailrace and extended 1,000 m downstream (Figure 1).

Within each reach, a series of transects extending bank to bank was established every 100 m, creating a series of 10 possible transects per reach. Transects were numbered sequentially from downstream to upstream, and a random number function in Microsoft Excel was used to select five transects for the survey within each reach.

Searches along each transect were conducted in 10-m segments and extended 0.5 m on each side of the transect. Each transect was evaluated for mussels using an adaptive sampling approach. First, a rapid visual search was conducted and entailed an initial search of 0.2 minutes

per m^2 (min/m^2) along each 10-m segment to determine if mussels were present (living or shell material). If mussels were present in a segment, a semi-quantitative search was triggered and the search time was extended to 1 min/m^2. If no mussels or evidence of mussels was observed in the rapid visual search, no additional effort was expended in that segment. During the semi-quantitative search, divers visually searched, probed the substrate, and turned over rocks to detect small, burrowed mussels.

General stream conditions and morphology were recorded within the study area. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.; Wentworth, 1922) were recorded for each 10-m transect segment. In addition, a general description of mussel habitat characteristics in the Project boundary was recorded. The Aquatic Habitat Classification on the St. Croix National Scenic Riverway (Wan et al., 2007) was referenced for habitat and substrate classification.

2.2 DATA AND MUSSEL HANDLING

Live mussels were kept submersed in ambient river water and kept cool and moist during processing. All live mussels were identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens were scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species were recorded and reported. Datasheets were populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of the mussel study plan provided by Mead & Hunt. Mussel taxonomy followed the names presented by Williams et al., 2017.

3.0 RESULTS AND DISCUSSION

The mussel survey was conducted on June 19, 2022. Discharge on the Namekagon River at Leonards, WI (USGS 05331833) was 117 cubic feet per second. Maximum visibility was greater than 1 m, and the water temperature was approximately 18.9° Celsius (66° Fahrenheit). Photographs of sampling sites and species encountered are provided in Appendix B.

3.1 REACH 1 (UPSTREAM)

The upstream portion of Reach 1 was riverine and consisted of a shallow run with moderate current velocity. The lower portion of Reach 1 was located at the confluence with Hayward Lake where the river was wider and current velocity was low. The surrounding land was primarily residential areas (29%) and forest (34%; USEPA, 2022a). Submerged vegetation was present in small amounts near the banks in the upstream portion of the reach but was more abundant in the downstream portion.

Transects 1, 2, 6, 7, and 8 were randomly selected for sampling in Reach 1. Transects 6, 7, and 8 were the upstream-most transects sampled and were within the shallow run habitat. Substrate along all three transects consisted of a mix of cobble, gravel, and sand and most closely aligned with substrate composition code 7 (abundant fine substrate, gravel, pebbles, and cobbles) in Wan et al. (2007). Woody debris and submerged aquatic vegetation were also present in some transect segments. Water depth did not exceed 0.9 m (3 feet [ft]) along these transects (Table 2; Figure 2).

Habitat along Transects 1 and 2 differed from the upstream transects. Depth reached a maximum of 1.2 m (4 ft) in the thalweg (deepest course along the length of the reach) along the right descending bank but did not exceed 0.9 m (3 ft) in most segments. Substrate in the thalweg contained mixed sand, clay, and silt. Transect 2 also spanned a shallow muddy area between the thalweg and the left descending bank which consisted almost entirely of silt, clay, and submersed aquatic vegetation (Table 2; Figure 2). Substrate along Transects 1 and 2 most closely corresponded with substrate composition code 1 (abundant fine substrate) in Wan et al. (2007).

No live mussels were collected in Reach 1. Weathered dead or subfossil shells of Threeridge (*Amblema plicata*), Wabash Pigtoe (*Fusconaia flava*), and Fatmucket (*Lampsilis siliquoidea*) were collected from Transect 6, and shells of the same species were observed atop the substrate while walking between transects (Table 3). The invasive Chinese Mystery Snail (*Cipangopaludina chinensis*) was abundant in both the coarse substrate observed from Transects 6 through 8 and the soft clay and silt substrate from Transects 1 and 2.

3.2 REACH 2 (DOWNSTREAM)

Reach 2 primarily consisted of a shallow glide/run with heterogeneous substrate and moderate current velocity. The streambanks were low and gradually sloping. While the riparian zones of both banks were forested throughout most of the reach (9%), surrounding land use was primarily commercial and residential (42%; USGS, 2022b). A series of wood piles spanned the width of the river near the upstream end of the reach.

Transects 2, 3, 4, 8, and 9 were randomly selected for sampling in Reach 2. Although some substrate variation was observed among the sampled transects, conditions were generally similar across all five. Substrate was comprised primarily of mixed cobble, gravel, and sand and most closely aligned with substrate composition code 7 (abundant fine substrate, gravel, pebbles, and cobbles) in Wan et al. (2007). Sand was generally more abundant near the banks while some transect segments featured small proportions of boulder, woody debris, and submerged vegetation. Maximum observed depth was 0.9 m (3 ft; Table 2; Figure 3).

A total of 373 live mussels of 10 species were collected in Reach 2 (Table 3). Mucket (*Actinonaias ligamentina*; 29.5%) and Fluted Shell (*Lasmigona costata*; 16.9%) were the most abundant species collected; Plain Pocketbook (*Lampsilis cardium*), Spike (*Eurynia dilatata*), Creeper (*Strophitus undulatus*), and Wabash Pigtoe (*Fusconaia flava*) were also commonly encountered. One Wisconsin species of special concern, Elktoe, was also present. Although species relative abundance varied somewhat among the transects, 7 of the 10 species were present on all five transects.

Mussel abundance was lowest along Transect 2, with only 37 individuals collected and ranged from 77 to 92 individuals in the remaining four transects. Surface density ranged from 1.23 mussels/m^2 on Transect 2 to 3.40 mussels/m^2 on Transect 3 and averaged 2.66 mussels/m^2 over all sampled transects (Table 3). Live mussels were present in all transect segments sampled except the left descending bank segments of Transects 2 and 4 (Figure 4).

Mussel community metrics for Reach 2 are summarized in Table 3. All but one individual had >5 external annuli; this may be due in part to the inherent bias of semi-quantitative sampling toward larger individuals. Simpson's diversity was 0.84 and Pielou's evenness was 0.34. The cumulative species curve suggests that additional species may be present in the reach. Based on the

trendline equation, 70 additional individuals would need to be collected to yield one additional species (Figure 5).

4.0 CONCLUSIONS

No live mussels were collected in Reach 1 upstream of Hayward Lake. The fine substrate observed in Transects 1 and 2 does not provide high-quality mussel habitat. The heterogeneous substrate and more moderate current velocity in Transects 6 – 8 may provide more suitable habitat, and relic shells were observed in this portion of the reach, suggesting that mussels may occur in low abundance in the upstream portion of Reach 1.

In contrast, a total of 373 live mussels of 10 species were collected in Reach 2, including one Wisconsin species of special concern. Mussels were present along all five sampled transects, and relic shells and live individuals were observed in the substrate while walking between transects as well. Habitat along the transects was characterized by heterogeneous substrate (cobble, gravel, sand) and moderate current velocity, and most of this reach appears to provide suitable habitat for mussels.

5.0 REFERENCES

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

U.S. Environmental Protection Agency (USEPA). (2022a). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?featureid=1850879.

U.S. Environmental Protection Agency (USEPA). (2022b). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?comid=1850519.

Wan, H., Perry, J., Ferrin, R., Moraska-LaFrancois, B., Wan, H., Perry, J., ... & Moraska-LaFrancois, B. (2007). Aquatic habitat classification on the St. Croix National Scenic Riverway. In Research report to the US National Park Service. University of Minnesota.

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *Journal of Geology, 30*, 377-392.

Williams, J. D., Bogan, A. E., Butler, R. S, Cummings, K. S., Garner, J. T., Harris, J. L., Johnson, N. A., and Watters, G. T. (2017). A revised checklist of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Wisconsin Department of Natural Resources (WDNR). (2018). Species Observations by County. Retrieved from https://wiatri.net/inventory/mussels/About/musselWaters.cfm.

Wisconsin Department of Natural Resources (WDNR). (2021). Wisconsin Natural Heritage Working List. Retrieved from https://dnr.wisconsin.gov/topic/NHI/WList.

Table 1. Mussel species reported from the Namekagon River in Sawyer County, Wisconsin.

Species	Common Name	Status [1]	Year of Observation [2]
Pleurobemini			
Eurynia dilatata	Spike		1987
Fusconaia flava	Wabash Pigtoe		1995
Pleurobema sintoxia	Round Pigtoe		1995
Lampsilini			
Actinonaias ligamentina	Mucket		1987
Lampsilis cardium	Plain Pocketbook		1987
Lampsilis siliquoidea	Fatmucket		1995
Ligumia recta	Black Sandshell		1987
Anodontini			
Alasmidonta marginata	Elktoe	SC/P	1987
Anodontoides ferussacianus	Cylindrical Papershell		1987
Lasmigona compressa	Creek Heelsplitter		1995
Lasmigona costata	Fluted Shell		1995
Pyganodon grandis	Giant Floater		1987
Strophitus undulatus	Creeper		1995
Total No. Species	13		

[1] SC/P = Wisconsin species of special concern (protected; WDNR, 2021)

[2] WDNR (2018)

Table 2. Habitat characteristics observed in Hayward riverine surveys, Namekagon River, 2022.

				Substrate Composition (%)										
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Mud	Silt	LWD	Veg.	Shell	Detritus
Reach 1 (US)	T1	0-10	0.61	0	0	0	30	40	0	10	10	10	0	0
	T1	10-20	0.91	0	10	10	0	40	0	40	0	0	0	0
	T1	20-30	0.91	0	0	0	0	0	70	20	0	10	0	0
	T1	30-40	0.91	0	0	0	0	0	80	15	0	5	0	0
	T1	40-50	0.91	0	0	0	0	0	60	20	0	20	0	0
	T1	50-60	1.22	0	0	0	0	20	0	30	10	40	0	0
	T1	60-70	1.22	0	0	0	10	40	0	20	0	30	0	0
	T1	70-80	0.91	0	0	0	0	20	0	70	0	10	0	0
Reach 1 (US)	T2	0-10	0.91	0	0	0	0	40	50	0	0	10	0	0
	T2	10-20	0.91	0	0	0	0	40	50	0	0	10	0	0
	T2	20-30	0.91	0	0	0	0	40	50	0	0	10	0	0
	T2	30-40	0.91	0	0	0	0	40	50	0	0	10	0	0
	T2	40-50	0.61	0	0	0	0	30	60	0	0	10	0	0
	T2	50-60	0.61	0	0	0	0	20	70	0	0	10	0	0
	T2	60-70	0.61	0	0	0	0	10	80	0	0	10	0	0
	T2	70-80	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	80-90	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	90-100	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	100-110	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	110-120	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	120-130	0.30	0	0	0	0	0	90	0	0	10	0	0
	T2	130-140	0.61	0	0	0	0	0	90	0	0	10	0	0
	T2	140-150	0.61	0	0	0	0	0	50	0	0	50	0	0
	T2	150-160	0.61	0	0	0	0	0	80	0	0	20	0	0
Reach 1 (US)	T6	0-10	0.30	0	5	30	20	40	0	0	5	0	0	0
	T6	10-20	0.91	0	0	20	40	20	0	0	20	0	0	0
	T6	20-30	0.91	0	0	0	30	50	0	0	0	20	0	0
	T6	30-40	0.91	0	0	20	20	30	0	0	0	30	0	0

Table 2. Habitat characteristics observed in Hayward riverine surveys, Namekagon River, 2022.

				Substrate Composition (%)										
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Mud	Silt	LWD	Veg.	Shell	Detritus
Reach 1 (US)	T7	0-10	0.46	0	0	30	40	20	0	0	10	0	0	0
	T7	10-20	0.76	0	0	20	30	50	0	0	0	0	0	0
	T7	20-30	0.91	0	0	10	50	40	0	0	0	0	0	0
	T7	30-35	0.30	0	0	10	50	40	0	0	0	0	0	0
Reach 1 (US)	T8	0-10	0.46	0	0	20	20	40	0	10	10	0	0	0
	T8	10-20	0.46	0	0	20	40	40	0	0	0	0	0	0
	T8	20-30	0.46	0	0	20	40	30	0	0	0	10	0	0
	T8	30-40	0.46	0	0	30	40	20	0	0	0	10	0	0
	T8	40-50	0.46	0	0	20	40	20	0	10	10	0	0	0
Reach 2 (DS)	T2	0-10	0.61	0	0	50	30	10	0	0	10	0	0	0
	T2	10-20	0.61	0	0	50	30	20	0	0	0	0	0	0
	T2	20-30	0.61	0	0	0	10	80	0	0	0	0	10	0
Reach 2 (DS)	T3	0-10	0.61	0	0	50	40	10	0	0	0	0	0	0
	T3	10-20	0.91	0	0	40	40	20	0	0	0	0	0	0
	T3	20-25	0.61	0	0	50	30	20	0	0	0	0	0	0
Reach 2 (DS)	T4	0-10	0.61	0	0	50	30	20	0	0	0	0	0	0
	T4	10-20	0.91	0	10	50	30	10	0	0	0	0	0	0
	T4	20-25	0.30	0	30	0	0	50	0	0	0	20	0	0
Reach 2 (DS)	T8	0-10	0.91	0	0	20	30	40	0	0	10	0	0	0
	T8	10-20	0.91	0	0	10	30	50	0	0	10	0	0	0
	T8	20-30	0.91	0	0	0	10	60	0	0	30	0	0	0
Reach 2 (DS)	T9	0-10	0.61	0	0	40	30	20	0	0	10	0	0	0
	T9	10-20	0.61	0	0	0	80	10	0	0	0	10	0	0
	T9	20-30	0.30	0	0	40	40	20	0	0	0	0	0	0

US = upstream; DS = downstream, LWD = large woody debris

Table 3. Summary of effort and mussels collected in Hayward riverine surveys, Namekagon River, 2022.

		Reach 1 (Upstream)							Reach 2 (Downstream)							Total	
Species	Common Name	T1	T2	T6	T7	T8	Total	%	T2	T3	T4	T8	T9	Total	%	Total	%
Amblemini																	
Amblema plicata	Threeridge	-	-	WD	-	-	WD	-	-	-	-	-	-	-	-	-	
Pleurobemini																	
Eurynia dilatata	Spike	-	-	-	-	-	-	-	2	17	16	2	-	37	9.9	37	9.9
Fusconaia flava	Wabash Pigtoe	-	-	WD	-	-	WD	-	2	6	9	8	10	35	9.4	35	9.4
Lampsilini																	
Actinonaias ligamentina	Mucket	-	-	-	-	-	-	-	18	29	20	23	20	110	29.5	110	29.5
Lampsilis cardium	Plain Pocketbook	-	-	-	-	-	-	-	2	6	10	9	13	40	10.7	40	10.7
Lampsilis siliquoidea	Fatmucket	-	-	SF	-	-	SF	-	5	3	2	4	7	21	5.6	21	5.6
Ligumia recta	Black Sandshell	-	-	-	-	-	-	-	2	3	5	7	1	18	4.8	18	4.8
Anodontini																	
Alasmidonta marginata	Elktoe	-	-	-	-	-	-	-	2	1	5	1	1	10	2.7	10	2.7
Lasmigona costata	Fluted Shell	-	-	-	-	-	-	-	4	15	4	23	17	63	16.9	63	16.9
Pyganodon grandis	Giant Floater	-	-	-	-	-	-	-	-	-	1	1	-	2	0.5	2	0.5
Strophitus undulatus	Creeper	-	-	-	-	-	-	-	-	5	5	14	13	37	9.9	37	9.9
Total Abundance		0	0	0	0	0	0	-	37	85	77	92	82	373	100.0	373	100.0
Live Species		0	0	0	0	0	0		8	9	10	10	8	10			
Effort (m^2)		80	160	40	35	50	365		30	25	25	30	30	140		505	
Surface Density (no./m^2)		0.00	0.00	0.00	0.00	0.00	0.00		1.23	3.40	3.08	3.07	2.73	2.66		0.739	
% ≤5 external annuli							-							0.27			
Simpson's Diversity							-							0.84			
Pielou's Evenness							-							0.34			

WD = weathered dead shell; SF = sub-fossil shell

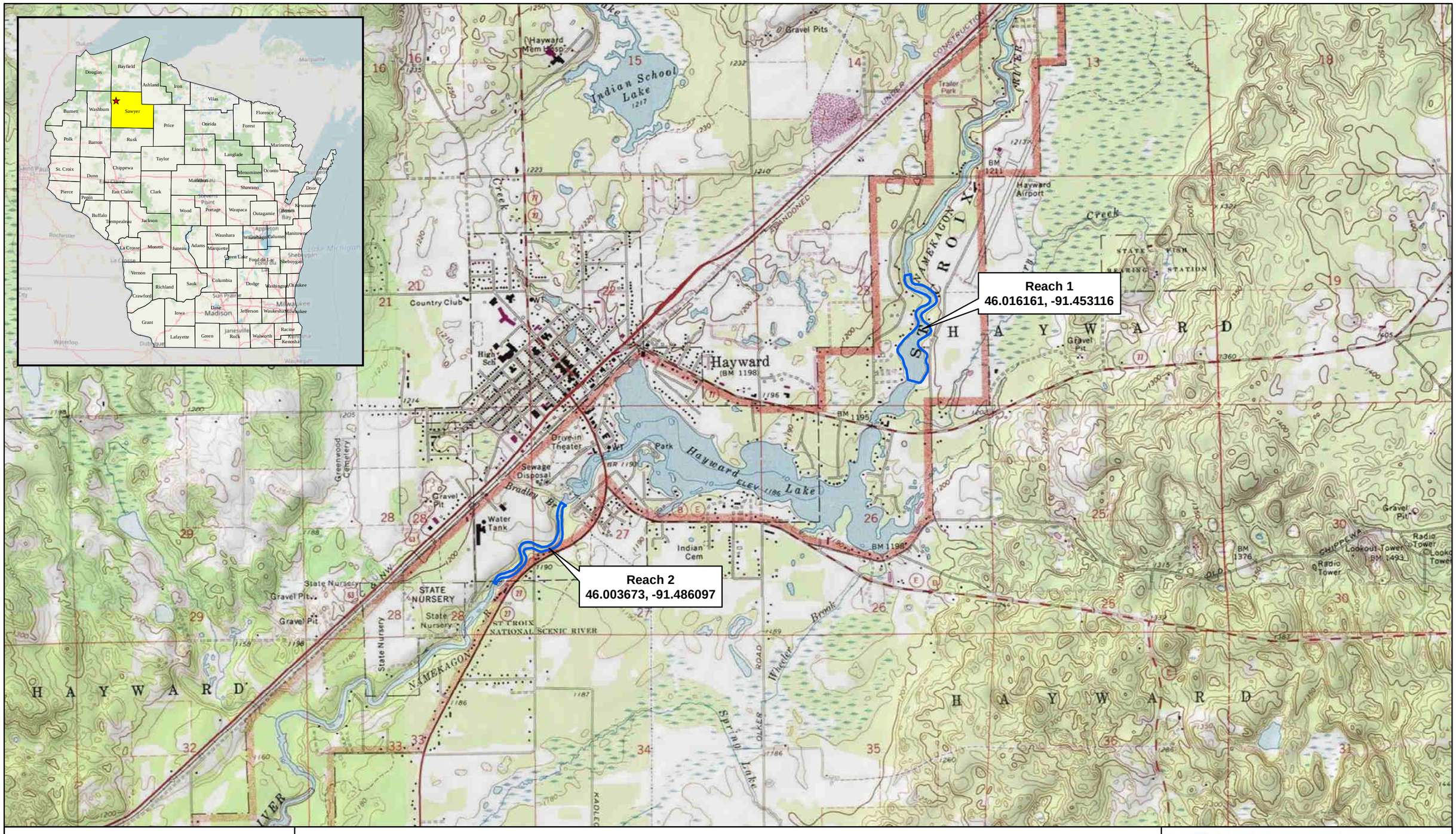

Figure 1. Hayward Project Location on USGS 7.5-minute Topographic Map of Hayward Quadrangle. Sawyer County, Wisconsin.

Riverine Reach Study Area

0 1,500 3,000 6,000 Feet

0 500 1,000 2,000 Meters

EnviroScience
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Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\MMead-and-Hunt\16082_Wisconsin_Mussels\Map1_Location_Hayward.mxd

Date: 8/17/2022

Basemap courtesy of National Geographic Society (2013).

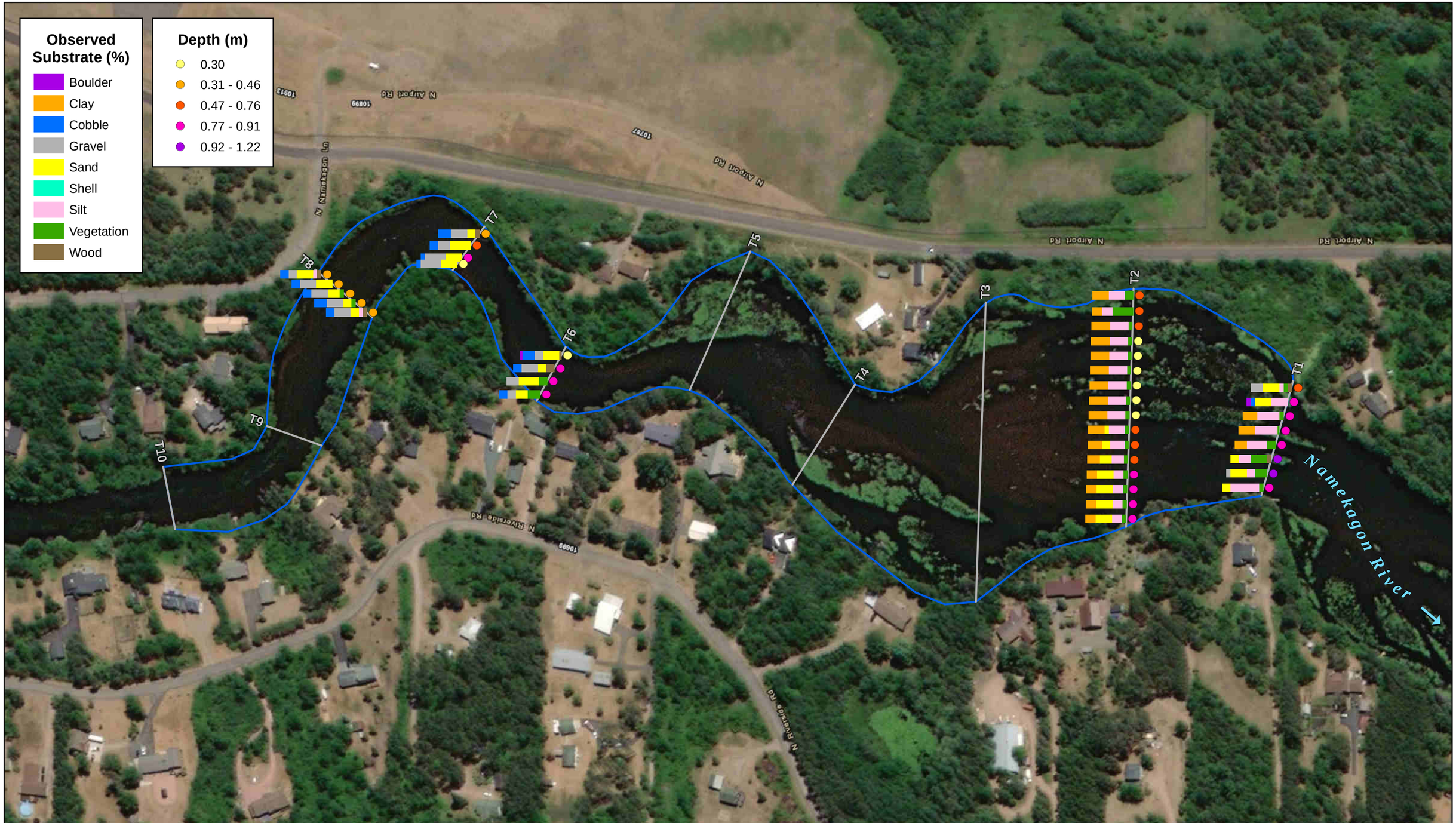

Figure 2. Substrate and Depth for the Hayward Project Reach One on the Namekagon River. Sawyer County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
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Date: 8/24/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map2_Substrate_R1_Hayward.mxd

Basemap courtesy of Esri.

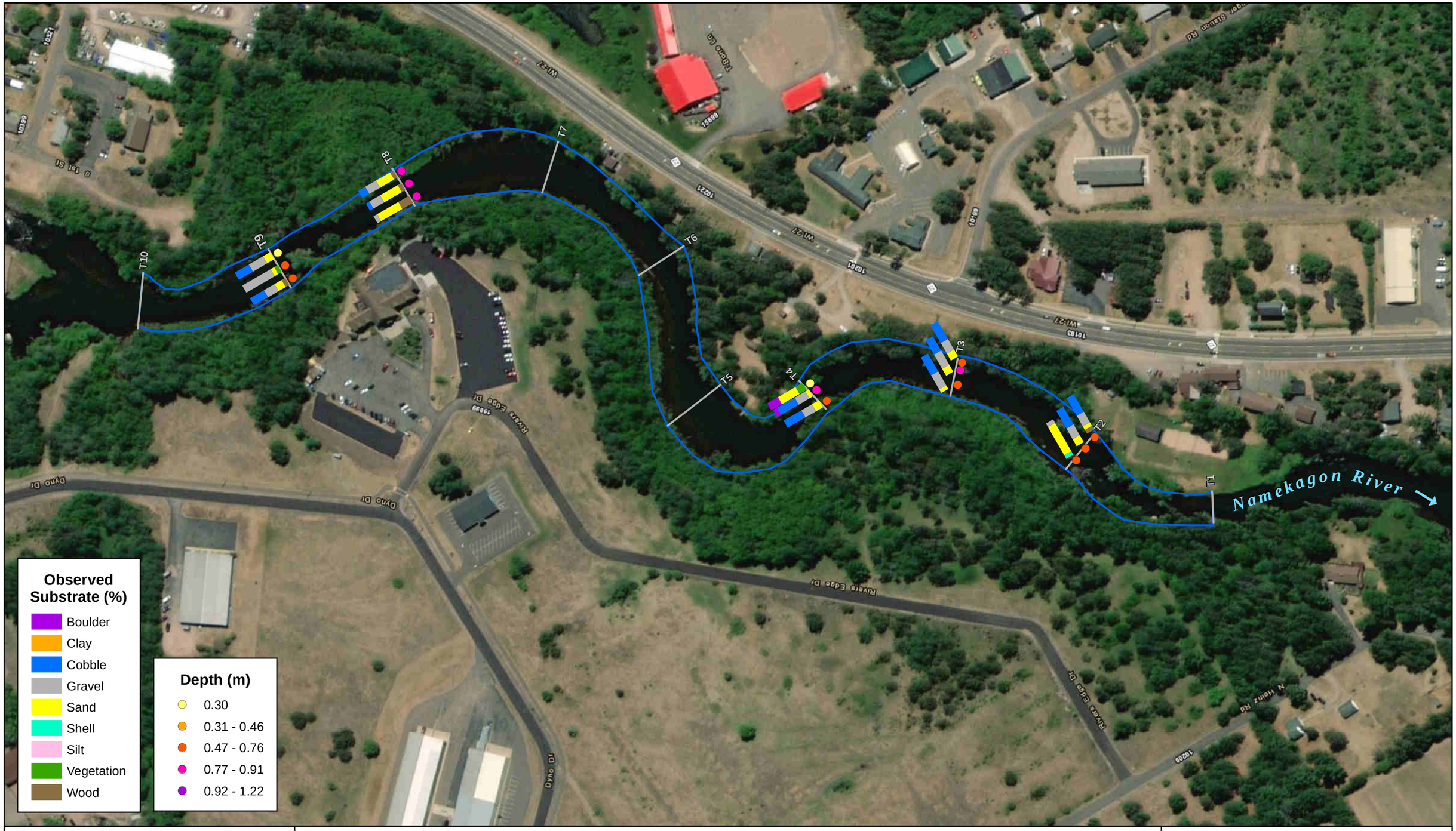

Figure 3. Substrate and Depth for the Hayward Project Reach Two on the Namekagon River. Sawyer County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
Excellence In Any Environment

Date: 8/24/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map3_Substrate_R2_Hayward.mxd

Basemap courtesy of Esri.

Figure 4. Mussel Abundance for the Hayward Project Reach Two on the Namekagon River. Sawyer County, Wisconsin.

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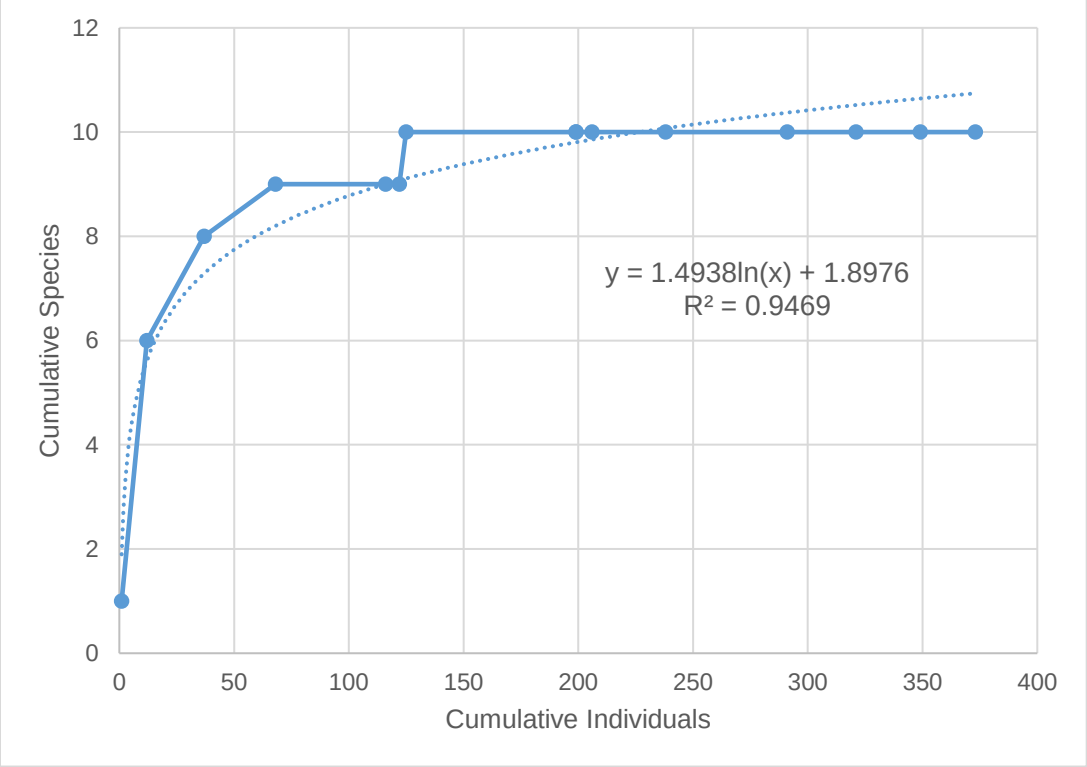
Basemap courtesy of Esri.

Date: 8/24/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map4_Mussels_R2_Hayward.mxd

Figure 5. Cumulative species curve for Hayward Project Reach Two on the Namekagon River. Sawyer County, Wisconsin



Appendix A

Scientific Collecting Permits and Survey Plan

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463

July 30, 2021

Emily Grossman
EnviroScience, Inc
2977 Hwy K #226
O'Fallon, MO 63368

Subject: WI E/T Permit Enclosed

Dear Emily:

With this letter we are updating your **ET Species Permit #1130**, per your request, as follows:

Species added to permit for removal and relocation to nearest suitable habitat outside impacted area:

- All Wisconsin threatened/endangered mussel species, collected as encountered on projects. Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.

These updates are now part of your WI E/T Permit and will expire along with your original permit. Updated conditions are attached to this letter.

Please keep this letter and your E/T permit with you when conducting activities involving species listed on your permit.

Thank you for your efforts on behalf of Wisconsin's endangered and threatened resources.

Sincerely,

Drew Feldkirchner
Bureau Director

Wisconsin Endangered and Threatened Species Permit Conditions

The following conditions apply to Wisconsin E/T Species Permit **#1130** issued to **Emily Grossman**:

1. Bureau of Natural Heritage Conservation Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
2. Permit holder must follow equipment disinfection protocols at outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
3. Permit holder agrees to follow Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling unless approved by the DNR species expert.
4. If you anticipate encountering a federally listed mussel species while conducting mussel surveys, a federal permit may also be required. For further information, contact U.S. Fish and Wildlife Service, Twin Cities Field Office at (952) 252-0092.
5. If a federally listed species is not anticipated, but is encountered during a survey or relocation, the surveyor must contact the U.S. Fish and Wildlife Service's Twin Cities Field Office (612) 725-3548 ext. 2206) within 24 hours of the encounter, unless the surveyor is already authorized to handle the species under a federal permit.
6. Permit holder must contact Lisie Kitchel (608) 266-5248) prior to conducting field work for each new project.

USACE GUIDELINES

1. Target and non-target species should be returned to point of capture, unless the project involves relocation. If the project involves relocation, please contact Lisie Kitchel (608) 266-5248).
2. Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
3. It is recommended to follow the equipment disinfection protocols for aquatic invasives as outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
4. It is recommended to follow the Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling.

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921

Endangered and Threatened Species Permit

Form 1700-002 (R 3/06)

The below named person is authorized by the Wisconsin Department of Natural Resources, pursuant to section 29.604, Wis. Stats., and Chapter NR 27, Wis. Adm. Code, to conduct the described activities for scientific or educational purposes.

DNR Permit Number	DNR Metal Tag Number
1130	
Date DNR Permit Issued	**Date DNR Permit Expires**
07/24/2018	01/31/2024
Federal Permit Number	**Date Federal Permit Expires**

Permittee Information

Last Name	First
Grossman	Emily

Street or Route	City	State	ZIP Code
21 Fort Zumwalt Dr	O'Fallon	MO	63366

Phone Number	Email Address	Date of Birth	Eye Color	Hair Color	Weight	Height
(847) 269-4159	egrossman@enviroscienceinc.com	3/19/1987	Blue	Brown	150	5'6"

Species or Study Information

County(ies) of Activity

Statewide

Name and Number of Specimens or Description of Study

All Wisconsin threatened/endangered mussel species
Mussels will be collected as encountered on projects; specific numbers of each species are not known at this time

Source of Species or Area of Study	Where Species or Item Will Be Kept
Aquatic systems (rivers/streams/lakes) throughout Wisconsin	Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.
Method of Taking and/or Transporting	**During the Following Period of Time**
Mussels will be collected by hand via wading/ snorkeling/diving.	Duration of permit validity.

Purpose for Obtaining or Collection

Mussel surveys and possible translocation for construction and/or ecological monitoring projects

Final Disposition of Specimens

Live mussels will be returned to the wild. Dead shells may be retained as vouchers, if permitted.

Scientific Qualification of Permittee

See permit file.

Additional Conditions of This Permit

See attached letter with conditions.

Permittee Certification

I hereby certify that I have read, am familiar, and agree to comply with the regulations described herein. This permit is not transferable and must be exhibited to any authorized agent of the Department of Natural Resources on demand.

Permittee Signature	Date Signed
DocuSigned by: Emily Grossman BCABDB7B5AC8410...	8/3/2021 | 12:23 PM CDT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
For the Secretary

By: DocuSigned by: Drew Feldkirchner F8586A547FC44E3... Date: 7/30/2021 | 12:00 PM C

Address updated on 1/14/2022 by NRR.

Emily Grossman

From: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>
Sent: Monday, June 6, 2022 3:00 PM
To: Emily Grossman; Weinzinger, Jesse J - DNR
Cc: Becca Winterringer
Subject: RE: Mussel survey plans

Emily – all three look good, the only thing I would add would be to please note if there is an obvious 'drawdown zone' in any of the river reaches as a result of either consistent drawdownd or seasonal drawdownd where no mussels are present due to being dewatered, the classic 'bathtub ring', to document habitat that is impacted by operation or seasonal maintenance. This is especially important for the Gile Flowage which has a significant drawdown.
By document I mean not just if its present but the extent to which it occurs, 1 foot, 2 feet, 1 meter, etc. in width, or however best to describe it, not if it is not present.
Hope that is clear, give me a call if you want to discuss.

Have fun in northern Wisconsin!!

Lisie Kitchel
Conservation Biologist
Bureau of Natural Heritage Conservation
Wisconsin Department of Natural Resources
101 S. Webster St.
Madison, WI 53707
Cell Phone: (608-220-5180

dnr.wi.gov

From: Emily Grossman <egrossman@enviroscienceinc.com>
Sent: Monday, June 6, 2022 11:26 AM
To: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Cc: Becca Winterringer <bwinterringer@enviroscienceinc.com>
Subject: Mussel survey plans

Lisie and Jesse,

EnviroScience was recently contracted by Mead and Hunt to conduct mussel surveys for four hydropower licensing/relicensing projects in northern Wisconsin. The locations and survey plans include:

- Hayward Lake and Trego Lake, Namekagon River near Hayward & Trego
- White River Flowage, White River near Ashland
- Gile Flowage, W. Fork Montreal River near Gile

Fieldwork will be led by either me (WI E/T permit #1130) or Becca Winterringer (WI E/T permit #1164). Per our permits, we wanted to notify you that we'll be conducting the surveys and request your review of the survey plans to ensure they're adequate. Based on the RFP we received, it looks like Mead and Hunt may have already discussed the survey methods with WIDNR, but please take a look at the attached plans and let me know if you have any comments or questions. We are hoping to start fieldwork in the next couple weeks, if possible, in order to complete the White River site before a planned drawdown of this reservoir in early July.

Again, please let me know if you have any questions/comments or need any additional info.

Thank you!

Emily Grossman
Senior Scientist/Project Manager

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5070 Stow Road, Stow, OH 44224 | EnviroScienceInc.com
O. 800.940.4025 | C. 847.269.4159 | 24-HR 888.866.8540
OH | TN | VA | WV | NC
Meet our new team in North Carolina!

SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior
National Park Service
Saint Croix

Study#: SACN-00158
Permit#: SACN-2022-SCI-0013
Start Date: Jun 20, 2022
Expiration Date: Jul 08, 2022
Coop Agreement#:
Optional Park Code:

Name of principal investigator:

Name: Rebecca Winterringer **Phone:**6365444754 **Email:**bwinterringer@enviroscienceinc.com

Name of institution represented:
EnviroScience, Inc.

Additional investigators or key field assistants:

Name: Emily Grossman	**Phone:** 847-269-4159	**Email:** egrossman@enviroscienceinc.com
Name: Robert Williams	**Phone:** 423-802-3237	**Email:** rwilliams@enviroscienceinc.com
Name: Matt Gilkay	**Phone:** 763-222-5107	**Email:** mgilkay@enviroscienceinc.com
Name: Paul Moreno	**Phone:** 54-317-1740	**Email:** m256moreno@gmail.com
Name: Ben Ebert	**Phone:** 517-899-3403	**Email:** bebert@enviroscienceinc.com

Study Title:
Mussel Studies for the Hayward (FERC No. 2417) and Trego (FERC No. 2711) Hydroelectric Projects, Namekagon River, Sawyer and Washburn Counties, Wisconsin.

Purpose of study:
The objective of the mussel studies is to provide data on freshwater mussel species and habitat within each of the Project areas. These studies aim to collect current mussel information to supplement historical data near the Project areas and document the resident mussel community above and below each dam. Coordination of the mussel studies has been undertaken by the Project owner and EnviroScience's client (Mead and Hunt). The mussel studies will follow the approved study plans submitted by Mead and Hunt related to correspondence from the NPS dated March 2, 2022.

Subject/Discipline:
Inventory Natural Resources
Water Resources

Locations authorized:
Hayward Hydroelectric Project - Reach 1 will begin approximately 430 m above the Highway 77 bridge (approx. coordinates: 46.013296, -91.453639) and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in (approximate coordinates: 46.002513, -91.489114) and will extend 1,000 m downstream.

Trego Hydroelectric Project - Reach 1 will begin at the Wagon Bridge Road crossing (approx. coordinates: 45.908514, -91.824905) and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam (approx. coordinates: 45.948372, -91.888830) and extend 1,000 m downstream.

Transportation method to research site(s):
Access to each survey area will be via public boat or canoe launches in public parking designated areas.

Collection of the following specimens or materials, quantities, and any limitations on collecting:

Name of repository for specimens or sample materials if applicable:

Repository type: Temporarily captured or handled (may include marking) and then released undamaged in place
Objects collected:
All freshwater mussels encountered will be inventories and released to their point of collection. Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported.Species likely to be encountered based on Wisconsin Observation by County and Waterbody:

Black Sandshell - Ligumia recta
Creek Heelsplitter - Lasmigona compressa
Creeper - Strophitus undulatus
Cylindrical Papershell - Anodontoides ferussacianus
Deertoe - Truncilla truncata
Elktoe - Alasmidonta marginata
Fatmucket - Lampsilis siliquoidea
Fluted-shell - Lasmigona costata
Fragile Papershell - Leptodea fragilis
Giant Floater - Pyganodon grandis
Hickorynut - Obovaria olivaria
Mapleleaf - Quadrula quadrula
Mucket - Actinonaias ligamentina
Paper Pondshell - Utterbackia imbecillis
Pimpleback - Quadrula pustulosa
Pink Heelsplitter - Potamilus alatus
Plain Pocketbook - Lampsilis cardium
Purple Wartyback - Cyclonaias tuberculata
Round Pigtoe - Pleurobema sintoxia
Salamander Mussel - Simpsonaias ambigua
Spike - Elliptio dilatata
Threeridge - Amblema plicata
Wabash Pigtoe - Fusconaia flava

NPS General Conditions for Scientific Research and Collecting Permit (available at the RPRS HELP page) apply to this permit. The following specific conditions or restrictions, and any attached conditions, also apply to this permit:

Plot Marking
Route marking such as painting, blazing, or flagging is prohibited. Materials used to mark plots must be pre-approved by the Resource Management Specialist and must be as subtle as possible. Biodegradable flagging should be used to temporarily mark plots. All tags must have the researcher s name, project name, and date. Whenever possible, markers must not be readily visible to visitors.

Aquatic Collecting
All equipment must be free of zebra mussels.
Decontamination procedures are visual inspection, removal of plants, shells, etc., and a hot water rinse of 140 degrees F or out of water for at least 5 days.

Other Permits
This permit does not negate or replace other permits that may be required from local, state or other federal agencies.

Summary of permitted field methods and activities:

Mussel studies will include field surveys of two riverine reaches at each of the two Project locations. Mussel study methods were developed based on the Wisconsin Department of Natural Resources' (WDNR) Guidelines for Sampling Freshwater Mussels in Wadable Streams (Piette, 2015).
Mussel studies within riverine habitat will be conducted at each Project location. The survey area for each Project will include two riverine reaches, one upstream of the impoundment and one downstream of the Project powerhouse outside of the mixing zone. The upstream and downstream boundaries of each reach will be defined as follows:
Hayward Hydroelectric Project - Reach 1 will begin approximately 430 m above the Highway 77 bridge and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in and will extend 1,000 m downstream.
Trego Hydroelectric Project - Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam and extend 1,000 m downstream.
Within each reach, a series of transects extending bank to bank will be established every 100 m, creating a series of 10 possible transects per reach. Transects will be numbered sequentially from downstream to upstream, and a random number selector will be used to select five transects for the survey within each reach.
Searches along each transect will be conducted in 10-m segments and will extend 0.5 m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search will entail an initial search of 0.2 minutes per m2 (min/m2) along each 10-m segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 min/m2. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.
EnviroScience will record general stream conditions and morphology within the study area and reference the Aquatic Habitat Classification on the St. Croix National Scenic Riverway for methodology and classifications. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only

when visibility at depth is at least 20 inches. In addition, a general description of mussel habitat in the Project boundary will be provided in reporting.
Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. Datasheets will be populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of each mussel study plan. Mussel taxonomy will follow the names presented by Williams et al., 2017.
If any living or dead federal or state-listed species are encountered, EnviroScience will notify Mead & Hunt immediately; per surveyor collection permits, WDNR, National Park Service (NPS), and the U.S. Fish & Wildlife Service (USFWS) will be notified within 24 hours. No live mussels will be harmed or taken during this Project. Any specimens of federally listed species that are encountered will be individually hand placed in their original locations.

Recommended by park staff(name and title):

Reviewed by Collections Manager:

Yes____ No____

Approved by park official:

Date Approved:

Title:

Superintendent

I Agree To All Conditions And Restrictions Of this Permit As Specified
(Not valid unless signed and dated by the principal investigator)

(Principal investigator's signature) (Date)

THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

GENERAL CONDITIONS
For
SCIENTIFIC RESEARCH AND COLLECTING PERMIT

United States Department of the Interior
National Park Service

1. **Authority** - The permittee is granted privileges covered under this permit subject to the supervision of the superintendent or a designee, and shall comply with all applicable laws and regulations of the National Park System area and other federal and state laws. A National Park Service (NPS) representative may accompany the permittee in the field to ensure compliance with regulations.

2. **Responsibility** - The permittee is responsible for ensuring that all persons working on the project adhere to permit conditions and applicable NPS regulations.

3. **False information** - The permittee is prohibited from giving false information that is used to issue this permit. To do so will be considered a breach of conditions and be grounds for revocation of this permit and other applicable penalties.

4. **Assignment** - This permit may not be transferred or assigned. Additional investigators and field assistants are to be coordinated by the person(s) named in the permit and should carry a copy of the permit while they are working in the park. The principal investigator shall notify the park's Research and Collecting Permit Office when there are desired changes in the approved study protocols or methods, changes in the affiliation or status of the principal investigator, or modification of the name of any project member.

5. **Revocation** - This permit may be terminated for breach of any condition. The permittee may consult with the appropriate NPS Regional Science Advisor to clarify issues resulting in a revoked permit and the potential for reinstatement by the park superintendent or a designee.

6. **Collection of specimens (including materials)** - No specimens (including materials) may be collected unless authorized on the Scientific Research and Collecting permit.

The general conditions for specimen collections are:

- Collection of archeological materials without a valid Federal Archeology Permit is prohibited.

- Collection of federally listed threatened or endangered species without a valid U.S. Fish and Wildlife Service endangered species permit is prohibited.

- Collection methods shall not attract undue attention or cause unapproved damage, depletion, or disturbance to the environment and other park resources, such as historic sites.

- New specimens must be reported to the NPS annually or more frequently if required by the park issuing the permit.Minimum information for annual reporting includes specimen classification, number of specimens collected, location collected, specimen status(e.g., herbarium sheet, preserved in alcohol / formalin, tanned and mounted, dried and boxed, etc.), and current location.

- Collected specimens that are not consumed in analysis or discarded after scientific analysis remain federal property.The NPS reserves the right to designate the repositories of all specimens removed from the park and to approve or restrict reassignment of specimens from one repository to another. Because specimens are Federal property, they shall not be destroyed or discarded without prior NPS authorization.
- Each specimen (or groups of specimens labeled as a group) that is retained permanently must bear NPS labels and must be accessioned and cataloged in the NPS National Catalog.Unless exempted by additional park - specific stipulations, the permittee will complete the labels and catalog records and will provide accession information.It is the permittee's responsibility to contact the park for cataloging instructions and specimen labels as well as instructions on repository designation for the specimens.

- Collected specimens may be used for scientific or educational purposes only, and shall be dedicated to public benefit and be accessible to the public in accordance with NPS policies and procedures.

- Any specimens collected under this permit, any components of any specimens (including but not limited to natural organisms, enzymes or other bioactive molecules, genetic materials, or seeds), and research results derived from collected specimens are to be used for

scientific or educational purposes only, and may not be used for commercial or other revenue - generating purposes unless the permittee has entered into a Cooperative Research And Development Agreement(CRADA) or other approved benefit - sharing agreement with the NPS.The sale of collected research specimens or other unauthorized transfers to third parties is prohibited.Furthermore, if the permittee sells or otherwise transfers collected specimens, any components thereof, or any products or research results developed from such specimens or their components without a CRADA or other approved benefit-sharing agreement with NPS, permittee will pay the NPS a royalty rate of twenty percent(20 %) of gross revenue from such sales or other revenues. In addition to such royalty, the NPS may seek other damages to which the NPS may be entitled including but not limited to injunctive relief against the permittee.

7. **Reports** - - The permittee is required to submit an Investigator's Annual Report and copies of final reports, publications, and other materials resulting from the study. Instructions for how and when to submit an annual report will be provided by NPS staff.Park research coordinators will analyze study proposals to determine whether copies of field notes, databases, maps, photos, and / or other materials may also be requested.The permittee is responsible for the content of reports and data provided to the National Park Service

8. **Confidentiality** - - The permittee agrees to keep the specific location of sensitive park resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

9. **Methods of travel** - Travel within the park is restricted to only those methods that are available to the general public unless otherwise specified in additional stipulations associated with this permit.

10. **Other permits** - The permittee must obtain all other required permit(s) to conduct the specified project.

11. **Insurance** - If liability insurance is required by the NPS for this project, then documentation must be provided that it has been obtained and is current in all respects before this permit is considered valid.

12. **Mechanized equipment** - No use of mechanized equipment in designated, proposed, or potential wilderness areas is allowed unless authorized by the superintendent or a designee in additional specific conditions associated with this permit.

13. **NPS participation** - The permittee should not anticipate assistance from the NPS unless specific arrangements are made and documented in either an additional stipulation attached to this permit or in other separate written agreements.

14. **Permanent markers and field equipment** - The permittee is required to remove all markers or equipment from the field after the completion of the study or prior to the expiration date of this permit. The superintendent or a designee may modify this requirement through additional park specific conditions that may be attached to this permit. Additional conditions regarding the positioning and identification of markers and field equipment may be issued by staff at individual parks.

15. **Access to park and restricted areas** - Approval for any activity is contingent on the park being open and staffed for required operations. No entry into restricted areas is allowed unless authorized in additional park specific stipulations attached to this permit.

16. **Notification** - The permittee is required to contact the park's Research and Collecting Permit Office (or other offices if indicated in the stipulations associated with this permit) prior to initiating any fieldwork authorized by this permit.Ideally this contact should occur at least one week prior to the initial visit to the park.

17. **Expiration date** - Permits expire on the date listed. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s).

18. **Other stipulations** - This permit includes by reference all stipulations listed in the application materials or in additional attachments to this permit provided by the superintendent or a designee. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits.

SURVEY PLAN:

FRESHWATER MUSSEL STUDIES FOR THE HAYWARD AND TREGO HYDROELECTRIC PROJECTS

(FERC Nos. 2417 and 2711)

Prepared for:

On Behalf of :

Mead & Hunt

Prepared by:

EnviroScience
Excellence In Any Environment

5070 Stow Rd.
Stow, OH 44224
800-940-4025
www.EnviroScienceInc.com

ES Project No. 16082

Date: June 6, 2022

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1.0 PROJECT OVERVIEW

EnviroScience, Inc. is pleased to submit this survey plan to the Wisconsin Department of Natural Resources (WDNR) on behalf of Mead & Hunt to perform freshwater mussel studies associated with the Federal Energy Regulatory Commission (FERC) relicensing process for the Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711). Northern States Power Company – Wisconsin, d/b/a Xcel Energy (Licensee/Applicant), is required to evaluate existing freshwater mussel resources and potential impacts to freshwater mussel resources associated with continued project operations. The Hayward project is located on the Namekagon River near Hayward, Sawyer County, Wisconsin. The Trego project is located on the Namekagon River near Trego, Washburn County, Wisconsin.

2.0 MUSSEL SURVEY SCOPE OF WORK

TASK ONE: MUSSEL STUDIES

Mussel survey methods were developed following the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). Mussel studies will include field surveys of two riverine reaches at each project location. One reach will be located upstream of the impoundment, and one will be downstream of the project powerhouse. The upstream and downstream boundaries of each reach will be defined as follows:

- Hayward Hydroelectric Project (22 MHT Work Scope): Reach 1 will begin approximately 430 m above the Highway 77 bridge and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in and will extend 1,000 m downstream.
- Trego Hydroelectric Project (22 MHT Work Scope): Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam and extend 1,000 m downstream.

Within each reach, a series of transects extending bank to bank will be established every 100 m, creating a series of 10 possible transects per reach. Transects will be numbered sequentially from downstream to upstream, and a random number selector will be used to select five transects for the survey within each reach.

Searches along each transect will be conducted in 10-m segments and will extend 0.5 m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search will entail an initial search of 0.2 minutes per m^2 (min/m^2) along each 10-m segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 min/m^2. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.

EnviroScience will record general stream conditions and morphology within the study area and will reference the Aquatic Habitat Classification on the St. Croix National Scenic Riverway (Wan et al., 2007) for methodology and classifications. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only when visibility at depth is at least 20 inches. In addition, a general description of mussel habitat in the project boundary will be provided.

Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. Datasheets will be populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of each mussel study plan provided by Mead & Hunt. Mussel taxonomy will follow the names presented by Williams et al., 2017.

If any living or dead federal or state-listed species are encountered, EnviroScience will notify Mead & Hunt immediately; per surveyor collection permits, WDNR, the National Park Service (NPS), and the U.S. Fish & Wildlife Service (USFWS) will be notified within 24 hours. No live mussels will be harmed or taken during this project. Any specimens of federally listed species that are encountered will be individually hand placed in their original locations.

TASK TWO: REPORTING

EnviroScience will provide Mead & Hunt with draft reports for the Hayward and Trego projects for review within 30 days of completion of fieldwork or by October 31, 2022, whichever occurs first. Final draft reports for each project for distribution to the relicensing participants will be completed within seven days after receiving Mead & Hunt's comments. EnviroScience will review and address participant comments and provide a final study report within 30 days of receiving participant comments from Mead & Hunt.

Each report will include a description of mussel survey activities and the prescribed Mussel Survey Summary Tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. GIS-based mapping will provide further visual presentations of the findings of the survey. Geo-referenced photos and GIS shapefiles will be provided electronically to Mead & Hunt.

MUSSEL SURVEY SCHEDULE

Field work will be initiated following coordination with WDNR, receipt of permits, and when suitable weather and river conditions allow. Normal to low water conditions and good visibility must occur to conduct field work; project activities will be planned accordingly. Fieldwork is tentatively planned for mid-June 2022.

3.0 LITERATURE CITED

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

Wan, H., Perry, J., Ferrin, R., Moraska-LaFrancois, B., Wan, H., Perry, J., ... & Moraska-LaFrancois, B. (2007). Aquatic habitat classification on the St. Croix National Scenic Riverway. In Research report to the US National Park Service. University of Minnesota.

Williams, J. D., Bogan, A. E., Butler, R. S., Cummings, K. S., Garner, J. T., Harris, J. L., ... & Watters, G. T. (2017). A revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Appendix B

Photographic Record

Appendix B. Index of photo locations, Hayward Mussel Survey, June 2022.

	Coordinates				
	UTM Zone 15N		NAD 1983		
Photo No.	Northing	Easting	Latitude	Longitude	View direction
Photo 1	5096967	619719	46.01581	-91.45344	South
Photo 2	5097182	619775	46.01774	-91.45266	Northeast
Photo 3	5097237	619857	46.01822	-91.45159	Southwest
Photo 4	5097329	619817	46.01905	-91.45209	Northwest
Photo 5	5095351	616891	46.00176	-91.49036	Southwest
Photo 6	5095745	617246	46.00525	-91.48567	North
Photo 7	5095745	617246	46.00525	-91.48567	South
Photo 8	5095837	617266	46.00607	-91.48540	Northeast
Photo 9	5095837	617266	46.00607	-91.48540	West
Photo 10	5095349	616856	46.00175	-91.49081	N/A
Photo 11	5095349	616856	46.00175	-91.49081	N/A
Photo 12	5095349	616856	46.00175	-91.49081	N/A
Photo 13	5095349	616856	46.00175	-91.49081	N/A
Photo 14	5095349	616856	46.00175	-91.49081	N/A
Photo 15	5095745	617246	46.00525	-91.48567	N/A
Photo 16	5095349	616856	46.00175	-91.49081	N/A
Photo 17	5095349	616856	46.00175	-91.49081	N/A
Photo 18	5095645	617232	46.00435	-91.48588	N/A
Photo 19	5095387	616948	46.00207	-91.48962	N/A
Photo 20	5097187	619767	46.01778	-91.45277	N/A

Photo 1. Reach 1, view looking downstream toward Transect 2.

Photo 2. Reach 1, view looking upstream from Transect 6.

Photo 3. Reach 1, view looking downstream from Transect 7.

Photo 4. Reach 1, view looking upstream from Transect 8.

Photo 5. Reach 2, view looking downstream toward Transect 2.

Photo 6. Reach 2, view looking upstream at old wood piles above Transect 9.

Photo 7. Reach 2, view looking downstream from Transect 9.

Photo 8. Reach 2, view looking upstream from Transect 10.

Photo 9. Reach 2, view looking toward the right descending bank at Transect 10.

Photo 10. Representative photo of Mucket (*Actinonaias ligamentina*) collected in the study area.

Photo 11. Representative photo of Elktoe (*Alasmidonta marginata*) collected in the study area.

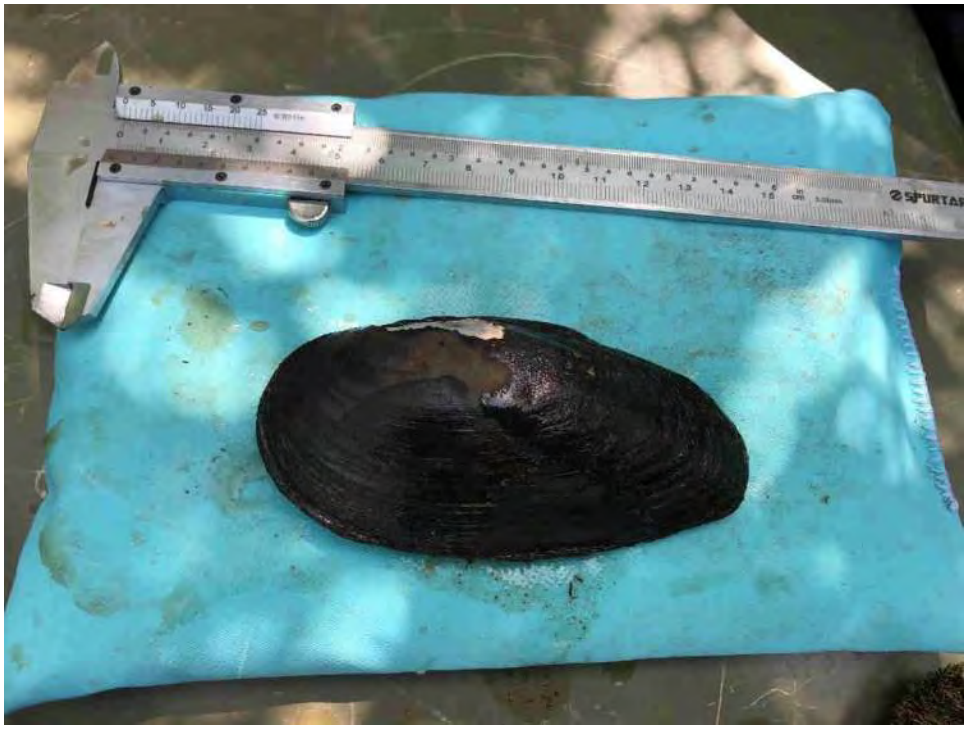

Photo 12. Representative photo of Spike (*Eurynia dilatata*) collected in the study area.

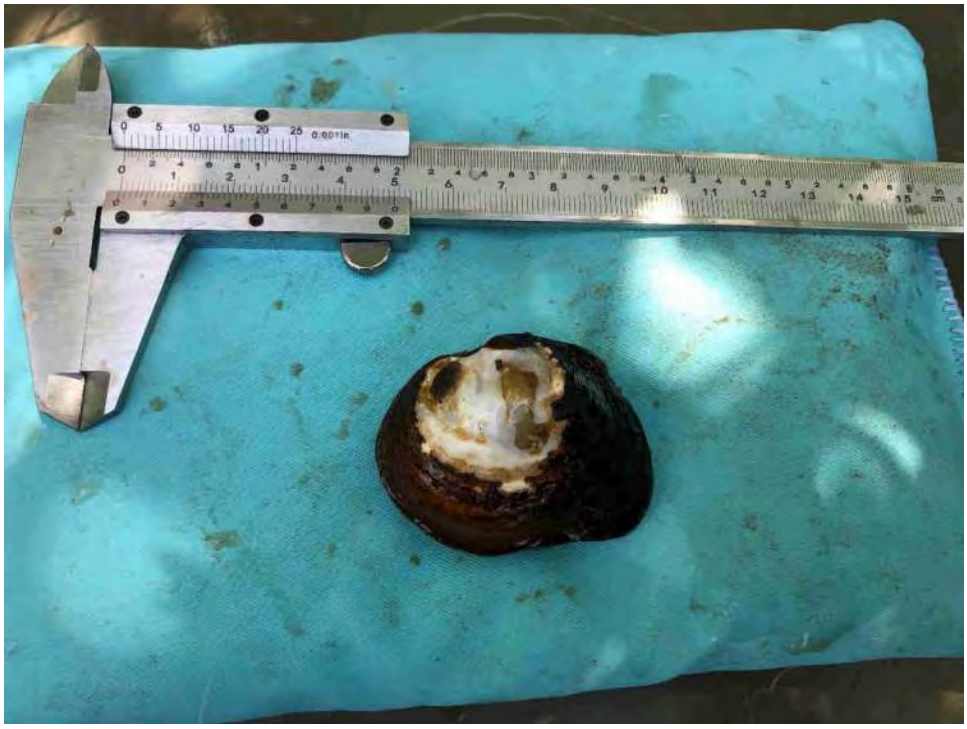

Photo 13. Representative photo of Wabash Pigtoe (*Fusconaia flava*) collected in the study area.

Photo 14. Representative photo of Plain Pocketbook (*Lampsilis cardium*) collected in the study area.

Photo 15. Representative photo of Fatmucket (*Lampsilis siliquoidea*) collected in the study area.

Photo 16. Representative photo of Fluted Shell (*Lasmigona costata*) collected in the study area.

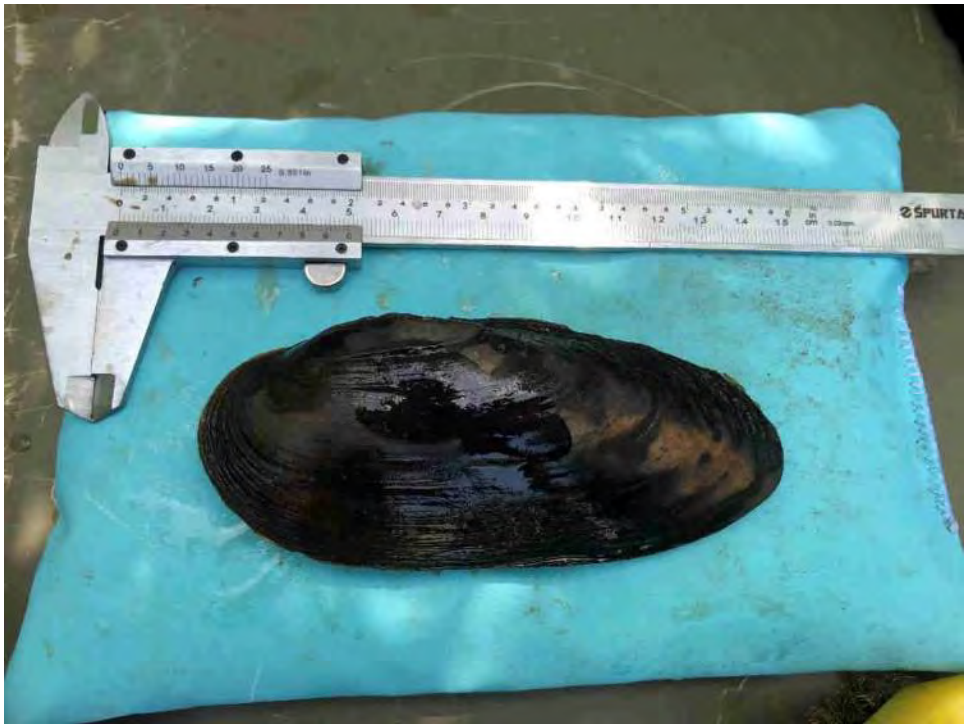

Photo 17. Representative photo of Black Sandshell (*Ligumia recta*) collected in the study area.

Photo 18. Representative photo of Giant Floater (*Pyganodon grandis*) collected in the study area.

Photo 19. Representative photo of Creeper (*Strophitus undulatus*) collected in the study area.

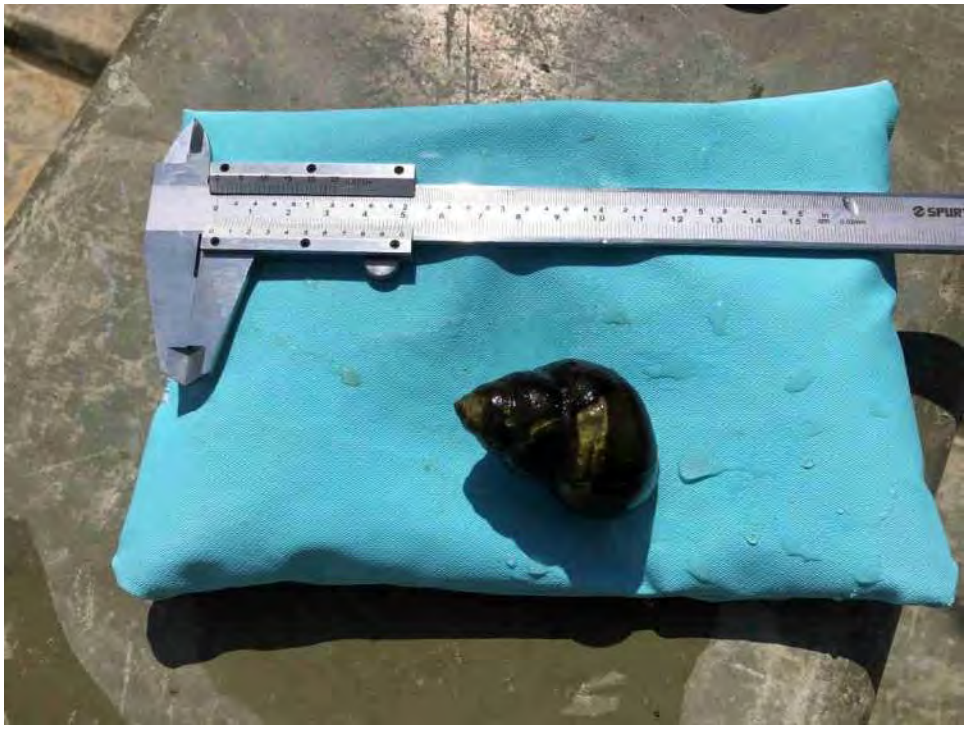

Photo 20. Representative photo of invasive Chinese Mystery Snail (*Cipangopaludina chinensis*) collected in Reach 1.

FRESHWATER MUSSEL STUDY FOR THE TREGO HYDROELECTRIC PROJECT

FERC No. 2711

Prepared for:

Mead & Hunt

1702 Lawrence Drive
De Pere, WI 54115

Project No.: 16082
Date: 1/25/2023

Prepared by:

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Freshwater Mussel Study for the Trego Hydroelectric Project

Initial Study Report

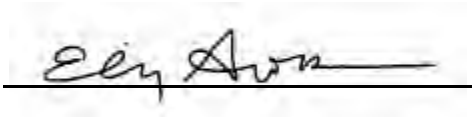
Document Date: 1/25/2023
Project No.: 16082

Prepared for: Mr. Shawn Puzen
Mead & Hunt

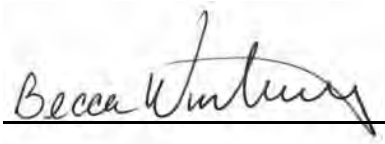
Authorization for Release

The analyses, opinions, and conclusions in this document are based entirely on EnviroScience's unbiased, professional judgment. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study.

To the best of their knowledge, the undersigned attest that this document and the information contained herein are accurate and conform to EnviroScience's internal Quality Assurance standards.



Emily Grossman
Senior Scientist | Field Manager



Becca Winterringer
Senior Scientist | Project Manager

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LIST OF APPENDICES

Appendix A. Scientific Collecting Permits and Survey Plan

Appendix B. Photographic Record

ACKNOWLEDGEMENTS

Xcel Energy provided funding for the project through Mead & Hunt. Mr. Shawn Puzen was the point of contact for Mead & Hunt, and Mr. Matthew Miller was the point of contact for Xcel Energy. The project manager for EnviroScience, Inc. was Ms. Becca Winterringer. Wisconsin permitted malacologist Ms. Emily Grossman led the survey effort. Also assisting with the survey effort were Mr. Robert Williams, Mr. Ben Ebert, Mr. Paul Moreno, and Mr. Matt Gilkay. Ms. Grossman authored the report, which was reviewed by Ms. Winterringer and Ms. Melissa Vaccarino.

1.0 INTRODUCTION

EnviroScience, Inc. was contracted by Mead & Hunt to perform freshwater mussel studies at the Trego Hydroelectric Project (Project) in Washburn County, Wisconsin. The Project is located on the Namekagon River near Trego, Wisconsin (Figure 1). Northern States Power Company – Wisconsin, a Wisconsin corporation (NSPW or Licensee/Applicant), holds a current license issued by the Federal Energy Regulatory Commission (FERC) to operate and maintain the Project. The current license expires in November 2025. NSPW must submit a final license application no later than November 30, 2023, to obtain a subsequent license (FERC Project No. 2711).

The Namekagon River is a tributary of the St. Croix River and harbors a diverse mussel assemblage. Twenty-three (23) species have been reported from the Namekagon River in Washburn County, including several Wisconsin listed species: Purple Wartyback (*Cyclonaias tuberculata*; endangered), Salamander Mussel (*Simpsonaias ambigua*; threatened), Mapleleaf (*Quadrula quadrula*; species of special concern), and Elktoe (*Alasmidonta marginata*; species of special concern). No federally listed threatened or endangered species are known to occur in this reach of the Namekagon River (Table 1).

Freshwater mussels residing near the Project may be affected by operation of the facility. Flow modifications upstream or downstream of the Project may alter habitat for mussels, and mussels occurring in the reservoir may become stranded during drawdown events. Therefore, the Wisconsin Department of Natural Resources (WDNR) requested that a mussel survey be completed as part of the FERC relicensing process. The objective of the survey was to characterize mussel habitat and determine mussel abundance and species richness in the Project vicinity. Data collected in this survey provides information on the baseline conditions for mussel density, diversity, and habitat in the Project area.

2.0 METHODS

Mussel survey methods were developed following the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). Mussel studies included field surveys of two riverine reaches, one above and one below the Trego Dam. Surveys were led by a Wisconsin permitted malacologist and were conducted according to the survey plan approved by WDNR (Appendix A).

2.1 RIVERINE SURVEYS

Mussel studies were conducted within riverine habitat near the Project location. Reach 1 (upstream reach) began at the Wagon Bridge Road crossing and extended 1,000 meters (m) downstream. Reach 2 (downstream reach) began 45 m downstream of Trego Dam and extended 1,000 m downstream (Figure 1).

Within each reach, a series of transects extending bank to bank was established every 100 m, creating a series of 10 possible transects per reach. Transects were numbered sequentially from downstream to upstream, and a random number function in Microsoft Excel was used to select five transects for the survey within each reach.

Searches along each transect were conducted in 10-m segments and extended 0.5 m on each side of the transect. Each transect was evaluated for mussels using an adaptive sampling approach. First, a rapid visual search was conducted and entailed an initial search of 0.2 minutes

per m^2 (min/m^2) along each 10-m segment to determine if mussels were present (living or shell material). If mussels were present in a segment, a semi-quantitative search was triggered and the search time was extended to 1 min/m^2. If no mussels or evidence of mussels was observed in the rapid visual search, no additional effort was expended in that segment. During the semi-quantitative search, divers visually searched, probed the substrate, and turned over rocks to detect small, burrowed mussels.

General stream conditions and morphology were recorded within the study area. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.; Wentworth, 2022) were recorded for each 10-m transect segment. In addition, a general description of mussel habitat characteristics in the Project boundary was recorded. The Aquatic Habitat Classification on the St. Croix National Scenic Riverway (Wan et al., 2007) was referenced for habitat and substrate classification.

2.2 DATA AND MUSSEL HANDLING

Live mussels were kept submersed in ambient river water and kept cool and moist during processing. All live mussels were identified to species and counted. The original survey plan also called for all individuals to be measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Due to high mussel abundance, WDNR approved modifying the scope of work to measure and age only a representative subset of individuals from each species. Individuals not measured and aged were identified and categorized as adult (>5 external annuli) or juvenile (≤5 external annuli). Dead shell specimens were scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species were recorded and reported. Datasheets were populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of the mussel study plan provided by Mead & Hunt. Mussel taxonomy followed the names presented by Williams et al., 2017.

3.0 RESULTS AND DISCUSSION

The mussel survey was conducted on June 20, 2022. Discharge on the Namekagon River at Leonards, WI (USGS 05331833) was 112 cubic feet per second. Maximum visibility was greater than 1 m, and the water temperature was approximately 20.6° Celsius (69° Fahrenheit). Photographs of sampling sites and species encountered are provided in Appendix B.

3.1 REACH 1 (UPSTREAM)

Reach 1 was a slow-flowing, impounded riverine reach with fine substrate. Current velocity was slow, although there was discernible flow (i.e., the water was not stagnant). The surrounding land cover consisted primarily of forest (65%) and residential area (14%; USEPA, 2022a). U.S. Highway 53 crossed the river near the midpoint of Reach 1. The streambanks were gently to moderately sloped, and no substantial bank erosion was observed. Large patches of cattails (*Typha* spp.) were present along one or both banks throughout much of the reach.

Transects 3, 4, 5, 7, and 9 were randomly selected for sampling in Reach 1. Substrate in most transect segments was primarily sand, with some silt near the banks, and most closely aligned with substrate composition code 1 (abundant fine substrate) in Wan et al. (2007). Boulder, cobble,

gravel, and submerged vegetation were occasionally present in small quantities along the bank, but these constituents were typically absent mid-channel (Figure 2). Water depth ranged from 0.3 m (1 foot [ft]) to 1.4 m (4.5 ft; Table 2; Figure 2).

The Reach 1 survey yielded 120 live mussels of 10 species. Fatmucket (*Lampsilis siliquoidea*; 45.0%) and Plain Pocketbook (*Lampsilis cardium*; 27.5%) together comprised over half of the mussels collected. The remaining eight species each represented <7% of the total (Table 3). No Wisconsin listed species were collected in Reach 1, and no additional species were collected as dead shells.

Mussel abundance was highest in Transect 4 (70 individuals) and considerably lower in the remaining four transects (7 – 23 individuals per transect). Surface density ranged from 0.23 mussels/m^2 in Transects 5 and 7 to 1.75 mussels/m^2 in Transect 4 and averaged 0.60 mussels/m^2 over the entire reach. Mussel distribution generally corresponded with habitat type. Numerous Fatmucket individuals were collected in the vertical silty banks formed by the edges of cattail stands, and most other mussel species were collected near the banks in patches of more heterogeneous substrate. Mussels were scarce in the pure sand substrate mid-channel (Figure 3).

Mussel community metrics are presented in Table 3. Most mussels were classified as adults (>5 external annuli), which may be due in part to the inherent bias of semi-quantitative sampling toward larger individuals. Simpson's diversity was 0.71 and Pielou's evenness was 0.33. Low evenness is attributed to the high relative abundance of Fatmucket and Plain Pocketbook and low relative abundance of the remaining species. The cumulative species curve suggests that additional species could occur in this reach. Based on the trendline equation, only 18 additional individuals would be required to collect one new species (Figure 4).

3.2 REACH 2 (DOWNSTREAM)

Reach 2 primarily consisted of glide/run habitat. Current velocity was moderate, and the maximum observed depth was 1.2 m (4 ft; Table 2; Figure 5). The surrounding land was primarily forested (63%; USEPA, 2022b) with a bridge crossing and canoe launch located in the downstream portion of the reach. Streambanks were gently to moderately sloped throughout most of the reach but were steeper near the Project tailrace.

Transects 3, 4, 5, 7, and 10 were randomly selected for sampling in Reach 2. Although some fine-scale habitat variation was observed among the sampled transects, conditions were generally similar at all five transects. Substrate consisted primarily of mixed boulder, cobble, gravel, and sand and most closely aligned with substrate composition code 6 (abundant fine substrate, gravel, and pebbles, and present but not abundant cobbles and boulders), code 7 (abundant fine substrate, gravel, pebbles, and cobbles), and code 8 (abundant fine substrate, gravel, pebbles, and cobbles, and present but not abundant boulders) in Wan et al. (2007). Boulder and cobble comprised a larger percentage of the substrate constituents in the upstream portion of the reach (Transects 7 and 10), while substrate in the remaining transects was a more even mix of cobble, gravel, and sand with some boulder.

A total of 1143 live mussels of 16 species were collected in Reach 2 (Table 3). Mucket (77.6%) was by far the most abundant species collected along all five transects. Fluted Shell (7.4%) was the only other species that comprised more than 5% of the total. One Wisconsin protected species, Purple Wartyback (endangered; 0.3%), and one Wisconsin special concern species,

Elktoe (2.4%), were collected. Some live mussels were extensively eroded on the umbo and both valves. Abundant dead shell material was present in the substrate throughout the reach.

Mussel abundance and species richness were lowest in Transect 10, along which only 28 individuals of four species were collected. Abundance was considerably higher in the remaining transects, with the live number of mussels ranging from 112 to 382 individuals per transect. Surface density ranged from 0.70 mussels/m^2 in Transect 10 to 9.55 mussels/m^2 in Transect 4 and averaged 5.86 mussels/m^2 over all sampled transects (Table 3). Live mussels were present in all transect segments sampled, though abundance per segment varied widely from 1 to 156 individuals (Figure 6).

Mussel community metrics for Reach 2 are summarized in Table 3. As in Reach 1, the proportion of individuals with ≤5 external annuli was low, likely due to the inherent bias toward large individuals with this sampling method. Simpson's diversity was 0.61 and Pielou's evenness was 0.14. Although species richness was higher than in Reach 1, both diversity and evenness were lower due to the very high abundance of Mucket relative to all other species. The cumulative species curve suggests that additional species may be present in the reach. Based on the trendline equation, 259 additional individuals would need to be collected to yield one additional species (Figure 7).

4.0 CONCLUSIONS

Mussels were present in low abundance in Reach 1 upstream of the impoundment. A total of 120 live individuals of 10 species were collected in this reach, and average surface density was 0.60 mussels/m^2. Most species were only collected in pockets of more heterogeneous substrate near the banks, while Fatmucket was more widely distributed and was found in vegetated banks adjacent to *Typha* stands, as well as in patches with other species. The sand substrate present across most of the channel width does not provide high-quality mussel habitat; patches of more suitable habitat are present along the stream margins.

In contrast, a total of 1143 live mussels of 16 species were collected in Reach 2, including one Wisconsin endangered species and one species of special concern. Surface density was relatively high, averaging 5.86 mussels/m^2 for the entire reach and reaching a maximum of 9.55 mussels/m^2 in Transect 4. Mussels were present along all five sampled transects, and numerous relic shells and live individuals were observed in the substrate while walking between transects. Habitat along the transects was characterized by heterogeneous substrate (boulder, cobble, gravel, sand) and moderate flow, and most of this reach appears to provide high quality mussel habitat.

5.0 REFERENCES

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

U.S. Environmental Protection Agency (USEPA). (2022a). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?reachcode=07030002000045&measure=0.

U.S. Environmental Protection Agency (USEPA). (2022b). Watershed report. Retrieved from https://watersgeo.epa.gov/watershedreport/?reachcode=07030002000033&measure=0.

Wan, H., Perry, J., Ferrin, R., Moraska-LaFrancois, B., Wan, H., Perry, J., ... & Moraska-LaFrancois, B. (2007). Aquatic habitat classification on the St. Croix National Scenic Riverway. In Research report to the US National Park Service. University of Minnesota.

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *Journal of Geology, 30*, 377-392.

Williams, J. D., Bogan, A. E., Butler, R. S, Cummings, K. S., Garner, J. T., Harris, J. L., Johnson, N. A., and Watters, G. T. (2017). A revised checklist of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Wisconsin Department of Natural Resources (WDNR). (2018). Species Observations by County. Retrieved from https://wiatri.net/inventory/mussels/About/musselWaters.cfm.

Wisconsin Department of Natural Resources (WDNR). (2021). Wisconsin Natural Heritage Working List. Retrieved from https://dnr.wisconsin.gov/topic/NHI/WList.

Table 1. Mussel species reported from the Namekagon River in Washburn County, Wisconsin.

Species	Common Name	Status [1]	Year of Observation [2]
Amblemini			
Amblema plicata	Threeridge		2016
Pleurobemini			
Eurynia dilatata	Spike		2016
Fusconaia flava	Wabash Pigtoe		2016
Pleurobema sintoxia	Round Pigtoe		2016
Quadrulini			
Cyclonaias pustulosa	Pimpleback		2016
Cyclonaias tuberculata	Purple Wartyback	E	1995
Quadrula quadrula	Mapleleaf	SC/P	2016
Lampsilini			
Actinonaias ligamentina	Mucket		2016
Lampsilis cardium	Plain Pocketbook		2016
Lampsilis siliquoidea	Fatmucket		2016
Leptodea fragilis	Fragile Papershell		1995
Ligumia recta	Black Sandshell		2016
Obovaria olivaria	Hickorynut		1988
Potamilus alatus	Pink Heelsplitter		2016
Truncilla truncata	Deertoe		2016
Anodontini			
Alasmidonta marginata	Elktoe	SC/P	2016
Anodontoides ferussacianus	Cylindrical Papershell		2016
Lasmigona compressa	Creek Heelsplitter		2016
Lasmigona costata	Fluted Shell		2016
Pyganodon grandis	Giant Floater		1995
Simpsonaias ambigua	Salamander Mussel	T	1988
Strophitus undulatus	Creeper		2016
Utterbackia imbecillis	Paper Pondshell		2006
Total No. Species	23		

[1] E = Wisconsin endangered, T = Wisconsin threatened, SC/P = Wisconsin species of special concern (protected; WDNR, 2021)

[2] WDNR (2018)

Table 2. Habitat characteristics observed in Trego riverine surveys, Namekagon River, 2022.

				Substrate Composition (%)									
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell
Reach 1 (US)	T3	0-10	0.61	0	0	0	0	85	5	0	5	5	0
	T3	10-20	0.91	0	0	0	0	100	0	0	0	0	0
	T3	20-30	0.91	0	0	0	0	90	10	0	0	0	0
	T3	30-40	0.91	0	0	0	0	100	0	0	0	0	0
	T3	40-50	0.91	0	0	0	0	90	0	0	10	0	0
	T3	50-55	0.61	0	0	0	0	40	30	0	30	0	0
Reach 1 (US)	T4	0-10	0.91	0	0	0	0	85	5	0	5	5	0
	T4	10-20	0.91	0	0	0	0	100	0	0	0	0	0
	T4	20-30	0.91	0	0	0	0	100	0	0	0	0	0
	T4	30-40	1.22	0	0	20	0	40	25	5	0	10	0
Reach 1 (US)	T5	0-10	0.30	0	0	0	0	75	20	0	0	5	0
	T5	10-20	0.76	0	0	0	0	90	10	0	0	0	0
	T5	20-30	1.07	0	0	0	0	100	0	0	0	0	0
	T5	30-40	0.91	0	20	20	0	50	0	0	0	10	0
Reach 1 (US)	T7	0-10	1.37	0	0	10	10	40	20	0	0	20	0
	T7	10-20	1.37	0	0	0	0	100	0	0	0	0	0
	T7	20-30	0.76	0	0	0	0	80	10	0	10	0	0
Reach 1 (US)	T9	0-10	0.61	0	0	0	0	70	20	0	10	0	0
	T9	10-20	0.91	0	0	0	0	80	10	0	10	0	0
	T9	20-30	0.91	0	0	0	0	80	10	0	10	0	0
	T9	30-35	0.61	0	0	0	0	80	10	0	10	0	0
Reach 2 (DS)	T3	0-10	0.46	0	20	30	30	20	0	0	0	0	0
	T3	10-20	1.22	0	20	40	30	10	0	0	0	0	0
	T3	20-30	0.61	0	10	30	40	20	0	0	0	0	0
Reach 2 (DS)	T4	0-10	0.30	0	0	10	20	60	0	0	0	10	0
	T4	10-20	1.07	0	0	40	20	40	0	0	0	0	0
	T4	20-30	1.07	0	20	30	40	10	0	0	0	0	0
	T4	30-40	0.46	0	0	40	20	40	0	0	0	0	0

Table 2. Habitat characteristics observed in Trego riverine surveys, Namekagon River, 2022.

				Substrate Composition (%)									
Reach	Transect	Segment	Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell
Reach 2 (DS)	T5	0-10	0.61	0	0	20	40	20	0	0	10	0	10
	T5	10-20	0.61	0	0	20	50	20	0	0	0	0	10
	T5	20-30	0.61	0	0	30	20	50	0	0	0	0	0
	T5	30-40	0.61	0	0	40	30	20	0	0	0	0	10
	T5	40-50	0.61	0	0	30	50	10	0	0	0	0	10
Reach 2 (DS)	T7	0-10	1.07	0	10	60	10	20	0	0	0	0	0
	T7	10-20	0.91	0	20	50	10	20	0	0	0	0	0
	T7	20-30	0.61	0	0	40	20	10	0	0	10	0	20
	T7	30-35	0.30	0	10	40	20	20	10	0	0	0	0
Reach 2 (DS)	T10	0-10	0.61	0	30	50	10	10	0	0	0	0	0
	T10	10-20	0.61	0	30	50	10	10	0	0	0	0	0
	T10	20-30	0.61	0	20	40	30	10	0	0	0	0	0
	T10	30-40	0.61	0	20	40	30	10	0	0	0	0	0

US = upstream; DS = downstream; LWD = large woody debris

Table 3. Summary of effort and mussels collected in Trego riverine surveys, Namekagon River, 2022.

		Reach 1 (Upstream)							Reach 2 (Downstream)							Total	
Species	Common Name	T3	T4	T5	T7	T9	Total	%	T3	T4	T5	T7	T10	Total	%	Total	%
Amblemini																	
Amblema plicata	Threeridge	-	-	-	-	-	-	-	2	6	1	-	-	9	0.8	9	0.7
Pleurobemini																	
Eurynia dilatata	Spike	-	4	1	-	1	6	5.0	-	4	3	-	-	7	0.6	13	1.0
Fusconaia flava	Wabash Pigtoe	2	3	1	-	2	8	6.7	-	8	3	-	-	11	1.0	19	1.5
Pleurobema sintoxia	Round Pigtoe	-	1	1	-	-	2	1.7	1	-	-	-	-	1	0.1	3	0.2
Quadrulini																	
Cyclonaias pustulosa	Pimpleback	-	-	-	-	-	-	-	-	2	1	-	-	3	0.3	3	0.2
Cyclonaias tuberculata	Purple Wartyback	-	-	-	-	-	-	-	-	-	3	1	-	4	0.3	4	0.3
Lampsilini																	
Actinonaias ligamentina	Mucket	-	3	1	3	1	8	6.7	78	300	252	240	17	887	77.6	895	70.9
Lampsilis cardium	Plain Pocketbook	7	18	4	2	2	33	27.5	6	10	15	9	7	47	4.1	80	6.3
Lampsilis siliquoidea	Fatmucket	9	37	1	2	5	54	45.0	2	1	7	7	2	19	1.7	73	5.8
Ligumia recta	Black Sandshell	4	-	-	-	-	4	3.3	2	2	6	5	-	15	1.3	19	1.5
Obovaria olivaria	Hickorynut	-	-	-	-	-	-	-	-	1	1	-	-	2	0.2	2	0.2
Potamilus alatus	Pink Heelsplitter	-	-	-	-	-	-	-	-	1	-	-	-	1	0.1	1	0.1
Anodontini																	
Alasmidonta marginata	Elktoe	-	-	-	-	-	-	-	8	3	13	4	-	28	2.4	28	2.2
Lasmigona costata	Fluted Shell	-	1	-	-	-	1	0.8	11	41	18	13	2	85	7.4	86	6.8
Pyganodon grandis	Giant Floater	1	-	-	-	-	1	0.8	1	-	-	-	-	1	0.1	2	0.2
Strophitus undulatus	Creeper	-	3	-	-	-	3	2.5	1	3	15	4	-	23	2.0	26	2.1
Total Abundance		23	70	9	7	11	120	100.0	112	382	338	283	28	1143	100.0	1263	100.0
Live Species		5	8	6	3	5	10		10	13	13	8	4	16		16	
Effort (m^2)		55	40	40	30	35	200		30	40	50	35	40	195		395	
Surface Density (no./m^2)		0.42	1.75	0.23	0.23	0.31	0.60		3.73	9.55	6.76	8.09	0.70	5.86		3.20	
% ≤5 external annuli							1.67							0.96			
Simpson's Diversity							0.71							0.61			
Pielou's Evenness							0.33							0.14			

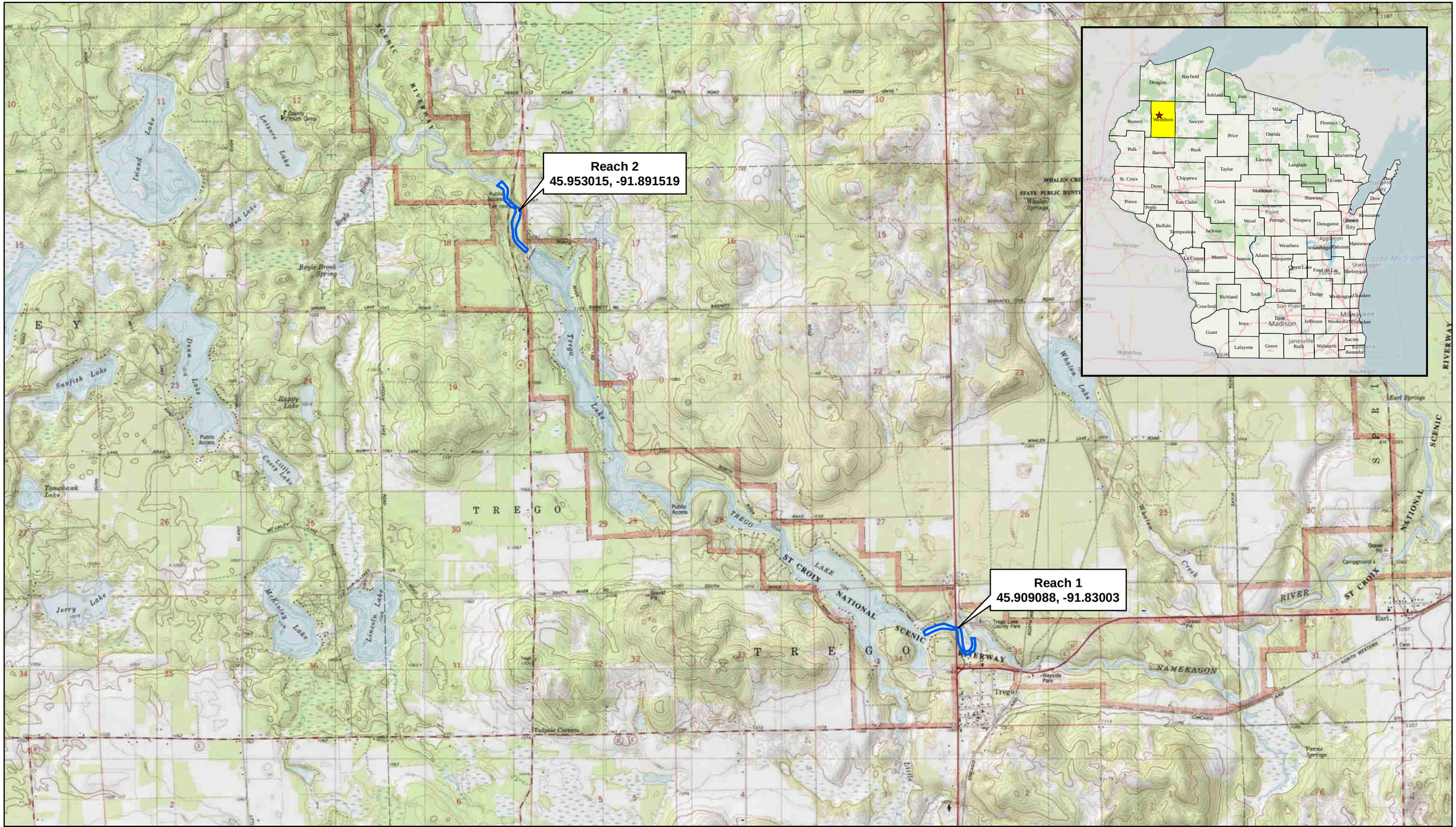

Figure 1. Trego Project Location on USGS 7.5-minute Topographic Map of Dunn Lake and Trego Quadrangles. Washburn County, Wisconsin.

Riverine Reach Study Area

0 2,500 5,000 10,000 Feet

0 750 1,500 3,000 Meters

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Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\MMead-and-Hunt\16082_Wisconsin_MusselsMap1_Location_Trego.mxd

Date: 8/17/2022

Basemap courtesy of Esri.

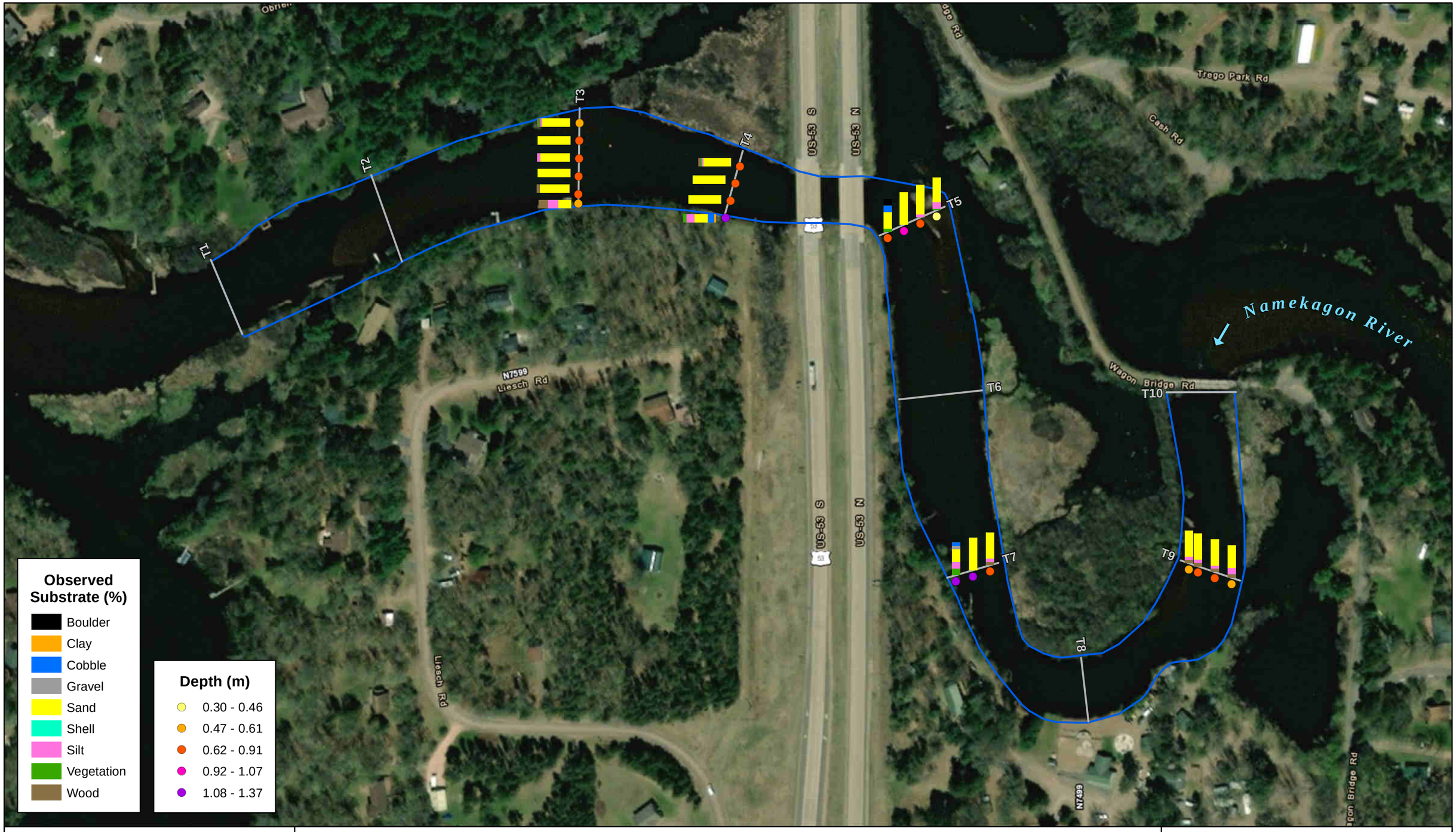

Figure 2. Substrate and Depth for the Trego Project Reach One on the Namekagon River. Washburn County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

EnviroScience
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Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\116082_Wisconsin_Mussels\16082_GIS\Map2_Substrate_R1_Trego.mxd

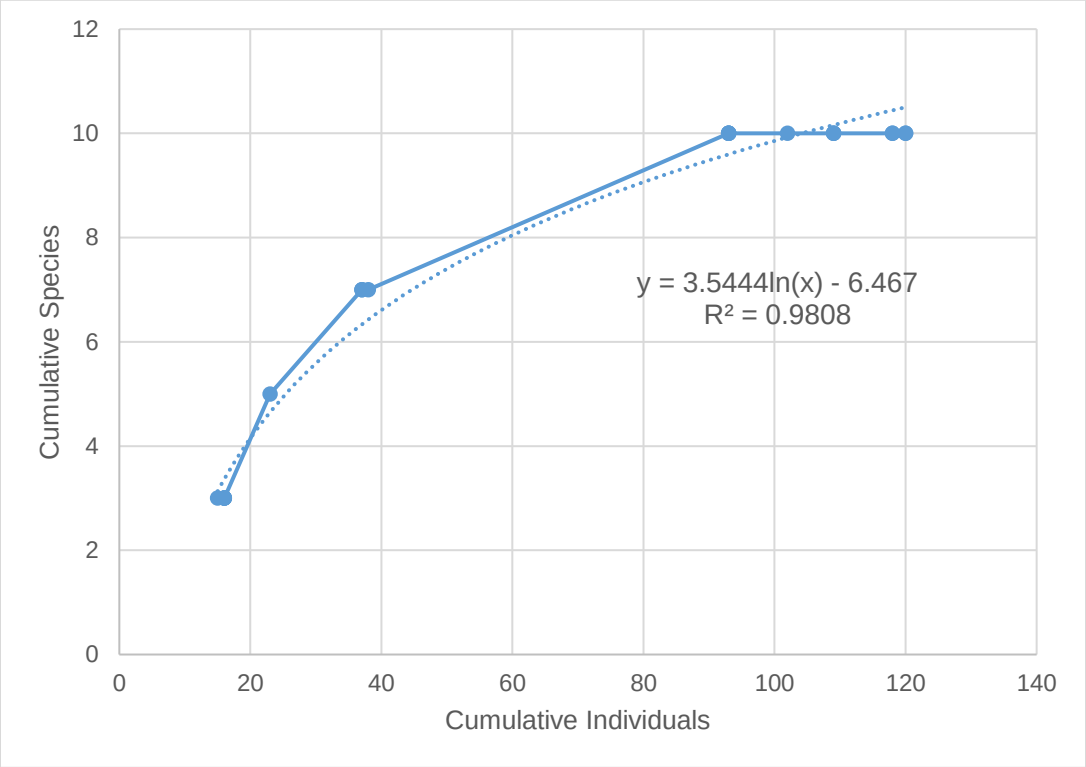
Basemap courtesy of Esri.

Figure 3. Mussel Abundance for the Trego Project Reach One on the Namekagon River. Washburn County, Wisconsin.

Basemap courtesy of Esri.

Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\MMead-and-Hunt\16082_Wisconsin_Mussels\Map4_Mussels_R1_Trego.mxd

Figure 4. Cumulative species curve for Trego Project Reach One on the Namekagon River. Washburn County, Wisconsin.



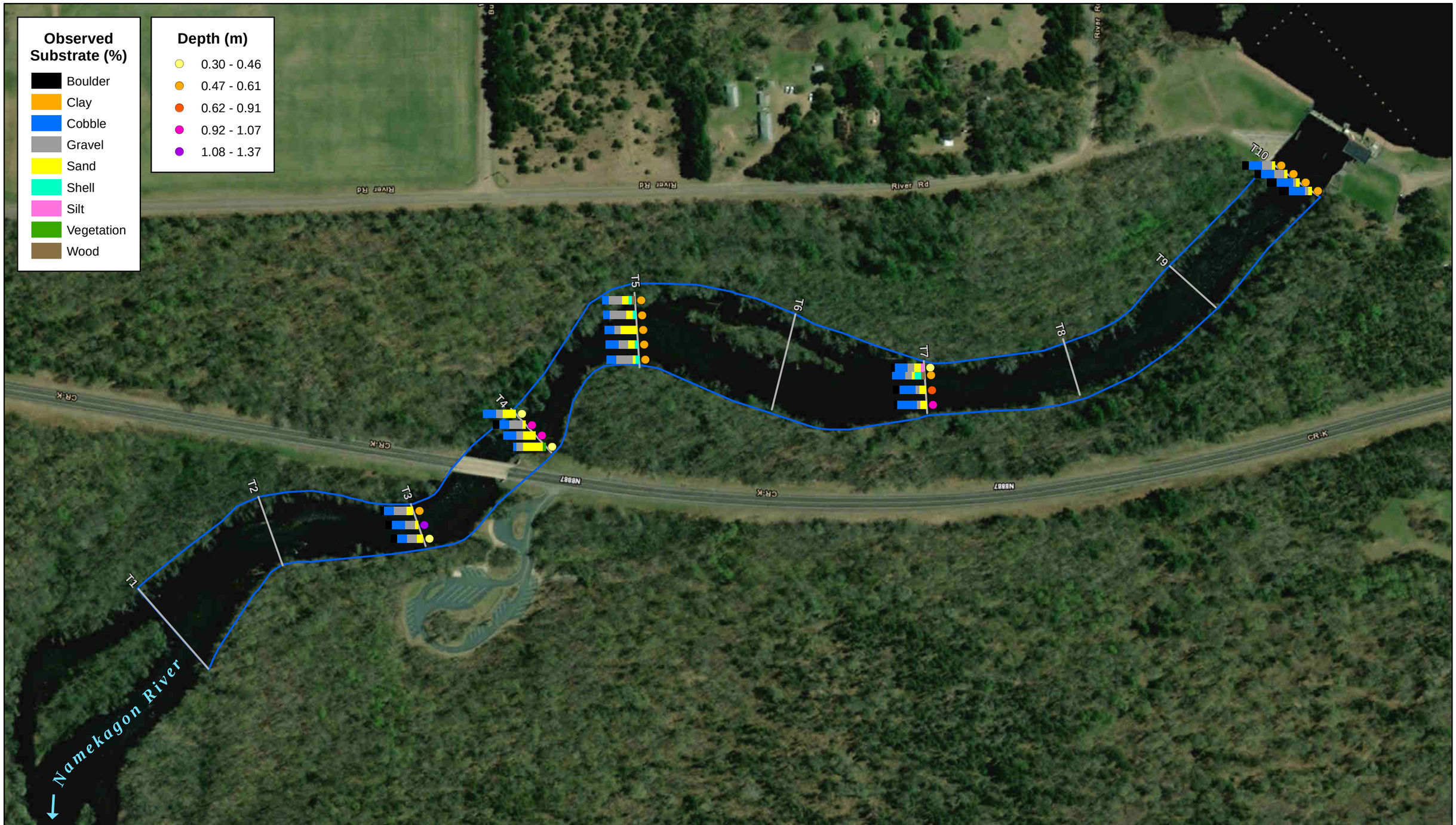


Figure 5. Substrate and Depth for the Trego Project Reach Two on the Namekagon River. Washburn County, Wisconsin.

Survey Transect

Riverine Reach Study Area

0 150 300 600 Feet

0 50 100 200 Meters

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Date: 8/18/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map3_Substrate_R2_Trego.mxd

Basemap courtesy of Esri.

Figure 6. Mussel Abundance for the Trego Project Reach Two on the Namekagon River. Washburn County, Wisconsin.

Survey Transect

0 150 300 600 Feet

0 50 100 200 Meters

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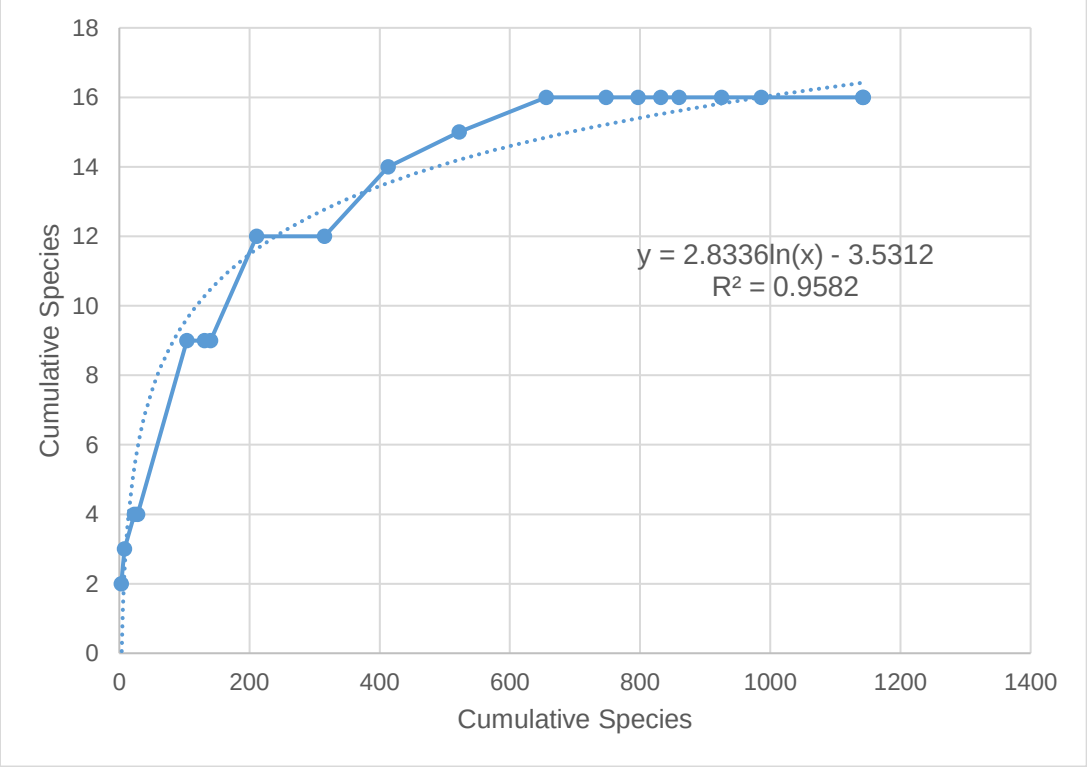
Date: 8/7/2022 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\MMead-and-Hunt\16082_Wisconsin_Mussels\Map5_Mussels_R2_Trego.mxd

Basemap courtesy of Esri.

Figure 7. Cumulative species curve for Trego Project Reach Two on the Namekagon River. Washburn County, Wisconsin.



Appendix A

Scientific Collecting Permits and Survey Plan

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463

July 30, 2021

Emily Grossman
EnviroScience, Inc
2977 Hwy K #226
O'Fallon, MO 63368

Subject: WI E/T Permit Enclosed

Dear Emily:

With this letter we are updating your **ET Species Permit #1130**, per your request, as follows:

Species added to permit for removal and relocation to nearest suitable habitat outside impacted area:

- All Wisconsin threatened/endangered mussel species, collected as encountered on projects. Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.

These updates are now part of your WI E/T Permit and will expire along with your original permit. Updated conditions are attached to this letter.

Please keep this letter and your E/T permit with you when conducting activities involving species listed on your permit.

Thank you for your efforts on behalf of Wisconsin's endangered and threatened resources.

Sincerely,

Drew Feldkirchner
Bureau Director

Wisconsin Endangered and Threatened Species Permit Conditions

The following conditions apply to Wisconsin E/T Species Permit **#1130** issued to **Emily Grossman**:

1. Bureau of Natural Heritage Conservation Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
2. Permit holder must follow equipment disinfection protocols at outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
3. Permit holder agrees to follow Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling unless approved by the DNR species expert.
4. If you anticipate encountering a federally listed mussel species while conducting mussel surveys, a federal permit may also be required. For further information, contact U.S. Fish and Wildlife Service, Twin Cities Field Office at (952) 252-0092.
5. If a federally listed species is not anticipated, but is encountered during a survey or relocation, the surveyor must contact the U.S. Fish and Wildlife Service's Twin Cities Field Office (612) 725-3548 ext. 2206) within 24 hours of the encounter, unless the surveyor is already authorized to handle the species under a federal permit.
6. Permit holder must contact Lisie Kitchel (608) 266-5248) prior to conducting field work for each new project.

USACE GUIDELINES

1. Target and non-target species should be returned to point of capture, unless the project involves relocation. If the project involves relocation, please contact Lisie Kitchel (608) 266-5248).
2. Mussels should not be surveyed when water temperatures are less than 40 º F and air temperatures are less than 32º F.
3. It is recommended to follow the equipment disinfection protocols for aquatic invasives as outlined in WDNR Manual Code 9183.1, found online at the DNR public site.
4. It is recommended to follow the Mussel Relocation Protocol (if applicable) and Wisconsin Wadeable Protocol for Mussel Sampling.

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921

Endangered and Threatened Species Permit

Form 1700-002 (R 3/06)

The below named person is authorized by the Wisconsin Department of Natural Resources, pursuant to section 29.604, Wis. Stats., and Chapter NR 27, Wis. Adm. Code, to conduct the described activities for scientific or educational purposes.

DNR Permit Number	DNR Metal Tag Number
1130	
Date DNR Permit Issued	**Date DNR Permit Expires**
07/24/2018	01/31/2024
Federal Permit Number	**Date Federal Permit Expires**

Permittee Information

Last Name	First
Grossman	Emily

Street or Route	City	State	ZIP Code
21 Fort Zumwalt Dr	O'Fallon	MO	63366

Phone Number	Email Address	Date of Birth	Eye Color	Hair Color	Weight	Height
(847) 269-4159	egrossman@enviroscienceinc.com	3/19/1987	Blue	Brown	150	5'6"

Species or Study Information

County(ies) of Activity

Statewide

Name and Number of Specimens or Description of Study

All Wisconsin threatened/endangered mussel species
Mussels will be collected as encountered on projects; specific numbers of each species are not known at this time

Source of Species or Area of Study	Where Species or Item Will Be Kept
Aquatic systems (rivers/streams/lakes) throughout Wisconsin	Live mussels will be returned to the wild. Dead shells may be retained as vouchers and deposited in a reference collection, if permitted.
Method of Taking and/or Transporting	**During the Following Period of Time**
Mussels will be collected by hand via wading/ snorkeling/diving.	Duration of permit validity.

Purpose for Obtaining or Collection

Mussel surveys and possible translocation for construction and/or ecological monitoring projects

Final Disposition of Specimens

Live mussels will be returned to the wild. Dead shells may be retained as vouchers, if permitted.

Scientific Qualification of Permittee

See permit file.

Additional Conditions of This Permit

See attached letter with conditions.

Permittee Certification

I hereby certify that I have read, am familiar, and agree to comply with the regulations described herein. This permit is not transferable and must be exhibited to any authorized agent of the Department of Natural Resources on demand.

Permittee Signature	Date Signed
DocuSigned by: Emily Grossman BCABDB7B5AC8410...	8/3/2021 | 12:23 PM CDT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
For the Secretary

By: DocuSigned by: Drew Feldkirchner F8586A547FC44E3... Date: 7/30/2021 | 12:00 PM C

Address updated on 1/14/2022 by NRR.

Emily Grossman

From: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>
Sent: Monday, June 6, 2022 3:00 PM
To: Emily Grossman; Weinzinger, Jesse J - DNR
Cc: Becca Winterringer
Subject: RE: Mussel survey plans

Emily – all three look good, the only thing I would add would be to please note if there is an obvious 'drawdown zone' in any of the river reaches as a result of either consistent drawdownd or seasonal drawdownd where no mussels are present due to being dewatered, the classic 'bathtub ring', to document habitat that is impacted by operation or seasonal maintenance. This is especially important for the Gile Flowage which has a significant drawdown.
By document I mean not just if its present but the extent to which it occurs, 1 foot, 2 feet, 1 meter, etc. in width, or however best to describe it, not if it is not present.
Hope that is clear, give me a call if you want to discuss.

Have fun in northern Wisconsin!!

Lisie Kitchel
Conservation Biologist
Bureau of Natural Heritage Conservation
Wisconsin Department of Natural Resources
101 S. Webster St.
Madison, WI 53707
Cell Phone: (608-220-5180

dnr.wi.gov

From: Emily Grossman <egrossman@enviroscienceinc.com>
Sent: Monday, June 6, 2022 11:26 AM
To: Kitchel, Lisie E - DNR <Lisie.Kitchel@wisconsin.gov>; Weinzinger, Jesse J - DNR <Jesse.Weinzinger@wisconsin.gov>
Cc: Becca Winterringer <bwinterringer@enviroscienceinc.com>
Subject: Mussel survey plans

Lisie and Jesse,

EnviroScience was recently contracted by Mead and Hunt to conduct mussel surveys for four hydropower licensing/relicensing projects in northern Wisconsin. The locations and survey plans include:

- Hayward Lake and Trego Lake, Namekagon River near Hayward & Trego
- White River Flowage, White River near Ashland
- Gile Flowage, W. Fork Montreal River near Gile

Fieldwork will be led by either me (WI E/T permit #1130) or Becca Winterringer (WI E/T permit #1164). Per our permits, we wanted to notify you that we'll be conducting the surveys and request your review of the survey plans to ensure they're adequate. Based on the RFP we received, it looks like Mead and Hunt may have already discussed the survey methods with WIDNR, but please take a look at the attached plans and let me know if you have any comments or questions. We are hoping to start fieldwork in the next couple weeks, if possible, in order to complete the White River site before a planned drawdown of this reservoir in early July.

Again, please let me know if you have any questions/comments or need any additional info.

Thank you!

Emily Grossman
Senior Scientist/Project Manager

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O. 800.940.4025 | C. 847.269.4159 | 24-HR 888.866.8540
OH | TN | VA | WV | NC
Meet our new team in North Carolina!

SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior
National Park Service
Saint Croix

Study#: SACN-00158
Permit#: SACN-2022-SCI-0013
Start Date: Jun 20, 2022
Expiration Date: Jul 08, 2022
Coop Agreement#:
Optional Park Code:

Name of principal investigator:

Name: Rebecca Winterringer **Phone:**6365444754 **Email:**bwinterringer@enviroscienceinc.com

Name of institution represented:
EnviroScience, Inc.

Additional investigators or key field assistants:

Name: Emily Grossman	**Phone:** 847-269-4159	**Email:** egrossman@enviroscienceinc.com
Name: Robert Williams	**Phone:** 423-802-3237	**Email:** rwilliams@enviroscienceinc.com
Name: Matt Gilkay	**Phone:** 763-222-5107	**Email:** mgilkay@enviroscienceinc.com
Name: Paul Moreno	**Phone:** 54-317-1740	**Email:** m256moreno@gmail.com
Name: Ben Ebert	**Phone:** 517-899-3403	**Email:** bebert@enviroscienceinc.com

Study Title:
Mussel Studies for the Hayward (FERC No. 2417) and Trego (FERC No. 2711) Hydroelectric Projects, Namekagon River, Sawyer and Washburn Counties, Wisconsin.

Purpose of study:
The objective of the mussel studies is to provide data on freshwater mussel species and habitat within each of the Project areas. These studies aim to collect current mussel information to supplement historical data near the Project areas and document the resident mussel community above and below each dam. Coordination of the mussel studies has been undertaken by the Project owner and EnviroScience's client (Mead and Hunt). The mussel studies will follow the approved study plans submitted by Mead and Hunt related to correspondence from the NPS dated March 2, 2022.

Subject/Discipline:
Inventory Natural Resources
Water Resources

Locations authorized:
Hayward Hydroelectric Project - Reach 1 will begin approximately 430 m above the Highway 77 bridge (approx. coordinates: 46.013296, -91.453639) and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in (approximate coordinates: 46.002513, -91.489114) and will extend 1,000 m downstream.

Trego Hydroelectric Project - Reach 1 will begin at the Wagon Bridge Road crossing (approx. coordinates: 45.908514, -91.824905) and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam (approx. coordinates: 45.948372, -91.888830) and extend 1,000 m downstream.

Transportation method to research site(s):
Access to each survey area will be via public boat or canoe launches in public parking designated areas.

Collection of the following specimens or materials, quantities, and any limitations on collecting:

Name of repository for specimens or sample materials if applicable:

Repository type: Temporarily captured or handled (may include marking) and then released undamaged in place
Objects collected:
All freshwater mussels encountered will be inventories and released to their point of collection. Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported.Species likely to be encountered based on Wisconsin Observation by County and Waterbody:

Black Sandshell - Ligumia recta
Creek Heelsplitter - Lasmigona compressa
Creeper - Strophitus undulatus
Cylindrical Papershell - Anodontoides ferussacianus
Deertoe - Truncilla truncata
Elktoe - Alasmidonta marginata
Fatmucket - Lampsilis siliquoidea
Fluted-shell - Lasmigona costata
Fragile Papershell - Leptodea fragilis
Giant Floater - Pyganodon grandis
Hickorynut - Obovaria olivaria
Mapleleaf - Quadrula quadrula
Mucket - Actinonaias ligamentina
Paper Pondshell - Utterbackia imbecillis
Pimpleback - Quadrula pustulosa
Pink Heelsplitter - Potamilus alatus
Plain Pocketbook - Lampsilis cardium
Purple Wartyback - Cyclonaias tuberculata
Round Pigtoe - Pleurobema sintoxia
Salamander Mussel - Simpsonaias ambigua
Spike - Elliptio dilatata
Threeridge - Amblema plicata
Wabash Pigtoe - Fusconaia flava

NPS General Conditions for Scientific Research and Collecting Permit (available at the RPRS HELP page) apply to this permit. The following specific conditions or restrictions, and any attached conditions, also apply to this permit:

Plot Marking
Route marking such as painting, blazing, or flagging is prohibited. Materials used to mark plots must be pre-approved by the Resource Management Specialist and must be as subtle as possible. Biodegradable flagging should be used to temporarily mark plots. All tags must have the researcher s name, project name, and date. Whenever possible, markers must not be readily visible to visitors.

Aquatic Collecting
All equipment must be free of zebra mussels.
Decontamination procedures are visual inspection, removal of plants, shells, etc., and a hot water rinse of 140 degrees F or out of water for at least 5 days.

Other Permits
This permit does not negate or replace other permits that may be required from local, state or other federal agencies.

Summary of permitted field methods and activities:

Mussel studies will include field surveys of two riverine reaches at each of the two Project locations. Mussel study methods were developed based on the Wisconsin Department of Natural Resources' (WDNR) Guidelines for Sampling Freshwater Mussels in Wadable Streams (Piette, 2015).
Mussel studies within riverine habitat will be conducted at each Project location. The survey area for each Project will include two riverine reaches, one upstream of the impoundment and one downstream of the Project powerhouse outside of the mixing zone. The upstream and downstream boundaries of each reach will be defined as follows:
Hayward Hydroelectric Project - Reach 1 will begin approximately 430 m above the Highway 77 bridge and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in and will extend 1,000 m downstream.
Trego Hydroelectric Project - Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam and extend 1,000 m downstream.
Within each reach, a series of transects extending bank to bank will be established every 100 m, creating a series of 10 possible transects per reach. Transects will be numbered sequentially from downstream to upstream, and a random number selector will be used to select five transects for the survey within each reach.
Searches along each transect will be conducted in 10-m segments and will extend 0.5 m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search will entail an initial search of 0.2 minutes per m2 (min/m2) along each 10-m segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 min/m2. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.
EnviroScience will record general stream conditions and morphology within the study area and reference the Aquatic Habitat Classification on the St. Croix National Scenic Riverway for methodology and classifications. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only

when visibility at depth is at least 20 inches. In addition, a general description of mussel habitat in the Project boundary will be provided in reporting.
Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. Datasheets will be populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of each mussel study plan. Mussel taxonomy will follow the names presented by Williams et al., 2017.
If any living or dead federal or state-listed species are encountered, EnviroScience will notify Mead & Hunt immediately; per surveyor collection permits, WDNR, National Park Service (NPS), and the U.S. Fish & Wildlife Service (USFWS) will be notified within 24 hours. No live mussels will be harmed or taken during this Project. Any specimens of federally listed species that are encountered will be individually hand placed in their original locations.

Recommended by park staff(name and title):

Reviewed by Collections Manager:

Yes____ No____

Approved by park official:

Date Approved:

Title:

Superintendent

I Agree To All Conditions And Restrictions Of this Permit As Specified
(Not valid unless signed and dated by the principal investigator)

(Principal investigator's signature) (Date)

THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

GENERAL CONDITIONS
For
SCIENTIFIC RESEARCH AND COLLECTING PERMIT

United States Department of the Interior
National Park Service

1. **Authority** - The permittee is granted privileges covered under this permit subject to the supervision of the superintendent or a designee, and shall comply with all applicable laws and regulations of the National Park System area and other federal and state laws. A National Park Service (NPS) representative may accompany the permittee in the field to ensure compliance with regulations.

2. **Responsibility** - The permittee is responsible for ensuring that all persons working on the project adhere to permit conditions and applicable NPS regulations.

3. **False information** - The permittee is prohibited from giving false information that is used to issue this permit. To do so will be considered a breach of conditions and be grounds for revocation of this permit and other applicable penalties.

4. **Assignment** - This permit may not be transferred or assigned. Additional investigators and field assistants are to be coordinated by the person(s) named in the permit and should carry a copy of the permit while they are working in the park. The principal investigator shall notify the park's Research and Collecting Permit Office when there are desired changes in the approved study protocols or methods, changes in the affiliation or status of the principal investigator, or modification of the name of any project member.

5. **Revocation** - This permit may be terminated for breach of any condition. The permittee may consult with the appropriate NPS Regional Science Advisor to clarify issues resulting in a revoked permit and the potential for reinstatement by the park superintendent or a designee.

6. **Collection of specimens (including materials)** - No specimens (including materials) may be collected unless authorized on the Scientific Research and Collecting permit.

The general conditions for specimen collections are:

- Collection of archeological materials without a valid Federal Archeology Permit is prohibited.

- Collection of federally listed threatened or endangered species without a valid U.S. Fish and Wildlife Service endangered species permit is prohibited.

- Collection methods shall not attract undue attention or cause unapproved damage, depletion, or disturbance to the environment and other park resources, such as historic sites.

- New specimens must be reported to the NPS annually or more frequently if required by the park issuing the permit.Minimum information for annual reporting includes specimen classification, number of specimens collected, location collected, specimen status(e.g., herbarium sheet, preserved in alcohol / formalin, tanned and mounted, dried and boxed, etc.), and current location.

- Collected specimens that are not consumed in analysis or discarded after scientific analysis remain federal property.The NPS reserves the right to designate the repositories of all specimens removed from the park and to approve or restrict reassignment of specimens from one repository to another. Because specimens are Federal property, they shall not be destroyed or discarded without prior NPS authorization.
- Each specimen (or groups of specimens labeled as a group) that is retained permanently must bear NPS labels and must be accessioned and cataloged in the NPS National Catalog.Unless exempted by additional park - specific stipulations, the permittee will complete the labels and catalog records and will provide accession information.It is the permittee's responsibility to contact the park for cataloging instructions and specimen labels as well as instructions on repository designation for the specimens.

- Collected specimens may be used for scientific or educational purposes only, and shall be dedicated to public benefit and be accessible to the public in accordance with NPS policies and procedures.

- Any specimens collected under this permit, any components of any specimens (including but not limited to natural organisms, enzymes or other bioactive molecules, genetic materials, or seeds), and research results derived from collected specimens are to be used for

scientific or educational purposes only, and may not be used for commercial or other revenue - generating purposes unless the permittee has entered into a Cooperative Research And Development Agreement(CRADA) or other approved benefit - sharing agreement with the NPS.The sale of collected research specimens or other unauthorized transfers to third parties is prohibited.Furthermore, if the permittee sells or otherwise transfers collected specimens, any components thereof, or any products or research results developed from such specimens or their components without a CRADA or other approved benefit-sharing agreement with NPS, permittee will pay the NPS a royalty rate of twenty percent(20 %) of gross revenue from such sales or other revenues. In addition to such royalty, the NPS may seek other damages to which the NPS may be entitled including but not limited to injunctive relief against the permittee.

7. **Reports** - - The permittee is required to submit an Investigator's Annual Report and copies of final reports, publications, and other materials resulting from the study. Instructions for how and when to submit an annual report will be provided by NPS staff.Park research coordinators will analyze study proposals to determine whether copies of field notes, databases, maps, photos, and / or other materials may also be requested.The permittee is responsible for the content of reports and data provided to the National Park Service

8. **Confidentiality** - - The permittee agrees to keep the specific location of sensitive park resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

9. **Methods of travel** - Travel within the park is restricted to only those methods that are available to the general public unless otherwise specified in additional stipulations associated with this permit.

10. **Other permits** - The permittee must obtain all other required permit(s) to conduct the specified project.

11. **Insurance** - If liability insurance is required by the NPS for this project, then documentation must be provided that it has been obtained and is current in all respects before this permit is considered valid.

12. **Mechanized equipment** - No use of mechanized equipment in designated, proposed, or potential wilderness areas is allowed unless authorized by the superintendent or a designee in additional specific conditions associated with this permit.

13. **NPS participation** - The permittee should not anticipate assistance from the NPS unless specific arrangements are made and documented in either an additional stipulation attached to this permit or in other separate written agreements.

14. **Permanent markers and field equipment** - The permittee is required to remove all markers or equipment from the field after the completion of the study or prior to the expiration date of this permit. The superintendent or a designee may modify this requirement through additional park specific conditions that may be attached to this permit. Additional conditions regarding the positioning and identification of markers and field equipment may be issued by staff at individual parks.

15. **Access to park and restricted areas** - Approval for any activity is contingent on the park being open and staffed for required operations. No entry into restricted areas is allowed unless authorized in additional park specific stipulations attached to this permit.

16. **Notification** - The permittee is required to contact the park's Research and Collecting Permit Office (or other offices if indicated in the stipulations associated with this permit) prior to initiating any fieldwork authorized by this permit.Ideally this contact should occur at least one week prior to the initial visit to the park.

17. **Expiration date** - Permits expire on the date listed. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s).

18. **Other stipulations** - This permit includes by reference all stipulations listed in the application materials or in additional attachments to this permit provided by the superintendent or a designee. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits.

SURVEY PLAN:

FRESHWATER MUSSEL STUDIES FOR THE HAYWARD AND TREGO HYDROELECTRIC PROJECTS

(FERC Nos. 2417 and 2711)

Prepared for:

On Behalf of :

Mead & Hunt

Prepared by:

EnviroScience
Excellence In Any Environment

5070 Stow Rd.
Stow, OH 44224
800-940-4025
www.EnviroScienceInc.com

ES Project No. 16082

Date: June 6, 2022

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1.0 PROJECT OVERVIEW

EnviroScience, Inc. is pleased to submit this survey plan to the Wisconsin Department of Natural Resources (WDNR) on behalf of Mead & Hunt to perform freshwater mussel studies associated with the Federal Energy Regulatory Commission (FERC) relicensing process for the Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711). Northern States Power Company – Wisconsin, d/b/a Xcel Energy (Licensee/Applicant), is required to evaluate existing freshwater mussel resources and potential impacts to freshwater mussel resources associated with continued project operations. The Hayward project is located on the Namekagon River near Hayward, Sawyer County, Wisconsin. The Trego project is located on the Namekagon River near Trego, Washburn County, Wisconsin.

2.0 MUSSEL SURVEY SCOPE OF WORK

TASK ONE: MUSSEL STUDIES

Mussel survey methods were developed following the 2015 WDNR Guidelines for Sampling Freshwater Mussels in Wadeable Streams (Guidelines; Piette, 2015). Mussel studies will include field surveys of two riverine reaches at each project location. One reach will be located upstream of the impoundment, and one will be downstream of the project powerhouse. The upstream and downstream boundaries of each reach will be defined as follows:

- Hayward Hydroelectric Project (22 MHT Work Scope): Reach 1 will begin approximately 430 m above the Highway 77 bridge and extend 1,000 m upstream. Reach 2 will begin at the canoe portage put-in and will extend 1,000 m downstream.
- Trego Hydroelectric Project (22 MHT Work Scope): Reach 1 will begin at the Wagon Bridge Road crossing and extend 1,000 m downstream. Reach 2 will begin 45 m below the Trego Dam and extend 1,000 m downstream.

Within each reach, a series of transects extending bank to bank will be established every 100 m, creating a series of 10 possible transects per reach. Transects will be numbered sequentially from downstream to upstream, and a random number selector will be used to select five transects for the survey within each reach.

Searches along each transect will be conducted in 10-m segments and will extend 0.5 m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within each segment. The rapid visual search will entail an initial search of 0.2 minutes per m^2 (min/m^2) along each 10-m segment to determine if mussels are present. If mussels are present in a segment, a semi-quantitative search will be triggered, and the time will be extended to 1 min/m^2. During the semi-quantitative search, divers will visually search, probe the substrate, and turn over rocks to detect small, burrowed mussels.

EnviroScience will record general stream conditions and morphology within the study area and will reference the Aquatic Habitat Classification on the St. Croix National Scenic Riverway (Wan et al., 2007) for methodology and classifications. Water depth and river bottom substrate composition using the Wentworth Scale (% observed of silt, sand, gravel, etc.) will be recorded. The survey will be conducted only when visibility at depth is at least 20 inches. In addition, a general description of mussel habitat in the project boundary will be provided.

Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, measured (length in millimeters), aged (external annuli count), and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead less than one year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. Datasheets will be populated and summarized per the Mussel Survey Summary Tables provided in Appendix 2 of each mussel study plan provided by Mead & Hunt. Mussel taxonomy will follow the names presented by Williams et al., 2017.

If any living or dead federal or state-listed species are encountered, EnviroScience will notify Mead & Hunt immediately; per surveyor collection permits, WDNR, the National Park Service (NPS), and the U.S. Fish & Wildlife Service (USFWS) will be notified within 24 hours. No live mussels will be harmed or taken during this project. Any specimens of federally listed species that are encountered will be individually hand placed in their original locations.

TASK TWO: REPORTING

EnviroScience will provide Mead & Hunt with draft reports for the Hayward and Trego projects for review within 30 days of completion of fieldwork or by October 31, 2022, whichever occurs first. Final draft reports for each project for distribution to the relicensing participants will be completed within seven days after receiving Mead & Hunt's comments. EnviroScience will review and address participant comments and provide a final study report within 30 days of receiving participant comments from Mead & Hunt.

Each report will include a description of mussel survey activities and the prescribed Mussel Survey Summary Tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. GIS-based mapping will provide further visual presentations of the findings of the survey. Geo-referenced photos and GIS shapefiles will be provided electronically to Mead & Hunt.

MUSSEL SURVEY SCHEDULE

Field work will be initiated following coordination with WDNR, receipt of permits, and when suitable weather and river conditions allow. Normal to low water conditions and good visibility must occur to conduct field work; project activities will be planned accordingly. Fieldwork is tentatively planned for mid-June 2022.

3.0 LITERATURE CITED

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

Wan, H., Perry, J., Ferrin, R., Moraska-LaFrancois, B., Wan, H., Perry, J., ... & Moraska-LaFrancois, B. (2007). Aquatic habitat classification on the St. Croix National Scenic Riverway. In Research report to the US National Park Service. University of Minnesota.

Williams, J. D., Bogan, A. E., Butler, R. S., Cummings, K. S., Garner, J. T., Harris, J. L., ... & Watters, G. T. (2017). A revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. *Freshwater Mollusk Biology and Conservation, 20*(2), 33-58.

Appendix B

Photographic Record

Appendix B. Index of photo locations, Trego Mussel Survey, June 2022.

	Coordinates				
	UTM Zone 15N		NAD 1983		
Photo No.	Northing	Easting	Latitude	Longitude	View direction
Photo 1	5084683	590792	45.90972	-91.82936	East
Photo 2	5084459	591014	45.90767	-91.82655	South
Photo 3	5084461	591140	45.90768	-91.82492	South
Photo 4	5084461	591140	45.90768	-91.82492	Northeast
Photo 5	5089498	585906	45.95367	-91.89148	Southeast
Photo 6	5089429	585972	45.95304	-91.89065	Southeast
Photo 7	5089345	586008	45.95229	-91.89019	East
Photo 8	5089152	585988	45.95056	-91.89049	North
Photo 9	5088917	586139	45.94842	-91.88859	Northwest
Photo 10	5088917	586139	45.94842	-91.88859	Southwest
Photo 11	5089345	586008	45.95229	-91.89019	N/A
Photo 12	5089152	585978	45.95055	-91.89062	N/A
Photo 13	5089345	586008	45.95229	-91.89019	N/A
Photo 14	5089429	585972	45.95304	-91.89065	N/A
Photo 15	5089345	586008	45.95229	-91.89019	N/A
Photo 16	5089345	586008	45.95229	-91.89019	N/A
Photo 17	5089345	586008	45.95229	-91.89019	N/A
Photo 18	5084668	590792	45.90959	-91.82937	N/A
Photo 19	5084668	590792	45.90959	-91.82937	N/A
Photo 20	5089429	585972	45.95304	-91.89065	N/A
Photo 21	5084668	590792	45.90959	-91.82937	N/A
Photo 22	5089345	586008	45.95229	-91.89019	N/A
Photo 23	5084649	590966	45.90939	-91.82713	N/A
Photo 24	5089429	585972	45.95304	-91.89065	N/A
Photo 25	5084668	590792	45.90959	-91.82937	N/A
Photo 26	5089498	585906	45.95367	-91.89148	N/A
Photo 27	5089152	585978	45.95055	-91.89062	N/A
Photo 28	5089429	585972	45.95304	-91.89065	N/A

Photo 1. Reach 1, view looking upstream from Transect 3.

Photo 2. Reach 1, view looking upstream from Transect 7.

Photo 3. Reach 1, view looking downstream from Transect 9.

Photo 4. Reach 1, view looking upstream from Transect 9.

Photo 5. Reach 2, view looking upstream from Transect 3.

Photo 6. Reach 2, view looking upstream from Transect 4.

Photo 7. Reach 2, view looking across the river from the left descending bank near Transect 5.

Photo 8. Reach 2, view looking downstream from Transect 7.

Photo 9. Reach 2, view looking downstream from Transect 10.

Photo 10. Reach 2, view of divers searching for mussels on Transect 10.

Photo 11. Representative photo of Mucket (*Actinonaias ligamentina*) collected in the study area.

Photo 12. Representative photo of Elktoe (*Alasmidonta marginata*) collected in the study area.

Photo 13. Representative photo of Threeridge (*Amblema plicata*) collected in the study area.

Photo 14. Representative photo of Pimpleback (*Cyclonaias pustulosa*) collected in the study area.

Photo 15. Representative photo of Purple Wartyback (*Cyclonaias tuberculata*) collected in the study area.

Photo 16. Representative photo of Spike (*Eurynia dilatata*) collected in the study area.

Photo 17. Representative photo of Wabash Pigtoe (*Fusconaia flava*) collected in the study area.

Photo 18. Representative photo of Plain Pocketbook (*Lampsilis cardium*) collected in the study area.

Photo 19. Representative photo of Fatmucket (*Lampsilis siliquoidea*) collected in the study area.

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RECREATION STUDY REPORT

Recreation Report for the Hayward Hydroelectric Project (FERC No. 2417) and Trego Hydroelectric Project (FERC No. 2711)

Prepared for

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March 2023
Version: FINAL
EA Project No. 16154.02

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LIST OF ACRONYMS AND ABBREVIATIONS

ATV – All terrain vehicle

AIS – Aquatic Invasive Species

FERC, Commission – Federal Energy Regulatory Commission

NPS – National Park Service

NSPW, Applicant – Northern States Power Company-a Wisconsin corporation

SCORP – Statewide Comprehensive Outdoor Recreation Plan

TLD – Trego Lake District

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1. INTRODUCTION

Northern States Power Company – Wisconsin (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Projects). The Projects are owned, operated, and maintained by the Licensee. The current licenses, which designate the Projects as FERC Nos. 2417 (Hayward) and 2711 (Trego), expire on November 30, 2025. To obtain subsequent licenses, the Licensee must submit final license applications to FERC no later than November 30, 2023. The final license applications, in part, must include an evaluation of the existing recreational facilities associated with each Project along with proposed recreation enhancements.

The Projects are located on the Namekagon River in Sawyer County (Hayward) and Washburn County (Trego) in Wisconsin. The Namekagon River is a 99.5-mile-long northern tributary to the St. Croix River and is protected by the National Park Service (NPS) under the St. Croix National Scenic Riverway (Figure 1-1). The river is classified as Class I-II rapids. It is generally shallow with a rocky bottom. There are ample opportunities for fishing, wildlife viewing, water sports, and paddling on the Namekagon River.

In March 2019, the State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) for 2019-2023. The SCORP identifies recreation needs by region rather than specific sites or Project areas. The SCORP places an emphasis on nature-based recreational opportunities including hiking, fishing, and boating. For both Projects, the Licensee currently provides a carry-in access on the reservoir, a tailrace fishing area downstream of the powerhouse, and a canoe portage that helps fulfill recreation needs. These recreational opportunities are consistent with the SCORP.

Hydro operations, including fluctuations in reservoir elevation, and insufficient public access, can limit recreational opportunities. Adequate information is necessary to determine what impacts may be occurring from hydro operations as well as which recreational opportunities may be enhanced. The existing recreational facilities within the Projects were evaluated for recreational use and improvements.

The goals of the 2022 Hayward and Trego Recreation Study were to:

- obtain a subjective assessment of recreation facility conditions and needed enhancements;
- determine capacity of existing facilities to address current and future user demand; and
- provide sufficient information to evaluate impacts and provide rationale for recreation enhancement recommendations.

The results of the Hayward and Trego Recreation Study are presented herein and include the following items:

- recreation counts based on the data collected in 2022;
- recreation trends by activity and season;
- a discussion of the adequacy of the recreational facilities in the project area to meet recreational demand;
- recommendations to accommodate recreational needs in the project area.

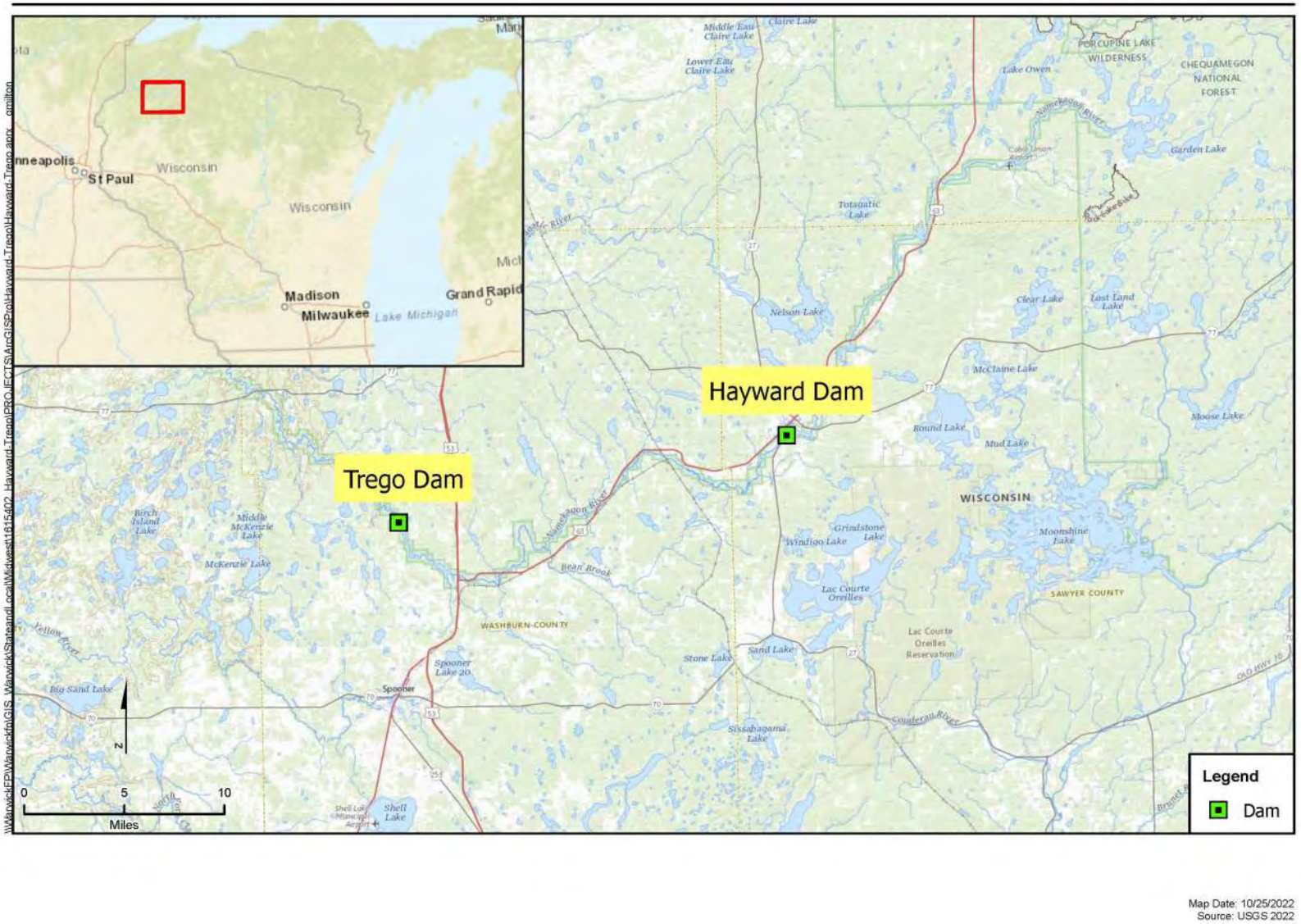

Figure 1-1 Hayward and Trego Project Site Locations

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2. METHODS

This section describes the methods used to collect, summarize, and extrapolate the recreation data collected in 2022. Each subsection focuses on the different types of data and information collected.

2.1 RECREATION INVENTORY

An inventory of public and private recreational facilities near the Projects (Figures 2-1 and 2-2) was created using maps and aerial images of the area, internet resources, and interviews. Section 3 describes each of the following public recreational facilities:

- Hayward Canoe Portage Take-Out and Carry-In Reservoir Access – NSPW facility
- Hayward Canoe Portage Trail and Put-In – NSPW facility
- Hayward Informal Tailwater Bank Fishing Area – NSPW facility
- Hayward City Boat Landing
- Hayward City Beach & Barrier-Free Fishing Pier
- Hayward Bartz's Bay Informal Ice Fishing Access[1]
- Town of Trego Park Boat Landing
- Town of Trego Boat Landing
- Trego North Tailwater Access (Canoe Portage) – NSPW facility
- Trego South Tailwater Access – NSPW facility

The recreation facilities were inventoried during one of the recreational use surveys, using the forms included in Appendix 1, to collect information on recreation amenities and capacity. The following types of information were recorded:

1) The primary type(s) of recreation provided at the site.
2) Existing sanitation facilities (if any).
3) Type of vehicle access and parking capacity (if any).
4) The presence and type (if any) of barrier-free facilities.
5) The geolocation of the facility.
6) Signage
7) Photographs of each recreation site, each amenity and sign, the entryways to primary recreation sites from the main road(s), and any adverse impacts from the site on the surrounding environment, including shoreline erosion.

2.2 FACILITY CONDITION ASSESSMENT

The condition of each amenity or feature at each facility (including recreational wayfinding signs and interpretive signs) and its immediate vicinity were assessed during one of the site visits. Each facility was assigned a rating according to the following scale:

[1] Bartz's Bay Informal Ice Fishing Access was surveyed during the January and February survey periods only.

1) Missing and Needs Replacement
2) Not Usable and Needs Replacement
3) Needs Repair
4) Needs Maintenance or cleaning
5) Good Working Condition (does not need any attention)

If a rating warranted additional attention, that specific item was noted on the form.

2.3 RECREATION USE SURVEY

Recreation use surveys were conducted at each of the recreation sites listed in Section 2.1. The surveys lasted a minimum of one hour per site and were conducted between the hours of 7:00 a.m. and 7:00 p.m. Surveys were completed on a rotating schedule to avoid from being conducted at the same time of the day and to account for time-of-day use patterns. The use survey form included in Appendix 1 was administered to gather opinions about the existing recreation facilities and opportunities. The surveyor recorded the number of people in a party, their primary reason for visiting the site, their perception of level of use, and their opinions regarding the amount and types of recreation opportunities offered within the proposed Project vicinity. The recreation use surveys were conducted according to the following schedule in Table 2-1.

Table 2-1. Recreation Use Survey Schedule.

Survey Month/Season	Recurrence Interval
January	One randomly selected weekend day. One randomly selected weekday.
February	One randomly selected weekend day One randomly selected weekday
April	One randomly selected weekend day.
May	One randomly selected weekend day. One day during Memorial Day weekend.
June	One randomly selected weekday. Two randomly selected weekend day.
July	One randomly selected weekday. One[2] randomly selected weekend day.
August	One randomly selected weekday. Two randomly selected weekend day.
September	One weekend day the weekend following Labor Day weekend.

The recreation surveys provided the information necessary to estimate the use at each site (Section 5.1).

[2] Two randomly selected weekend days were planned; however, only one was completed due to unavoidable staffing shortages.

2.4 RECREATION SPOT COUNTS

Upon arriving at each recreation site where recreation use surveys were collected, a spot count was conducted using the form enclosed in Appendix 1. The information was then analyzed to assess recreational use and is summarized in Section 5.2 by month, season, and type of activity.

2.5 FUTURE AND POTENTIAL RECREATION

To assess future recreation needs within the Project vicinity, a questionnaire was sent to municipalities and other entities responsible for existing recreation within the Project vicinity (Appendix 2). Specifically, the questionnaire was sent to the City of Hayward, Hayward Area Chamber of Commerce, and Sawyer County for the Hayward Project and the Town of Trego, Trego Lake District, and Washburn County for the Trego Project. The questionnaire was also sent to the NPS St. Croix National Scenic Riverway for both Projects. Each entity was given 30 days to respond to the questionnaire and their responses were incorporated into the Future and Projected Use evaluation (Section 5.3).

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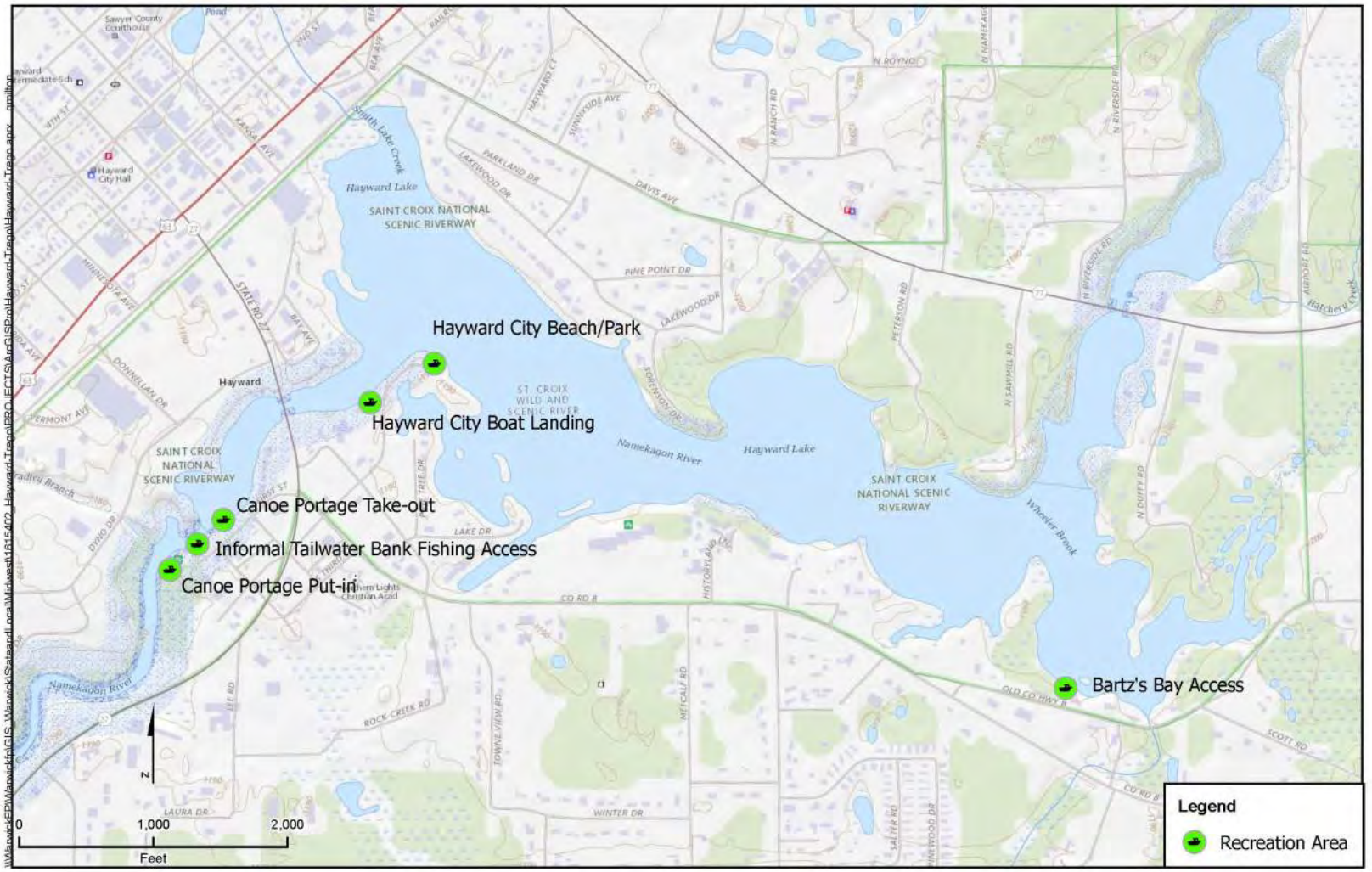

Figure 2-1. Hayward Project Recreation Facilities.

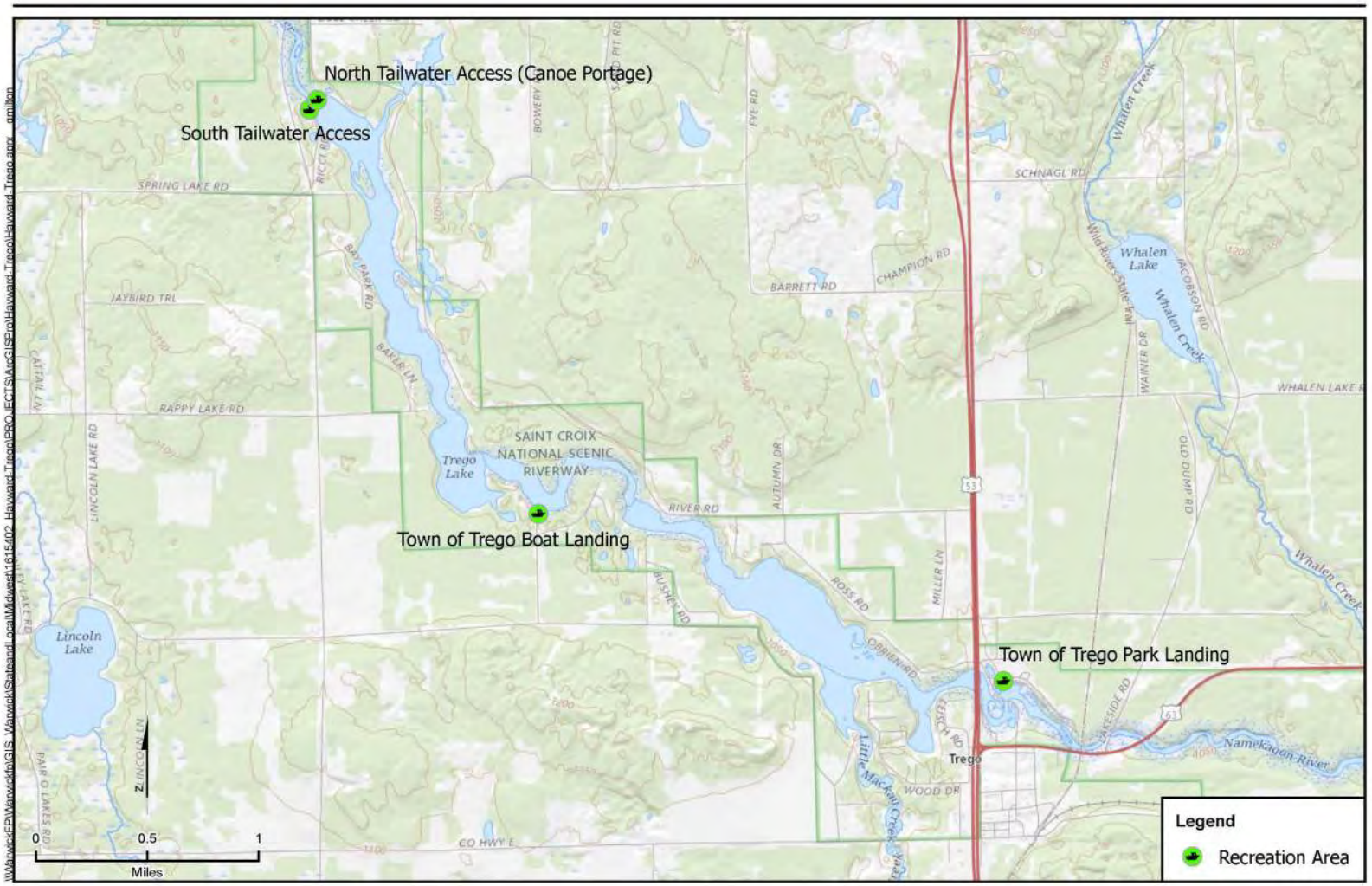

Figure 2-2. Trego Project Recreation Facilities.

3. DESCRIPTIONS OF RECREATIONAL FACILITIES AT THE HAYWARD PROJECT

The public recreational facilities listed in the approved study plan are described below along with a discussion of their use and adequacy. Facility locations are depicted in Figures 2-1, 2-2, and 3-1 through 3-3.

3.1 HAYWARD CANOE PORTAGE TAKE-OUT AND CARRY-IN RESERVOIR ACCESS

NSPW owns and maintains the canoe portage take-out and carry-in access just upstream of the spillway along the east shoreline of Lake Hayward (Figure 3-1). The access enables recreationists to safely launch small craft on, and disembark from, Lake Hayward. The canoe portage take-out and carry-in access was refurbished in 2019 and features a parking area, informational Project signage, and timber step approach to and from the water. The parking area is shared with the informal tailwater bank fishing area and can accommodate approximately 20 vehicles. There is no fee associated with the use of this area.

3.2 HAYWARD CANOE PORTAGE TRAIL AND PUT-IN

NSPW owns and maintains the canoe portage trail and put-in along the east side of the Project (Figure 3-1). The canoe portage trail proceeds from the take-out in a southwesterly direction, along South 1st Street and a gravel road, approximately 600 ft. to the short trail leading from the road to the put-in downstream of the Project tailwater. When combined with the Hayward canoe portage take-out, the trail and put-in enable canoers/kayakers to safely bypass the Hayward Dam. Access between the take-out and put-in is available both to users that are walking and driving. Parking is available for approximately six vehicles along the gravel loop road that terminates at the put-in trail. As with the take-out, there are no fees associated with recreational the use of this area.

3.3 HAYWARD INFORMAL TAILWATER BANK FISHING AREA

NSPW owns and maintains an informal tailwater shoreline fishing area on the east side of the Namekagon River, approximately 270 feet downstream of the canoe portage take-out and carry-in access (Figure 3-1). The informal tailwater access features an area for parking and tiered (i.e., terraced) approach to and from the river. The parking area is shared with the canoe portage take-out and carry-in access and can accommodate approximately 20 vehicles. There is no fee associated with the use of this area.

3.4 HAYWARD CITY BOAT LANDING

The City of Hayward owns and maintains this single launch boat landing on the south side of the lake (Figure 3-2). It is the only public, trailer-accessible boat landing on the lake. The landing consists of a cement launch pad with paved approach and dock with gravel approach. The City maintains a “lifejacket loaner” stand to encourage recreationists to use lifejackets when on Lake

Hayward. A light pole situated in the parking area provides lighting during the evening hours. The adjacent gravel parking lot is large enough to accommodate approximately 20 vehicles or 10 vehicles with trailers. The parking lot also serves as overflow parking for users of the beach and park area. The City does not charge a fee for the use of this launch and no other amenities are present.

3.5 HAYWARD CITY BEACH AND BARRIER-FREE FISHING PIER

The City of Hayward owns the City beach and park on the south side of the lake (Figure 3-2). It consists of a 100-foot sand beach with designated swimming area, changing rooms, restroom facilities, shelter, playground, park bench with solar-powered charging station, six picnic tables near the beach and playground, seven tables in the picnic area with charcoal grills, and shore fishing opportunities. The area also features a walking bridge and an Americans with Disabilities Act (ADA) compliant fishing pier. A paved parking lot is provided that can accommodate 24 vehicles with two parking spots being designated for handicap access. There is no fee associated with the use of the park or beach.

3.6 HAYWARD BARTZ'S BAY INFORMAL ICE FISHING ACCESS

The Bartz's Bay informal ice fishing access was only visited for the recreation survey during January and February since it is a winter recreation access (Figure 2-1). The Bartz's Bay informal ice fishing access is located off a local road, Chippewa Trail, that is popular with ice anglers in the winter who wish to walk out to ice fish. The informal access consists of an unimproved trail on private land, between two residential lots. Ice anglers park their vehicles along Chippewa Trail, predominantly on the southwest side, which is snow-plowed wider at the access point to accommodate approximately six vehicles.

3.7 TOWN OF TREGO PARK BOAT LANDING

The Town of Trego owns and maintains a small boat landing adjacent to the Town Park campground located on the north shore of the Namekagon River, east of U.S. Highway 53, at the end of Cash Road (Figure 2-2). The access consists of a single-lane boat ramp composed of concrete planks with a gravel driveway and no dock. The landing is small and shallow and is primarily used as a put-in and take-out for canoers and kayakers. Shallow water between this landing and the main flowage excludes the use of larger motorized watercraft. Cash Road and the parking area can accommodate 20 vehicles or six vehicles with trailers, primarily along the margin. There is no user fee for the landing.

3.8 TOWN OF TREGO BOAT LANDING

The Town of Trego owns and maintains a single-lane boat launch along the south shore of the middle portion of Trego Flowage (Figure 2-2). It is the only public landing on the flowage and consists of a single cement launch, paved approach, and dock. The landing is sufficient to launch larger motorized boats. Parking is available along the shoulders of Trego Landing Road and can

accommodate eight vehicles or two vehicles with trailers. There is space designated as handicap parking that can accommodate two vehicles. There is no user fee for this launch.

3.9 TREGO NORTH TAILWATER ACCESS (CANOE PORTAGE)

NSPW owns and maintains an area north of the Trego Dam that serves both as a canoe portage and tailwater fishing access (Figure 3-3). The take-out for the canoe portage is located along the northwest shore of Trego Flowage, immediately north of the Trego Dam buoyed exclusion zone. From the take-out, the portage trail follows a west-southwesterly direction for approximately 325 ft. to the downstream put-in, adjacent to the north tailwater access. The portage enables users travelling from upstream-to-downstream to safely bypass the dam. The north tailwater fishing access consists of a concrete retaining wall with safety railing along the river. Parking for the area is available along the shoulder of River Road as well as the gravel approach to the north access gate. There is space for approximately eight vehicles. A portable lavatory is provided and maintained between the portage take-out or parking area and tailwater access. There are no fees associated with the use of these areas.

3.10 TREGO SOUTH TAILWATER ACCESS

NSPW owns and maintains an area southwest of the Trego Dam that provides access to the south tailwater (Figure 3-3). Access to the south tailwater is provided via two metal staircases. The upper staircase is located near the southwest corner of the Project's powerhouse while the lower staircase is closer to river level. The lower staircase provides access to a concrete retaining wall with safety railing along the river. Parking for up to four vehicles is available in an area off the north end of Ricci Road, southwest of the south Project's access gate. There is no fee associated with the use of this area.

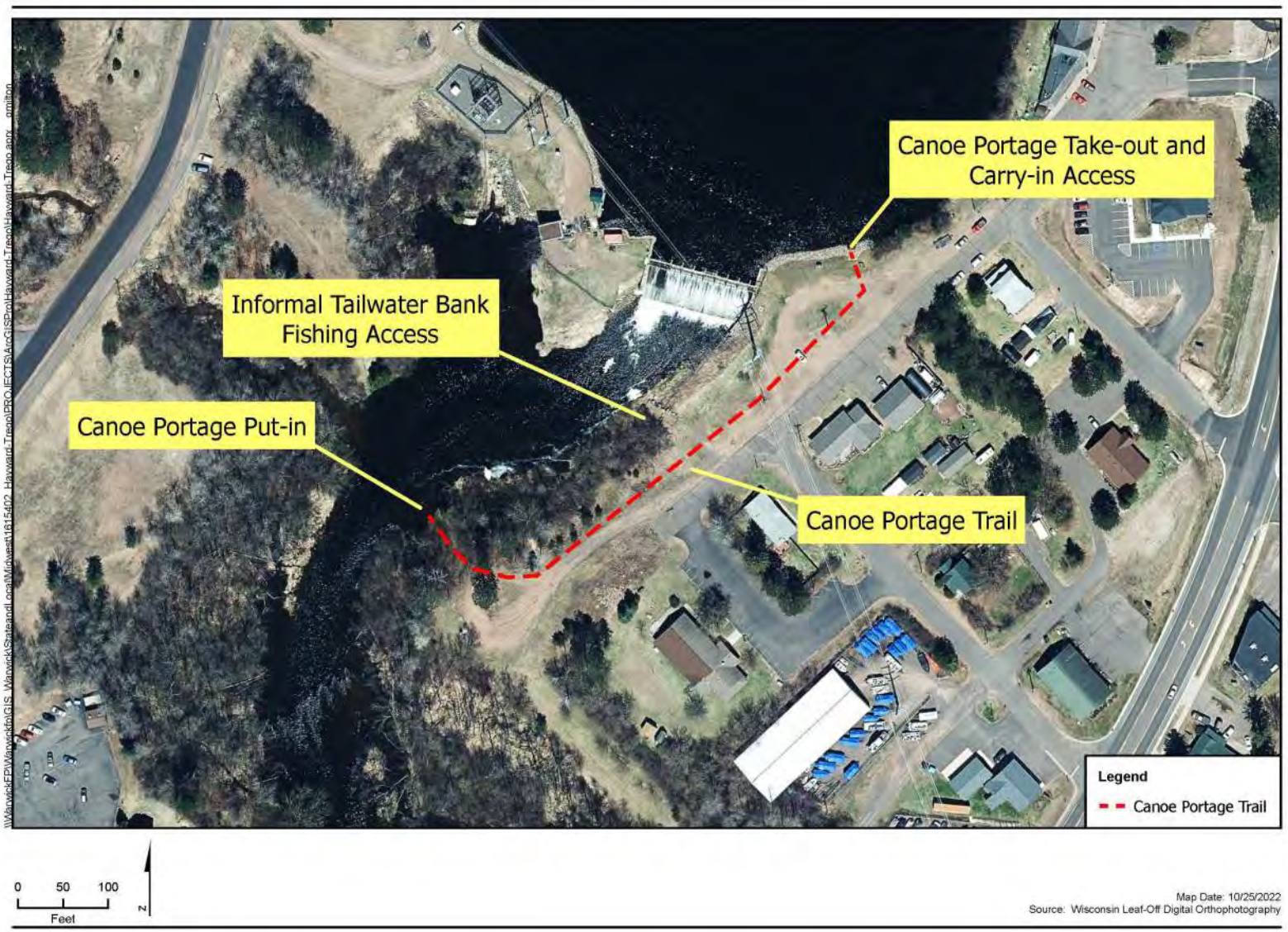

Figure 3-1. Hayward Project Recreation Facilities - Tailwater Areas

Figure 3-2. Hayward Project Recreation Facilities – Upstream Areas.

Figure 3-3. Trego Project Recreation Facilities – Canoe Portage and Tailwater Access

4. RESULTS OF RECREATION INVENTORY AND CONDITION ASSESSMENTS

As part of the recreation inventory and recreation assessments of facilities near the Hayward and Trego Projects, photographs were taken of amenities and observations were recorded on data sheets. A photolog of amenities for each of the facilities inventoried and assessed is presented as Appendix 3. Likewise, data sheets used in the inventory and assessment are provided as Appendix 4.

4.1 HAYWARD CANOE PORTAGE TAKE-OUT AND CARRY-IN RESERVOIR ACCESS

Condition of Amenities

The amenities at the Hayward canoe portage take-out and carry-in reservoir access, as described in Section 3.1, were assessed as being in good condition in 2022. Amenities and signage associated with the Hayward canoe portage take-out and carry-in reservoir access are presented as Photographs 1 through 13 in Appendix 3.

Parking

The Hayward canoe portage take-out and carry-in reservoir access parking is an unpaved area. While there are no designated parking spaces, there is room to park approximately 20 vehicles.

Signage

Signage at the facility includes a directional FERC Project sign that identifies the Hayward Project and displays the nearby recreational resources. Directional signs face the water to inform paddlers of the take-out location and, on the shoreline, display the direction of the portage trail. Additional signage identifies hazards, informs the public of private property, and provides details on normal pond elevation. The signage associated with the portage take-out and carry-in access was considered to be comprehensive and in good condition during 2022.

4.2 HAYWARD CANOE PORTAGE TRAIL AND PUT-IN

Condition of Amenities

The Hayward canoe portage trail and put-in amenities described in Section 3.2 were evaluated as being primarily in good condition. However, due to one sign as described below, the location was rated as needing maintenance. Amenities at the Hayward canoe portage trail and put-in are depicted in Photographs 14 through 25 in Appendix 3.

Parking

There are no designated parking spaces near the Hayward canoe portage put-in. However, the area can accommodate approximately six vehicles along the gravel loop road that terminates at the put-in trail. Additional parking is available a short distance away, near the take-out.

Signage

The canoe portage trail signage consists of a sign near the take-out directing paddlers to the put-in as well as a sign near the trail leading to the river put-in. The signage is in generally good condition and the trail is clearly marked. The only exception is the invasive species sign that was vandalized and observed in the river. The sign is not owned by NSPW nor is it a FERC requirement to have it at this facility. While the existing signage is in good condition, the present condition of the invasive species sign resulted in a "in need of maintenance" rating.

4.3 HAYWARD INFORMAL TAILWATER BANK FISHING AREA

Condition of Amenities

The Hayward informal tailwater shoreline fishing area amenities described in Section 3.3 were assessed as being in good condition during 2022. Amenities at the Hayward informal tailwater bank fishing area are depicted as Photographs 26 through 37 in Appendix 3.

Parking

There are no designated parking spaces for the Hayward informal tailwater bank fishing access. A parking area is shared with the Hayward canoe portage take-out and carry-in reservoir access which can accommodate approximately 20 vehicles.

Signage

Due to the informal nature of the access, signage specific to the Hayward informal tailwater bank fishing access is not provided.

4.4 HAYWARD CITY BOAT LANDING

Condition of Amenities

The amenities at the Hayward City Boat Landing, as described in Section 3.4, were assessed as being in good condition during 2022. The facility's amenities are depicted in Photographs 38 through 47 of Appendix 3.

Parking

There are no designated parking spaces at the Hayward City Boat Landing; however, the available space can accommodate 20 vehicles or 10 vehicles with trailers.

Signage

All signage associated with the Hayward City Boat Landing was rated as being in good condition. Signage includes interpretive and regulation signs. The interpretive signage is related to the Namekagon River being designated a National Scenic River. The regulation signage provides information on fish species bag and size limits as well as invasive species control. Additionally, the City maintains a "lifejacket loaner" stand to encourage recreationists to use lifejackets when on or around Lake Hayward.

4.5 HAYWARD CITY BEACH AND BARRIER-FREE FISHING PIER

Condition of Amenities

All amenities at the Hayward City Beach and Barrier-Free Fishing Pier, described in Section 3.5, were assessed as being in good condition during 2022. Amenities at the Hayward City Beach and Barrier-Free Fishing Pier are included as Photographs 48 through 67 of Appendix 3.

Parking

Central to the beach, park, and picnic area, the City provides a paved parking lot that can accommodate 24 vehicles including two parking spots being designated for handicap access.

Signage

Signage is restricted to areas within the Hayward City Beach and Park. Signs are largely related to regulations and include beach rules, restricted motor vehicle access, and handicap parking. All signage was in good condition.

4.6 HAYWARD BARTZ'S BAY INFORMAL ICE FISHING ACCESS

Condition of Amenities

The limited amenities of the Bartz's Bay Informal Ice Fishing Access, as described in Section 3.6, were assessed as being in good condition during 2022. Photographs 68 through 71 of Appendix 3 depict the amenities at the facility.

Parking

No designated parking spaces are associated with the Bartz's Bay Informal Ice Fishing Access. Parking is available on the shoulder of Chippewa Trail, along the southwest side, which is snow-plowed wider at the access point to accommodate approximately six vehicles

Signage

No signage is associated with the Bartz's Bay Informal Ice Fishing Access.

4.7 TOWN OF TREGO PARK BOAT LANDING

Condition of Amenities

The amenities at the Town of Trego Park Boat Landing, described in Section 3.7, were assessed as being in good condition during 2022. Photographs 72 through 81 of Appendix 3 depict the amenities at the Town of Trego Park Boat Landing.

Parking

The Town of Trego Park Boat Landing does not have delineated spaces in the gravel parking lot; however, the area can accommodate up to 20 vehicles or six vehicles with trailers.

Signage

Signage at the Town of Trego Park Boat Landing consists of both regulation (i.e., no camping) and directional signs. The "no camping" wood sign was in poor condition. However, a newer metal sign nearby was in good condition as were the directional signs to the landing from both the Trego Campground Road and the Namekagon River.

4.8 TOWN OF TREGO BOAT LANDING

Condition of Amenities

The amenities at the Town of Trego Boat Landing, described in Section 3.8, were assessed as being in good condition during 2022. Photographs 82 through 93 of Appendix 3 depict the amenities at the facility.

Parking

The Town of Trego Boat Landing parking area can accommodate eight vehicles or two vehicles with trailers. A handicap parking space is designated and can accommodate two vehicles or one vehicle with a trailer.

Signage

Signage at the Town of Trego Boat Landing is almost entirely related to regulations. Regulation signs consist of fishing regulations, invasive species control, no fireworks, no personal watercraft, no power loading, no parking, and handicap parking. The signs were considered to be in good condition during 2022.

4.9 TREGO NORTH TAILWATER ACCESS (CANOE PORTAGE)

Condition of Amenities

The amenities at the Trego North Tailwater Access (Canoe Portage), described in Section 3.9, were assessed as being in good condition during 2022. Photographs 94 through 119 of Appendix 3 depict the amenities at the facility.

Parking

There are no designated parking spaces for the Trego North Tailwater Access (Canoe Portage) Users may park along the shoulder of River Road as well as the gravel approach to the north Project access gate. Collectively, there is space for approximately eight vehicles.

Signage

Signage at Trego North Tailwater Access (Canoe Portage) includes directional and interpretive signs. Directional signage indicates the canoe portage take out as well as direction of the portage trail. Interpretive signage is provided to inform visitors of the hazards associated with the Project tailwater area. The signs were considered to be in good condition during 2022.

4.10 TREGO SOUTH TAILWATER ACCESS

Condition of Amenities

The amenities at the Trego South Tailwater Access, described in Section 3.10, were assessed as being in good condition during 2022. Photographs 120 through 133 of Appendix 3 depict the amenities at the Trego South Tailwater Access.

Parking

There are no designated parking spaces for the Trego South Tailwater Access; however, parking for up to four vehicles is available in an area off the north end of Ricci Road, southwest of the south access gate for the Project.

Signage

Signage at Trego South Tailwater Access includes a FERC Project sign and interpretive signs. The FERC Project sign is located to the east of the south project access gate. Interpretive signage is provided to inform visitors of the hazards associated with the Project tailwater area. The signs were considered to be in good condition during 2022.

4.11 SUMMARY

The existing amenities of the 10 surveyed recreation resources near the Hayward and Trego Projects were rated as in good condition (Appendix 3). No deficiencies that NSPW is responsible for were identified as part of the recreation inventory and condition assessment.

5. SUMMARY OF RECREATIONAL USE

5.1 RECREATIONAL USE SURVEYS

This section provides a summary of the data gathered from interviews with recreational users regarding the recreational facilities and opportunities near the Hayward and Trego Projects (Appendix 5). Recreational surveys were conducted over 16 days at each of the two project areas between January and September 2022. The surveys were conducted on weekdays, weekends, and holidays with the number of surveys varying by month throughout the period. Surveys near the Hayward Project were conducted at six locations in January and February. Bartz's Bay Informal Ice Fishing Access was not surveyed in April through September. Four locations were surveyed near the Trego Project throughout the study period. Collectively, the 16 surveys at each project yielded 73 total visitor interviews.

Of the 73 recreation users that were interviewed, 44 visitors were interviewed at recreation locations associated with the Hayward Project (Table 5-1).

Table 5-1. Recreational use based on user interviews, Hayward Project (January-February, April-September 2022)

Month	Surveys	Bartz's Bay	Hayward Canoe Portage Take Out	Hayward Canoe Portage Trail Put In	Hayward Informal Tail Access	City of Hayward Boat Landing	City of Hayward Beach/Pier	Total by Month	Average by Month & No. Surveys
January	2	1	0	0	0	2	0	3	1.50
February	2	0	0	0	0	0	0	0	0.00
April	1	--	0	0	0	0	2	2	2.00
May	2	--	0	1	1	0	0	2	1.00
June	3	--	0	0	0	2	8	10	3.33
July	2	--	1	0	0	0	6	7	3.50
August	3	--	2	0	2	1	9	14	4.67
September	1	--	1	0	0	3	2	6	6.00
Total	**16**	**1**	**4**	**1**	**3**	**8**	**27**	**44**	

The City of Hayward Beach and Fishing Pier produced over half of the visitor interviews followed by the City of Hayward Boat Landing. The fewest interviews were conducted at the Bartz's Bay informal ice fishing access and Hayward Canoe Portage Trail and Put-In. The greatest number of visitors were interviewed in August while the single survey in September produced the highest average number of interviews per survey event.

The four recreation sites associated with the Trego Project yielded 29 user interviews over 16 surveys (Table 5-2).

Table 5-2. Recreational use based on user interviews, Trego Project (January-February, April-September 2022)

Month	Surveys	Town of Trego Park Boat Landing	Town of Trego Boat Landing	Trego North Tailwater Access (Canoe Portage)	Trego South Tailwater Access	Total by Month	Average by Month & No. Surveys
January	2	0	0	0	0	0	0.00
February	2	0	0	0	0	0	0.00
April	1	0	0	0	1	1	1.00
May	2	2	0	3	1	6	3.00
June	3	1	2	0	3	6	2.00
July	2	0	1	0	3	4	2.00
August	3	2	0	3	3	8	2.67
September	1	1	0	2	1	4	4.00
Total	**16**	**6**	**3**	**8**	**12**	**29**	

The two tailwater access points were the most popular recreation areas near the Trego Project with 12 and eight visitors being interviewed at the South Tailwater Access and North Tailwater Access, respectively. The fewest interviews were conducted at the Town of Trego Boat Landing. Similar to the Hayward Project, August had the highest number of visitors and the single survey in September again produced the highest average number of interviews per survey event.

Collectively, weekends produced more interviews compared to weekdays for both projects; however, this was more apparent for the Trego Project (Table 5-3). Only slightly more visitors were encountered during weekend surveys compared to weekdays at the Hayward Project. In contrast, more than double the visitors were interviewed on weekend days compared to weekdays at Trego.

Seasonally, the four surveys in January and February yielded three interviews, all at the Hayward Project. By comparison, spring and summer had substantially more visitors with 27 and 43 interviews conducted, respectively. At Hayward, 27 interviews were conducted during the summer period compared to 14 interviews during the spring months. Spring and summer were more evenly split at the Trego Project with spring producing 13 visitor interviews and summer 16.

Table 5-3. Recreational use by type of day, Hayward and Trego Projects (January-February, April-September 2022)

Season	Month	Surveys	Hayward Project		Trego Project		Total	
			Weekday	Weekend	Weekday	Weekend	Monthly	Seasonally
Winter	January	2	0	3	0	0	3	3
	February	2	0	0	0	0	0	
Spring	April	1	0	2	0	1	3	27
	May	2	0	2	0	6	8	
	June	3	6	4	4	2	16	
Summer	July	2	7	0	4	0	11	43
	August	3	5	9	1	7	22	
	September	1	1	5	0	4	10	
Year	**Total**	**16**	**19**	**25**	**9**	**20**	**73**	**73**
	# Days		**6**	**10**	**6**	**10**	**16**	
	Ave. Per		**3.17**	**2.50**	**1.50**	**2.00**	**4.56**	

Visitors were asked which of nine activities they participated in during their visit. At the Hayward Project, each of the nine activities was identified as the primary activity by at least one individual (Table 5-4). The most popular activities at Hayward were shoreline/tailwater fishing (24% of the respondents), swimming (24% of the respondents), and other (22% of the respondents).

Table 5-4. Activities during visit to the Hayward Project Area (January-February, April-September 2022)

Location	Shore fishing	Boat Fishing	Motorized Boating	Paddling	Swim	Picnic	Wildlife Viewing	Ice Fishing	Other
Bartz's Bay	0	0	0	0	0	0	0	1	0
Hayward Portage Take Out	1	0	1	1	0	0	0	0	2
Hayward Portage Trail/Put In	1	0	0	0	0	0	0	0	0
Hayward Informal Tailwater Access	2	0	0	0	0	0	1	0	0
City of Hayward Boat Landing	3	4	1	0	1	0	0	2	0
City of Hayward Beach/Fishing Pier	5	0	1	1	11	1	1	1	9
Total	12	4	3	2	12	1	2	4	11

Shoreline/tailwater fishing was a popular recreation activity for all locations except at Bartz's Bay. In contrast, those who responded that swimming or other was their primary activity were mostly interviewed at the City of Hayward beach and fishing pier. Dog walking was the activity for the majority of visitors that identified their primary activity as other.

Five of the nine activities were identified as the primary activity by visitors to the Trego Project area (Table 5-5). Over 50% percent of visitors at the Trego Project were participating in shoreline/tailwater fishing and most of those respondents were divided between the Trego North Tailwater Access and Trego South Tailwater Access. Motorized boating and non-motorized boating were the second and third most popular activities.

Table 5-5. Activities during visit to the Trego Project Area (January-February, April-September 2022)

Location	Shore fishing	Boat Fishing	Motorized Boating	Paddling	Swim	Picnic	Wildlife Viewing	Ice Fishing	Other
Trego Park Boat Landing	4	0	4	3	0	0	0	0	0
Trego Boat Landing	0	1	2	1	0	0	0	0	0
Trego North Tailwater Access/Canoe Portage	7	0	0	0	0	0	0	0	1
Trego South Tailwater Access	9	0	2	2	0	0	0	0	1
Total	**20**	**1**	**8**	**6**	**0**	**0**	**0**	**0**	**2**

The two visitors that identified other as their primary activity were hiking.

Visitors to both Projects were asked if they were prevented from participating in an activity of their choice and to provide the reasons why they were unable to engage in said activity. Of the 44 respondents at the Hayward Project, two provided comments regarding being unable to engage in an activity. One individual stated that they wanted to ride their All-Terrain Vehicle (ATV) but were unable to locate the trail and another individual stated that they were unable to use the restroom at the Hayward City Beach because a suspicious person was occupying the restroom for an inordinate amount of time. The remainder of the respondents at the Hayward Project, and all individuals interviewed at Trego, stated that they had not been prevented from engaging in the activities of their choice.

Recreationists were asked if they or anyone in their group had a physical condition or personal limitation that made it difficult to access or participate in an activity. All visitors at both Projects responded that they did not have a physical condition or personal limitation that made it difficult to access or participate in activities.

Users were asked multiple questions about resource crowding at recreation sites associated with both Projects. At Hayward, 83 of the 92 responses or 90% stated that the resources were not crowded (Table 5-6). Only three respondents indicated that at least some of the resources were moderately to extremely crowded.

Table 5-6. Crowding during visit to the Hayward Project Area (January-February, April-September 2022)

Resource	Not Crowded	Slightly Crowded	Moderately Crowded	Very Crowded	Extremely Crowded
Parking	33	4	0	1	0
Trails	14	0	0	0	0
Campground	11	0	1	0	0
Boat-in Campsite	4	0	0	0	0
Shore Fishing	13	2	0	0	1
Boating	8	0	0	0	0
Total Each Response	**83**	**6**	**1**	**1**	**1**
Total No. Responses	**92**				

Similarly, 64 of 73 responses from individuals visiting the Trego Project area stated that the resources were not crowded (Table 5-7). Once again, only three responses indicated that at least some of the resources were moderately to very crowded.

Table 5-7. Crowding during visit to the Trego Project Area (January-February, April-September 2022)

Resource	Not Crowded	Slightly Crowded	Moderately Crowded	Very Crowded	Extremely Crowded
Parking	25	2	0	0	0
Trails	13	2	0	0	0
Campground	2	0	0	2	0
Boat-in Campsite	0	0	0	0	0
Shore Fishing	17	2	1	0	0
Boating	7	0	0	0	0
Total Each Response	**64**	**6**	**1**	**2**	**0**
Total No. Responses	**73**				

Visitors were asked if crowding caused them to change their plans. Overwhelmingly, 93% and 97% of visitors to the Hayward and Trego Project areas, respectively, responded that crowding did not affect their plans. Four individuals responded that crowding did affect them (i.e., three near Hayward and one near Trego). In each case, the individuals stated that they moved to avoid crowding.

When asked if crowding was a factor in their trip planning, 40 of 44 respondents at Hayward and 20 of 29 visitors to the Trego Project area said that crowding was not a factor considered in their trip planning. For those that did consider over-crowding in their trip planning, most said that they avoided certain times of the day while a few others said they avoided specific places.

In addition to crowding, visitors were asked if the behavior of an individual or group had interfered with the enjoyment of their trip. At both the Hayward and Trego Projects, 100% of respondents stated that no group or individual had interfered with the enjoyment of their trip.

Visitors were asked to rate their satisfaction with the amenities during their current visit; 1-very satisfied, 2-somewhat satisfied, 3-neither, 4-dissatisfied, and 5-very dissatisfied. At the Hayward Project, the average ratings given for the facilities among the locations ranged from 1.00 (very satisfied) to 5.00 (very dissatisfied) with an average rating of 1.89 between very satisfied and satisfied (Table 5-8).

While most visitors gave the facilities at the Hayward Project neutral or positive ratings, some negative ratings were received. Of the 44 respondents, 14 expressed dissatisfaction (i.e., dissatisfied or very dissatisfied) among the facilities at the Hayward Project. Dissatisfaction was primarily related to poor signage outside and within the facility at the Hayward Canoe Portage Take-Out (n=2). Lack of trash receptacles, poor signage, and inadequate parking were listed as reasons for visitor dissatisfaction at the Hayward Canoe Portage Trail and Put-In and Hayward Informal Tailwater access (n=2). At Hayward City Beach and Fishing Pier, poor signage, lack of trash receptacles, and restroom conditions were cited as reasons for dissatisfaction (n=10).

Average satisfaction ratings among the recreation amenities associated with the Trego Project ranged from 1.00 (very satisfied) to 4.00 (dissatisfied) with an overall average rating of 2.10 (Table 5-9).

Similar to the recreation facilities at the Hayward Project, most Trego Project amenities were rated neutral or better; however, a few negative ratings were received. Of the 29 visitors interviewed, eight expressed dissatisfaction (i.e., dissatisfied or very dissatisfied) with one or more of the amenities. At the Trego Park Boat Landing, dissatisfaction was voiced regarding the lack of signage (n=2). Four individuals collectively expressed dissatisfaction with the lack of trash receptacles, vehicle parking, roads to the facility, and/or signage at the Trego South Tailwater Access. Lastly, one individual described their dissatisfaction with the condition of the Trego Boat Landing signage, rocks at the end of the ramp and near the dock, as well as the lack of a restroom.

In terms of demographics regarding respondents at the Hayward Project, based on zip codes, 52% (n=22) of them were from Hayward while 31% (n=13) stated that they were from more than 25 miles away. The average distance traveled among the respondents was approximately 76 miles with the longest distance being approximately 600 miles.

The individuals interviewed at the Hayward recreation sites ranged in age from 18 to 75 years with the average age being 38 years old. Among those that provided their age, 62% were under the age of 40.

More than two-thirds (i.e., 70%) of those interviewed at the Hayward Project identified as being male, while women made up one-quarter of the visitors. Likewise, nearly 80% stated their ethnicity as White; however, 16% identified themselves as being Indigenous North American. Those claiming Asian and Hispanic ethnicity each made up approximately two percent of those interviewed.

Approximately 56% of those interviewed among the facilities associated with the Hayward Project stated that they obtained the information to plan their trip via “Other” and “Word of Mouth” while 40% said they planned their trip based on a “Previous Visit”. Those responding “Other” identified internet resources most often while local retailers were commonly associated with “Word of Mouth” responses.

Visitors to the Trego Project facilities were less local but also traveled a shorter distance compared to Hayward Project area facilities. Of the 29 visitors interviewed, 24% (n=7) of the Trego respondents were from Trego while 52% (n=15) stated that they were from more than 25 miles away. The average distance travelled among the respondents was approximately 52 miles with the longest distance being approximately 175 miles.

The age of those interviewed at the Trego recreation sites ranged from 17 to 73 years old with the average age being 47 years old. Among those that provided their age, 59% were over the age of 50 years old.

The gender composition of Trego respondents was similar to Hayward with women representing one-quarter and men making up three-quarters. The Trego visitors that were interviewed represented a less diverse segment of the population compared to the Hayward Project. Approximately 97% stated their ethnicity as White with three percent identifying themselves as being Indigenous North American.

Approximately 95% of those interviewed stated that they obtained the information to plan their trip via “Word of Mouth” or based on a “Previous Visit”.

Respondents were asked to comment on the amenities, needs, or concerns with the facilities near the Hayward and Trego Projects. Comments from the satisfaction portion of the survey, as well as general comments received at the end of the survey, were combined. While several positive comments about the facilities were given, some comments included recommended improvements. The comments were organized into two main categories: maintenance and new amenities.

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Table 5-8. Satisfaction with the Hayward Project Area Facilities (January-February, April-September 2022)

Location	Parameters	Restroom	Picnic Sites	Trash	Parking	Boat Launch Parking	Boat Launch	Boat Dock	Other Vehicle/ Boat	Roads to Facility	Signage to Facility	Signage within Facility	Other Roads/ Signage
Bartz's Bay	Number Responses	0[1]	0	0	1	0	0	0	1	0	0	0	0
	Average Rating	--	--	--	1.00	--	--	--	1.00	--	--	--	--
Hayward Canoe Portage Take Out	Number Responses	0	0	0	4	0	0	0	0	4	4	4	0
	Average Rating	--	--	--	2.00	--	--	--	--	1.25	3.00	3.00	--
Hayward Canoe Portage Trail Put-In	Number Responses	1	1	1	1	0	0	0	0	1	1	1	0
	Average Rating	1.00	2.00	5.00	1.00	--	--	--	--	1.00	1.00	1.00	--
Hayward Informal Tailwater Access	Number Responses	0	0	0	2	0	0	0	0	3	3	3	0
	Average Rating	--	--	--	3.00	--	--	--	--	2.33	3.00	3.00	--
City of Hayward Boat Landing	Number Responses	0	0	0	5	6	4	4	0	8	8	6	0
	Average Rating	--	--	--	1.20	1.67	1.50	1.25	0.00	1.38	1.38	1.17	--
City of Hayward Beach/Fishing Pier	Number Responses	17	15	10	22	0	0	0	0	26	26	26	1
	Average Rating	2.18	1.53	2.10	1.36	--	--	--	--	1.50	2.15	2.19	1.00

[1] 0 equals no response. Rating scale 1 to 5 (1 = Very Satisfied, 5 = Very Dissatisfied). See Appendix 1.

Table 5-9. Satisfaction with the Trego Project Area Facilities (January-February, April-September 2022)

Location	Parameters	Restroom	Picnic Sites	Trash	Parking	Boat Launch Parking	Boat Launch	Boat Dock	Other Vehicle /Boat	Roads to Facility	Signage to Facility	Signage within Facility	Other Roads/ Signage
Trego Park Boat Landing	Number Responses	0[1]	0	0	2	2	2	2	0	2	3	3	0
	Average Rating	--	--	--	3.00	3.00	3.00	3.00	--	3.00	3.67	2.33	--
Trego Boat Landing	Number Responses	5	0	1	7	0	0	0	1	8	7	5	0
	Average Rating	1.00	--	1.00	1.29	--	--	--	1.00	1.00	1.00	1.00	--
Trego North Tailwater/Canoe Portage	Number Responses	1	0	1	6	4	4	1	0	6	6	6	0
	Average Rating	3.00	--	3.00	1.00	2.25	2.00	3.00	--	1.17	2.00	2.00	--
Trego South Tailwater	Number Responses	0	0	1	11	0	0	0	1	12	11	11	0
	Average Rating	--	--	4.00	2.00	--	--	--	1.00	1.83	2.09	2.36	--

[1] 0 equals no response. Rating scale 1 to 5 (1 = Very Satisfied, 5 = Very Dissatisfied). See Appendix 1.

For the facilities at the Hayward Project, new amenities were more often suggested than maintenance needs (Table 5-10). The City of Hayward Beach/Fishing Pier was the most visited facility at the Hayward Project and it received the most comments (n=21). The most frequent comments received were in regard to new or more signage, need for trash receptacles, and geese management. More or better signage was also mentioned for the Hayward Canoe Portage Take-Out and Carry-In Access while trash receptacles were also suggested for the Hayward Canoe Portage Trail and Put-In.

Table 5-10. Summary of comments received from interviews near the Hayward Project (January-February, April-September 2022), Subject (number of comments)

Location	Maintenance	New Amenities
City of Hayward Beach/Fishing Pier	-Restroom improvements (2) -Geese management (3) -Pavilion maintenance (1)	-Dog waste bag station (1) -Fishing pier (1) -New/more signage (4) -Trash receptacles (3) -Public Wi-Fi (1) -Campground (1) -Additional fishing pier (1) -Buoys for the beach (1) -Widen entry road (2)
City of Hayward Boat Landing		-Additional boat moorings (1)
Hayward Canoe Portage Take-Out and Carry-In Access		-More/better signage (2) -ADA viewing and parking (1)
Hayward Canoe Portage Trail and Put-In		-Trash receptacles (1) -Picnic table (1)

Among the facilities near the Trego Project, constructive comments were received at all four facilities (Table 5-11). The Town of Trego Park Boat Landing and Trego South Tailwater Access received the most comments for facilities near the Trego Project. As with the Hayward facilities, comments regarding new amenities such as signage, portable lavatories, and expanded tailwater fishing access were more common than maintenance related comments.

Table 5-11. Summary of comments received from interviews near the Trego Project (January-February, April-September 2022), Subject (number of comments)

Location	Maintenance	New Amenities
Town of Trego Park Boat Landing	-Replace signage (1) -Remove rocks at end of landing and by dock (1)	-Install portable lavatory (1) -Add marker to sign at CTH K Landing (1)
Town of Trego Boat Landing		-New\better signage (2)
Trego North Tailwater Access/Canoe Portage		-Trash receptacles (1) -Expand fishing area (1) -Rod holders on the railing (1)
Trego South Tailwater Access	-Replace signage (1)	-Trash receptacles (2) -New signage (1) -Expand fishing area (2) -Lighted stairway (1)

5.2 SPOT COUNTS

The 16 recreational surveys conducted at facilities near the Hayward Project resulted in 84 spot count reports across the surveyed locations. These spot counts observed 175 users total (Table 5-12, Appendix 6). The average spot count for the 16 surveys was 10.94 users per location. Use of the City of Hayward Beach /Fishing Pier was substantially greater than the other five facilities surveyed and accounted for 81% of the user counts during 2022.

Among the eight months surveyed, April had the fewest total and average visits by recreational user (Tables 5-12). August had the highest user counts but July exhibited the greatest monthly average. The City of Hayward Boat Landing had the highest Winter counts (i.e., January and February) while the City of Hayward Beach\Fishing Pier saw the highest spring and summer spot counts.

Table 5-12. Recreational use based on spot counts, near the Hayward Project (January-February, April-September 2022)

Month	Surveys	Bartz' s Bay Informal Ice Fishing Access	Hayward Canoe Portage Take-Out and Carry-In Access	Hayward Canoe Portage Trail and Put-In	Hayward Informal Tailwater Bank Fishing Access	City of Hayward Boat Landing	City of Hayward Beach /Fishing Pier	Total by Month	Average by Month & No. Surveys
January	2	2	0	0	0	2	0	4	2.00
February	2	2	0	0	0	3	0	5	2.50
April	1	0	0	1	0	0	0	1	1.00
May	2	0	0	0	0	0	3	3	1.50
June	3	0	0	1	2	1	35	39	13.00
July	2	0	0	0	0	5	45	50	25.00
August	3	0	5	0	0	3	49	57	19.00
September	1	0	1	0	0	5	10	16	16.00
Total	**16**	**4**	**6**	**2**	**2**	**19**	**142**	**175**	**10.94**

In addition to instantaneous site counts of recreation users at each location, the spot count forms identified 11 specific recreational activities and one "other" category (Appendix 1). These activities ranged from ATV/Snowmobiling and various types of boating to hiking, jogging, walking and wildlife viewing. Recreation users at the Hayward Project were observed participating in many of the aforementioned activities, with the exception of bicycling and bird watching. All of the recreationist observed at the Hayward Project during the winter were listed under "other" and were ice fishing. From July through September, the primary activities for most visitors were swimming and shore fishing.

Spot counts conducted at the Trego Project were noticeably lower compared to the Hayward Project. The Trego spot counts tallied 34 users total (Table 5-13). The average spot count for the 16 surveys was 2.13 users per location. Unlike the Trego recreational interviews, which were highest at the tailwater facilities, spot counts were highest at the Town of Trego Boat Landing followed by the Town of Trego Park Boat Landing.

February had the fewest total and average visits by recreational user over the eight survey months (Tables 5-13). Similar to Hayward, the highest user count at Trego was in August, which also exhibited the highest average count. Trego spot counts were similar among the months and seasons with the exception of August, which was substantially higher.

Table 5-13. Recreational use based on spot counts, near the Trego Project (January-February, April-September 2022)

Month	Surveys	Town of Trego Park Boat Landing	Town of Trego Boat Landing	Trego North Tailwater Access/Canoe Portage	Trego South Tailwater Access	Total by Month	Average by Month & No. Surveys
January	2	0	2	0	0	2	1.00
February	2	0	0	0	0	0	0.00
April	1	1	0	0	1	2	2.00
May	2	1	0	2	0	3	1.50
June	3	0	1	1	0	2	0.67
July	2	3	0	0	1	4	2.00
August	3	3	9	3	2	17	5.67
September	1	1	0	2	1	4	4.00
Total	**16**	**9**	**12**	**8**	**5**	**34**	**2.13**

Among the 11 specific recreational activities, visitors to the Trego area were observed participating in seven activities. The four activities that were not observed include swimming, picnicking, bird watching, and ATV/Snowmobiling. Winter activities were minimal and restricted to walking. However, summer activities were largely split between power boating and shore/tailwater fishing.

5.3 FUTURE AND POTENTIAL RECREATION

Future and potential recreation use questionnaires were mailed to representatives from the City of Hayward, Hayward Area Chamber of Commerce, Sawyer County, Town of Trego, Trego Lake District (TLD), Washburn County, and NPS on July 14, 2022. Delivery on July 18, 2022 was confirmed for each recipient (Appendix 2). Among the seven stakeholder entities that

received the questionnaire, only the TLD and NPS responded. The following is a summary of their responses with complete responses provided by each stakeholder included in Appendix 7.

5.3.1 National Park Service

Stakeholders were asked about their interest in recreation sites in the vicinity of the Hayward and Trego Projects as well as their primary function and responsibilities with regard to the recreation sites. NPS responded that the Namekagon River is protected as part of the Wild and Scenic Rivers system and the National Park system. The Namekagon River is managed by St. Croix National Scenic Riverway for "*the preservation and protection of the aquatic, cultural, recreational, scenic-aesthetic, water quality, and free-flowing condition values*". The NPS does not manage all recreation sites near the Hayward and Trego Projects but has "*an interest in providing safe, high-quality recreational opportunities to the public as part of the NPS experience*".

NPS owns and manages the County K Landing, which is downstream of the Trego Project. In addition, the NPS Namekagon River Visitor Center in the Town of Trego and the Earl Landing in the Town of Earl are between the Hayward and Trego Project areas but within the responsibilities of NPS. Amenities associated with the County K Landing include a gravel river access, picnic tables, interpretive and informational signage, paved parking lot, and vault toilet. The amenities at Earl Landing include a gravel parking area, concrete boat ramp, vault toilet, primitive camping, potable water, and picnic tables.

NPS reported that Namekagon River access points near the Visitor Center on the north and south banks of the river were removed due to redevelopment of the Highway 63 and Highway 53 Interchange project and the removal of the Lakeside Road Bridge. As such, no facilities remain at these locations. The removal of these two access points has reduced recreational access to the Namekagon River and near the Hayward and Trego Projects. The NPS is considering a river access point to the east of the Namekagon River Visitor Center, near the Highway 63 Bridge. NPS noted that parking capacity is frequently exceeded at Earl Landing. As such, NPS is set to begin the design process to improve conditions at the Earl Landing during Fiscal Year 2024.

5.3.2 Trego Lake District

The TLD described itself as "*a specialized unit of government created to manage Trego Lake with a legal responsibility to support and encourage the preservation of the natural beauty, peacefulness, safety, and recreational value of the shoreline and waters of Trego Lake, and to coordinate with the various public and private organizations in these efforts*". The TLD encompasses the water and shoreline from the Trego Project to the Highway 53 bridge and is managed by those owning property within the boundary. There are approximately 275 landowners that have access to the lake from their property.

TLD works with Wisconsin Department of Natural Resources to analyze water quality, protect the fishery, maintain and mark navigation channels, and coordinate control of aquatic invasive species (AIS) in the lake.

Recreational activities on Trego Lake, including boating, swimming, and fishing, are all impacted by sedimentation buildup and AIS. In conjunction with the Town of Trego, TLD operates and maintains the Trego Landing. In addition, a private resort and campground (i.e., Bay Park Resort and Campground) is situated on Trego Lake. TLD stated that these sites have not exceeded capacity or experienced insufficient parking.

In terms of future management and enhancement of recreational opportunities, TLD will continue to manage AIS and navigation through aquatic macrophyte harvesting and spot dredging. In 2023, via a tax levy on members, TLD intends to expand AIS control through additional macrophyte harvesting as identified in their Aquatic Plant Management Plan. Despite these efforts, TLD foresees the need to further expand AIS and sedimentation management within the district to enhance the resource and improve recreational opportunities near the Trego Project. TLD also expressed concern over the loss of Namekagon River due to the Trego interchange development access (see NPS discussion above) and believes those former access points need to be replaced.

6. CONCLUSIONS

Overall, the six Hayward Project and four Trego Project recreational locations were considered in good condition during the 2022 surveys. The inventory identified one facility and amenity that required maintenance and that was related to signage at the Hayward Canoe Portage Trail and Put-In. Most recreational facilities at the Hayward and Trego Projects received low to moderate use during the 2022 survey events. The lone exception was at the Hayward City Beach/Fishing Pier, which received periodic moderate to high use, particularly in June, July, and August. Despite the high use at the Hayward City Beach/Fishing Pier, based on the facility assessments, observations, spot counts, and user interviews, this facility does not appear to be overused and overcrowding is infrequent. With the exception of the Hayward City Beach/Fishing Pier, crowding or lack of capacity was not observed during the surveys.

A few respondents requested improved signage at NSPW-owned recreation locations (Tables 5-10 and 5-11). Improved signage was requested for both the Hayward Canoe Portage Take-Out and Carry-In Access and the Trego South Tailwater Access. The Hayward Canoe Portage Take-Out and Carry-In Access is visibly marked for recreation users both on the water and on land (Appendix 3, Photos 9, 12, 13, 14, 17, and 19). Therefore, additional signage is unnecessary at this time. Likewise, one respondent suggested that the signage at the Trego South Tailwater Access is faded (Appendix 3, Photo 120). While somewhat faded, the signage remains completely readable such that replacement is unnecessary at this time.

For the Hayward project, one individual suggested that an ADA parking and viewing area would benefit the public at the Hayward Canoe Portage Take-Out and Carry-In Access (Table 5-10). Given the open, level, and relatively obstacle free area at the Hayward Canoe Portage Take-Out and Carry-In Access, it is recommended that NSPW evaluate the possibility for an ADA parking and viewing area. In addition, one respondent requested that a picnic table be located along the Hayward Canoe Portage Trail and Put-In. Given the ample space available along the portage trail, near the take out, carry-in access, informal bank fishing access, or at the loop near the canoe portage put-in, it is recommended that NSPW evaluate the possibility of installing a picnic table near the Hayward Canoe Portage Trail and Put-In.

Three respondents suggested that the Trego North Tailwater Access and Trego South Tailwater Access fishing areas are in need of expansion (Table 5-11). However, based on actual observed use throughout the Trego recreation survey, the facilities are more than adequate to support the number of individuals visiting them. In fact, among the 16 surveys conducted, the number of individuals using the north or south tailwater fishing areas exceeded one individual on two occasions and in both cases there were two people using the access compared to eight surveys when no users were observed at either tailwater access (Appendix 6). Therefore, use of these resources suggests that expansion of the north and south tailwater fishing areas at the Trego Project is unnecessary.

While there may be legitimate needs for future improvement or expansion of recreational resources in the vicinity of the Projects, the low to moderate observed use during these surveys

suggests that the capacity of the Hayward and Trego recreational resources is sufficient now and in the foreseeable future.

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WATER QUALITY MONITORING TURTLE STUDY REPORT

STUDY REPORT

for

Hayward Hydroelectric Project (FERC Project No. 2417) and Trego Hydroelectric Project (FERC Project No. 2711)

Water Quality Monitoring Study

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February 7, 2023

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PROJECT INFORMATION AND BACKGROUND

Northern States Power Company, a Wisconsin corporation (NSPW or Licensee), currently holds licenses issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Hayward and Trego Hydroelectric Projects (Project or Projects). The Projects are owned, operated, and maintained by NSPW. The current licenses, which designate the Projects as FERC Nos. 2417 (Hayward) and 2711 (Trego), expire on November 30, 2025. To obtain new licenses, NSPW must submit a Final License Application (FLA) to FERC no later than November 30, 2023. The FLA, in part, must include an evaluation of the existing water quality associated with the Project.

On March 11, 2021, NSPW held a Joint Agency Meeting to present information about the Project. At the meeting, and during the 60-day comment period immediately following, NSPW received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) requested that NSPW complete a water quality study at both Projects.

WDNR indicated that data be collected and analyzed using river monitoring protocols upstream of the impoundments and downstream of the dams. Lake protocols should be applied to the deep hole of the impoundments. NSPW developed a study plan to include monitoring for all parameters requested by WDNR with the exception of cyanobacteria, methyl mercury, and sediment accumulation. The study plan was otherwise consistent with the WDNR request.

On behalf of NSPW, and under the direction of Mead and Hunt, Inc., Great Lakes Environmental Center, Inc. (GLEC) conducted a Water Quality Monitoring Study at the Hayward and Trego Projects during 2022 to determine if waters within the Project boundaries meet current state water quality standards. The work was completed in accordance with the Study Plan provided by Mead and Hunt.

STUDY AREA

The study included water quality monitoring at three locations for each Project. One site was located downstream of the powerhouse outside of the mixing zone, one was located in the deep hole within the reservoir, and one was located upstream of the main impoundment in a riverine area.

At the Hayward Project, site 1 was located approximately 3,600 feet upstream of the Highway 77 bridge, site 2 was located in the deep hole at existing WDNR Monitoring Station 83131, and site 3 was located near the canoe portage put-in at existing WDNR Monitoring Station 583001.

At the Trego Project, site 1 was located just upstream of the Highway 53 bridge at existing WDNR Monitoring Station 10022021, site 2 was located in the deep hole at existing WDNR Monitoring Station 663162, and site 3 was located approximately 250 feet downstream of the Trego Dam.

Figures 1, 2, and 3 illustrate the sampling locations at each Project.

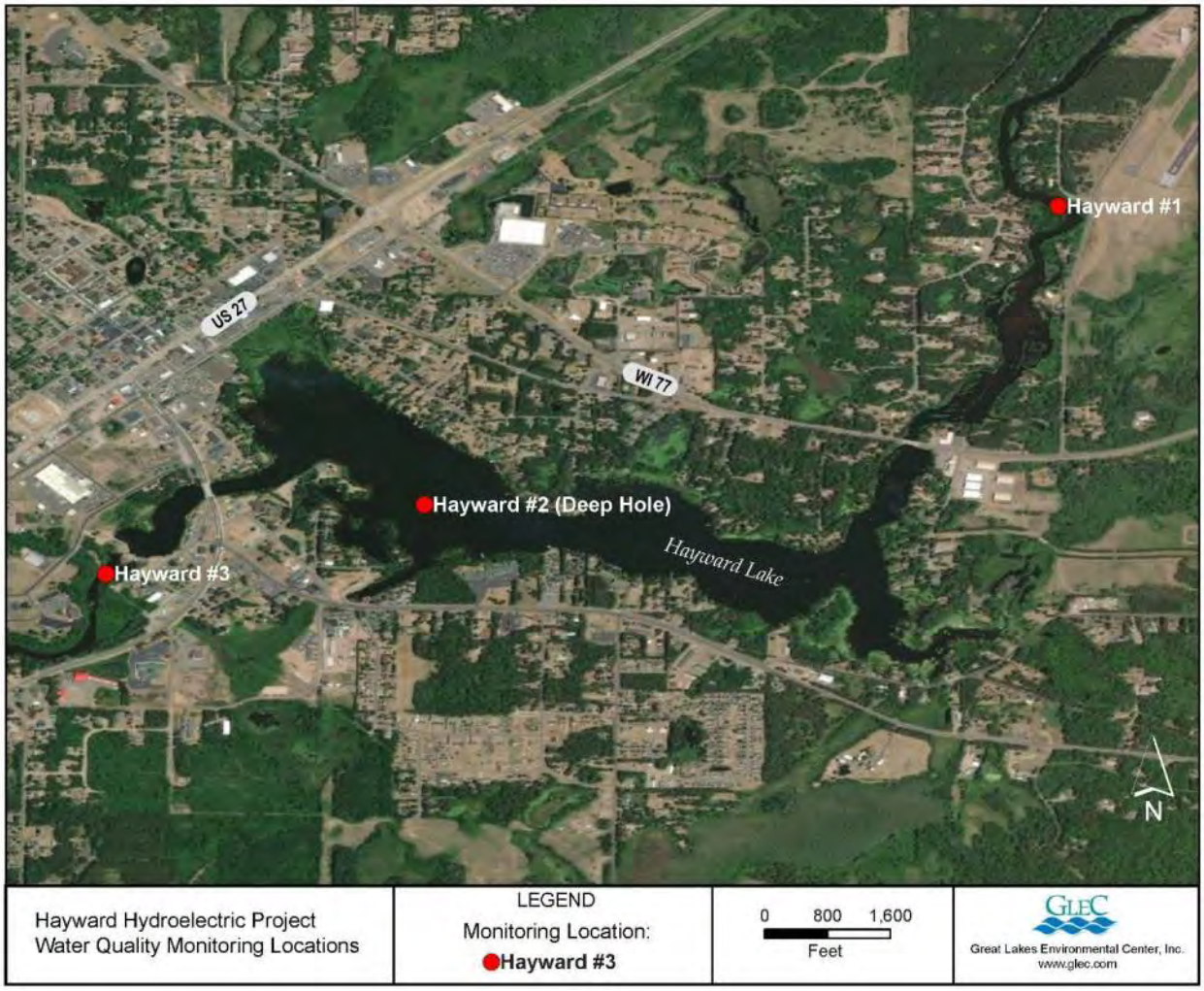


FIGURE 1. HAYWARD SAMPLING LOCATIONS FOR THE 2022 WATER QUALITY ASSESSMENT. HAYWARD #1: 46.01897, -91.45208, HAYWARD #2: 46.00855, -91.47421, HAYWARD #3: 46.00614, -91.48534

FIGURE 2. TREGO #1 SAMPLING LOCATION FOR THE 2022 WATER QUALITY ASSESSMENT. TREGO #1: 45.90951, -91.82713

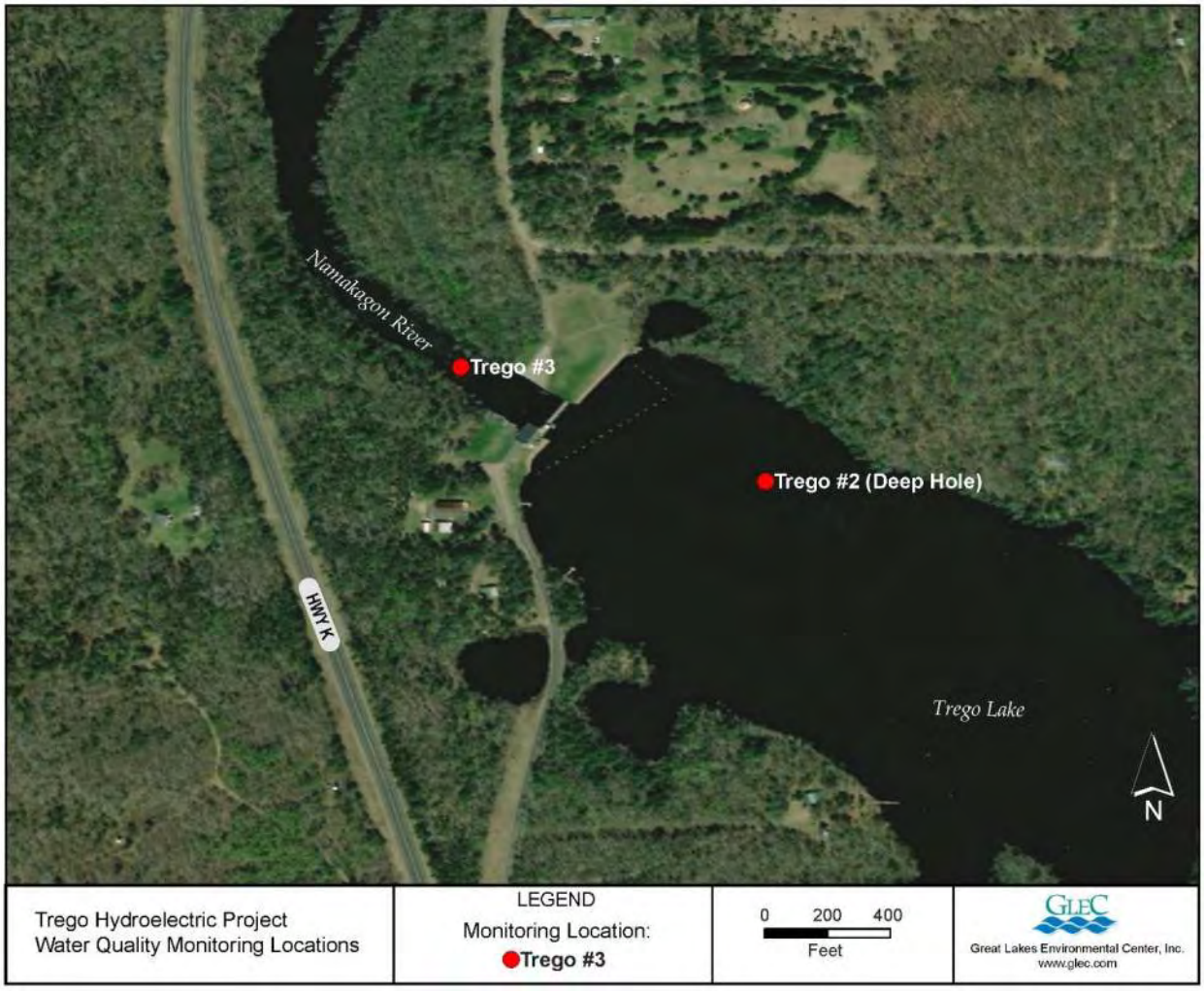


FIGURE 3. TREGO #2 AND TREGO #3 SAMPLING LOCATIONS FOR THE 2022 WATER QUALITY ASSESSMENT. TREGO #2: 45.94750, -91.88639, TREGO #3: 45.94850, -91.88905

METHODOLOGY

The objective of the water quality monitoring study was to determine if the Projects meet current state water quality standards. Since Hayward Lake and Trego Lake are classified as impounded flowing waters, with a residence time of less than 14 days, WDNR indicated that the data should be collected and/or analyzed using river monitoring protocols at the upstream and downstream monitoring locations for each Project. However, lake monitoring protocols should be applied to both Projects when analyzing the deep hole within the impoundments.

River monitoring protocols were implemented at the following four locations:

- Hayward #1: 46.01897, -91.45208, 3,600 feet upstream of the Highway 77 bridge,

- Hayward #3: 46.00614, -91.48534, near the canoe portage put-in at existing WDNR Monitoring Station 583001,
- Trego #1: 45.90951, -91.82713, upstream of the Highway 53 bridge at existing WDNR Monitoring Station 10022021, and
- Trego #3: 45.94850, -91.88905, approximately 250 feet downstream of the Trego Dam.

Lake monitoring protocols were implemented at the following two locations:

- Hayward #2: 46.00855, -91.47421, deep hole at existing WDNR Monitoring Station 83131, and
- Trego #2: 45.94750, -91.88639, deep hole at existing WDNR Monitoring Station 663162.

NSPW developed the study plan to include monitoring for all parameters requested by WDNR with the exception of cyanobacteria, methyl mercury, and sediment accumulation. A summary of the Hayward and Trego water quality assessment plans is shown in Figure 4 for the upstream and downstream monitoring locations and in Figure 5 for the deep hole locations. At each upstream and downstream location, the following was collected and/or recorded at the frequency outlined in Figure 4:

- Ammonia
- Bacteria (*Escherichia coli* (*E. coli*))
- Chloride
- Chlorophyll *a*
- Conductivity
- Dissolved Oxygen (DO)
- Dissolved Phosphorus
- Nitrate (plus Nitrite)
- pH
- Sulfate
- Total Mercury
- Temperature
- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids

At each deep hole location, the following was collected and/or recorded at the frequency outlined in Figure 5:

- Ammonia
- Bacteria (*Escherichia coli* (*E. coli*))
- Chloride
- Chlorophyll *a*
- Color
- Conductivity
- Dissolved Oxygen (DO)
- Dissolved Phosphorus
- Iron
- Manganese
- Nitrate (plus Nitrite)
- pH
- Secchi Depth
- Sulfate
- Sulfide
- Total Mercury
- Temperature
- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids

The analysis of the above parameters was completed following written Standard Operating Procedures (SOPs) which are based upon USEPA analytical methods and WDNR Nutrient Grab Sample Protocols located online at https://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=114118765. GLEC staff and the GLEC Nutrient Chemistry laboratory (Traverse City, MI) completed the analysis for:

- Ammonia
- Bacteria (*E. coli*)
- Chlorophyll *a*
- Conductivity
- Color
- Dissolved Oxygen
- Dissolved Phosphorus
- Nitrate (plus Nitrite)
- pH
- Secchi Depth
- Temperature
- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids

The analysis for the remaining parameters, listed below, was completed by Pace and ALS Laboratories (Green Bay, WI and Holland, MI, respectively).

- Chloride
- Iron
- Sulfate
- Total Mercury
- Sulfide
- Manganese

The analysis for bacteria (*E. coli*) was completed using the IDEXX Colilert methodology (IDEXX Colilert 2022). All field collection and subsequent analyses were conducted by individuals with prior water quality monitoring training and experience.

Discrete Multi-parameter Water Quality Measurements and Hydrographic Profiles

Discrete multi-parameter water quality measurements of temperature, DO, pH, and specific conductance were collected at each monitoring station during each visit using a calibrated YSI ProDSS multi-parameter meter. The data was collected according to the schedule outlined in Figures 4 and 5.

A hydrographic profile for temperature, DO, pH, and specific conductance was developed using a calibrated YSI ProDSS multi-parameter meter in the deepest part of each impoundment (Hayward #2 and Trego #2) beginning at the water surface and continuing at 1-meter intervals until the impoundment bed was reached. These profiles were completed following the schedule outlined in Figure 5.

Parameter	Samples	Type of Sampling	Sampling Frequency					
			May	June	July	Aug.	Sept.	Oct.
Ammonia	6 total	Lab	x	x	x	x	x	x
Bacteria	6 total	Lab	x	x	x	x	x	x
Chloride	6 total	Lab	x	x	x	x	x	x
Chlorophyll *a*	3 total	Lab			x	x	x	
Conductivity	Continuous July-Sept.	Field Measurement			x	x	x	
DO	Continuous July-Sept.	Field Measurement			x	x	x	
Dissolved Phosphorus	6 total	Lab	x	x	x	x	x	x
Nitrate (plus nitrite)	6 total	Lab	x	x	x	x	x	x
pH	Continuous July-Sept.	Field Measurement			x	x	x	
Sulfate	1 total	Lab	x					
Total Mercury	1 total	Lab	x					
Temperature	Continuous May-Oct.	Field Measurement	x	x	x	x	x	x
Total Nitrogen	6 total	Lab	x	x	x	x	x	x
Total Phosphorus	6 total	Lab	x	x	x	x	x	x
Total Suspended Solids	6 total	Lab	x	x	x	x	x	x

FIGURE 4. HAYWARD AND TREGO UPSTREAM AND DOWNSTREAM LOCATIONS, WATER QUALITY ASSESSMENT PLAN (2022)

Parameter	Samples	Type of Sampling	Sampling Frequency			
			May	July	Aug.	Sept.
Ammonia	1 total	Lab		x		
Bacteria	4 total	Lab	x	x	x	x
Chloride	4 total	Lab	x	x	x	x
Chlorophyll *a*	3 total	Lab		x	x	x
Conductivity	4 total	Field Profile	x	x	x	x
Color	1 total	Lab		x		
DO	4 total	Field Profile	x	x	x	x
Dissolved Phosphorus	4 total	Lab	x	x	x	x
Iron	4 total	Lab	x	x	x	x
Manganese	4 total	Lab	x	x	x	x
Sulfide	4 total	Lab	x	x	x	x
Nitrate (plus nitrite)	1 total	Lab		x		
pH	4 total	Field Profile	x	x	x	x
Secchi depth	4 total	Field	x	x	x	x
Sulfate	1 total	Lab	x			
Total Mercury	1 total	Lab	x			
Temperature	4 total	Field Profile	x	x	x	x
Total Nitrogen	1 total	Field Fixed		x		
Total Phosphorus	4 total	Field Fixed	x	x	x	x
Total Suspended Solids	4 total	Lab	x	x	x	x

FIGURE 5. HAYWARD AND TREGO DEEP HOLE LOCATIONS, WATER QUALITY ASSESSMENT PLAN (2022)

Continuous Monitoring of Water Temperature, pH, DO, and Specific Conductance

Continuous (hourly) temperature data was collected at the upstream and downstream locations of each Project from May 17 to October 11, 2022 using Onset HOBO Tidbit Temperature Data Loggers.

Continuous (hourly) temperature, DO, pH, and specific conductance data was collected at the upstream and downstream locations of each Project from July 12 or 13 to September 28, 2022 using calibrated YSI EXO3 Multi-parameter sondes. Due to a field technician error while downloading data from the YSI EXO3 sondes, no continuous data was collected between July 29 and August 16, 2022 at Hayward Location #1 (upstream), Hayward Location #3 (downstream), or Trego Location #3 (downstream). The sonde at Trego Location #1 (upstream) remained in operation during that time. These deviations from the study plan are discussed further in the Results section.

Field staff downloaded data from the sondes at each monitoring station directly onto a laptop computer. During each visit, all equipment was checked for operation, calibration, battery life, and any necessary adjustments to the instruments were made based on manufacturer's specifications. Each sonde was also cleaned and the cable, housing, and other installation materials were visually inspected for damage and repaired as necessary.

Applicable Water Quality Standards

Data was collected and analyzed using the WDNR Wisconsin Consolidated Assessment and Listing Methodology (WisCALM Guidance) located online at the following web address: https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html. The WisCALM Guidance references Chapter NR 102, Water Quality Standards for Wisconsin Surface Waters from the Wisconsin State Administrative Codes (https://docs.legis.wisconsin.gov/code/admin_code/nr/100/102). The water quality standards for dissolved oxygen, pH and temperature applicable to the Hayward and Trego Hydroelectric Projects are summarized in Table 1.

TABLE 1. WATER QUALITY STANDARDS FOR THE HAYWARD AND TREGO HYDROELECTRIC PROJECTS

<table>
<tr><th>Wisconsin Administrative Code Chapter</th><th>Parameter</th><th>Criteria for Fish and Aquatic Life</th></tr>
<tr><td>NR 102.04</td><td>Dissolved Oxygen (Trego)</td><td>…surface waters shall attain a minimum dissolved oxygen concentration of 5 mg/L at all times.</td></tr>
<tr><td>NR 102.04</td><td>Dissolved Oxygen for Cold+ Waters (Hayward)</td><td>(a.) A minimum dissolved oxygen concentration of 6.0 mg/L at all times.
(b.) A minimum dissolved oxygen concentration of 7.0 mg/L when cold water fish are spawning through fry emergence from their redds, or gravel nests. (for Hayward, this period is from September 15 thru May 15)</td></tr>
<tr><td>NR 102.04</td><td>pH</td><td>The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.</td></tr>
<tr><td>NR 102.25</td><td>Ambient Water Temperature for Non-Specific (Warm-Large*) Waters (Trego)</td><td>The values listed shall be the applicable ambient temperatures, sub-lethal and acute water quality criteria for temperature for the protection of fish and aquatic life unless other values specified in subs. (3) to (5) are applicable or approved by the department…
<table>
<tr><td>Month</td><td>May</td><td>June</td><td>July</td><td>Aug</td><td>Sept</td><td>Oct</td></tr>
<tr><td>Ta (°F)</td><td>60</td><td>71</td><td>75</td><td>74</td><td>65</td><td>52</td></tr>
<tr><td>Ta (°C)</td><td>15.6</td><td>21.7</td><td>23.9</td><td>23.3</td><td>18.3</td><td>11.1</td></tr>
</table></td></tr>
<tr><td>NR 102.25</td><td>Ambient Water Temperature for Cold+ Waters (Hayward)</td><td>The values listed shall be the applicable ambient temperatures, sub-lethal and acute water quality criteria for temperature for the protection of fish and aquatic life unless other values specified in subs. (3) to (5) are applicable or approved by the department…
<table>
<tr><td>Month</td><td>May</td><td>June</td><td>July</td><td>Aug</td><td>Sept</td><td>Oct</td></tr>
<tr><td>Ta (°F)</td><td>56</td><td>62</td><td>64</td><td>63</td><td>57</td><td>49</td></tr>
<tr><td>Ta (°C)</td><td>13.3</td><td>16.7</td><td>17.8</td><td>17.2</td><td>13.9</td><td>9.4</td></tr>
</table></td></tr>
</table>

*Warm-Large = waters with a fish and aquatic life use designation of "warm water sport fish community" or "warm water forage fish community" and unidirectional 7Q10 flows ≥ 200 cubic feet per second (129 million gallons/day)
+ Cold = waters with a fish and aquatic life use designation of "cold water community"
Ta = ambient temperature

Data Analysis and Processing

Upon completion of the field data collection, all data was reviewed for errors and omissions. Verified data is presented as tables and/or plots to illustrate the information.

Equipment Calibration and Quality Assurance

The field measurement equipment used during this study included the following:

- Onset HOBO Tidbit Temperature Data Loggers were used to monitor continous (hourly) temperature. The water temperature sensor is accurate to ±0.2°C from 0° to 70°C.
- A YSI ProDSS Multi-parameter Meter was outfitted with temperature, specific conductance, pH and DO sensors. It was used to collect discrete multi-paramter water quality data and hydrographic profile data. The accuracy of the YSI ProDSS's sensor array as specified by the manufacturer is presented in Table 2 below.
- YSI EXO3 Multi-parameter Sondes were used to collect continous (hourly) measurements of temperature, specific conductance, pH and DO at the upstream and downstream locations at each Project. The accuracy of the YSI EXO3's sensor array as specified by the manufacturer is presented in Table 3 below.

TABLE 2. YSI PRODSS SENSOR SPECIFICATIONS

Sensor	Accuracy
Temperature	± 0.2°C
DO	0 to 20 mg/L: ± 0.1 mg/L or 1% of reading, whichever is greater
Specific Conductance	0 to 100 mS/cm: ±0.5% of reading or 0.001 mS/cm, whichever is greater
pH	± 0.2 pH units

TABLE 3. YSI EXO3 SENSOR SPECIFICATIONS

Sensor	Accuracy
Temperature	-5 to 35°C: ± 0.01°C
DO	0 to 20 mg/L: ± 0.1 mg/L or 1% of reading, whichever is greater
Specific Conductance	0 to 200 mS/cm: ±0.5% of reading or 0.001 mS/cm, whichever is greater
pH	± 0.1 pH units within ±10°C of calibration temp; ±0.2 pH units for entire temp range

STUDY RESULTS

Field measurements and water samples collected for analysis were completed as outlined in the Study Plan and followed written Standard Operating Procedures. Monitoring was conducted on May 17, June 14-15, July 12-13, and July 24 (Trego #2 resample for sulfide only), August 16-17, September 12, and October 11, 2022. Water quality characteristics and conditions at both Projects are detailed in this section. Several water quality plots are included as appendices to this report as specified below.

Discrete Multi-parameter Water Quality Measurements and Hydrographic Profiles

Summaries of the laboratory analyses of the water samples are provided in Tables 5 and 7 for Hayward and Trego, respectively. Summaries of the field data are provided in Tables 6 and 8 for Hayward and Trego, respectively. Field data (DO, pH, and temperature) in bold font in Tables 6 and 8 indicate parameters that were outside of the Water Quality Criteria for Fish and Aquatic Life as defined in Table 1.

Depth profiles for temperature, pH, DO, and specific conductance were completed at both deep hole locations (Hayward #2 and Trego #2) per the study plan. Figures displaying depth profiles for temperature, dissolved oxygen, and pH are presented in Appendix A for both the Hayward and Trego deep hole locations. Specific conductance was not plotted and varied little from surface to bottom. Monthly minimum and maximum specific conductance readings recorded during the hydrographic profiling at both Projects are presented in Table 4.

TABLE 4. MINIMUM AND MAXIMUM SPECIFIC CONDUCTANCE (µS/CM) RECORDED DURING PROFILING

	May		July		August		September	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Hayward #2	274	282	169	173	178	182	185	192
Trego #2	279	285	196	198	194	196	207	208

TABLE 5. SUMMARY OF WATER QUALITY PARAMETER SAMPLE ANALYSIS FOR THE HAYWARD HYDROELECTRIC PROJECT (2022)

	Hayward Location #1 (Upstream)						Hayward Location #2 (Deep Hole)						Hayward Location #3 (Downstream)					
Parameter	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**
Ammonia (µg/L)	73.9	<30.3	52.1	31.5	30.0	36.0	NC[2]	NC	<30.0	NC	NC	NC	39.0	80.6	37.2	<13.0	53.0	47.0
***E. coli* (MPN)**	5.2	15.5	3.1	13.1	13.4	18.7	3.1	NC	TE[3]	12.1	9.7	NC	17.1	15.6	24.3	16.0	8.6	2.0
Chloride (mg/L)	3.8	4.1	3.7	3.7	5.9	4.0	4.5	NC	4.9	4.6	0.7	NC	6.1	6.0	11.1	6.4	6.0	5.2
Chlorophyll-*a* (µg/L)	NC	NC	2.18	1.45	1.12	NC	NC	NC	2.71	1.20	1.68	NC	NC	NC	2.53	1.31	1.82	NC
Color (PCU)[1]	NC	NC	NC	NC	NC	NC	NC	NC	41	NC	NC	NC	NC	NC	NC	NC	NC	NC
Dissolved Phosphorus (µg/L)	2.0	2.8	1.8	<1.5	2.0	2.6	<1.5	NC	3.0	3.1	3.1	NC	1.6	6.5	3.2	2.6	2.5	<1.5
Iron (µg/L)	NC	NC	NC	NC	NC	NC	330	NC	296	215	276	NC	NC	NC	NC	NC	NC	NC
Manganese (µg/L)	NC	NC	NC	NC	NC	NC	45.0	NC	35.2	31.1	33.4	NC	NC	NC	NC	NC	NC	NC
Nitrate+ nitrite (µg/L)	66.4	11.0	37.6	21.7	49.5	77.9	NC	NC	6.4	NC	NC	NC	61.1	16.2	21.8	17.6	22.6	25.0
Sulfide (mg/L)	NC	NC	NC	NC	NC	NC	1.2	NC	<1.2	<1.2	<2.4	NC	NC	NC	NC	NC	NC	NC
Sulfate (mg/L)	2.1	NC	NC	NC	NC	NC	0.75	NC	NC	NC	NC	NC	<0.71	NC	NC	NC	NC	NC
Total Mercury (µg/L)	<0.16	NC	NC	NC	NC	NC	<0.16	NC	NC	NC	NC	NC	<0.16	NC	NC	NC	NC	NC
Total Nitrogen (mg/L)	0.49	0.55	0.39	0.33	0.35	0.37	NC	NC	0.43	NC	NC	NC	0.55	0.53	0.38	0.34	<0.021	0.38
Total Phosphorus (µg/L)	4.2	6.4	8.3	10.3	14.5	9.5	4.6	NC	9.1	6.8	15.0	NC	4.0	7.1	7.3	10.8	17.1	11.4
Total Suspended Solids (mg/L)	5.0	4.3	3.4	4.1	5.0	4.6	4.6	NC	3.3	4.4	4.9	NC	3.6	3.1	5.8	3.9	5.1	6.3

[1] PCU = Platinum Cobalt Units, [2] NC = Not Collected per Study Plan, [3]TE = Technician Error – E. coli processing time exceeded; value not used.

TABLE 6. SUMMARY OF WATER QUALITY FIELD PARAMETER RESULTS FOR THE HAYWARD HYDROELECTRIC PROJECT (2022)

Field Measurements[1]	Hayward Location #1 (Upstream)						Hayward Location #2 (Deep Hole)						Hayward Location #3 (Downstream)					
	May	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**
Specific Conductance (µS/cm)	133	NC[2]	168	179	183	186	274	NC	173	178	192	NC	133	NC	173	179	196	190
DO (mg/L)	9.78	NC	9.01	10.85	6.73*	10.93	9.74	NC	8.93	9.71	8.71	NC	9.39	NC	8.39	9.16	8.83	10.88
pH (s.u.)	7.86	NC	7.83	8.44	8.17	7.73	7.75	NC	8.09	8.24	7.88	NC	7.60	NC	7.97	8.04	7.83	7.91
Secchi depth (inches)	NC	NC	NC	NC	NC	NC	80	NC	87	115	102	NC	NC	NC	NC	NC	NC	NC
Temperature (ºC)	**17.3**	**22.4**	17.4	**19.5**	**15.6**	9.3	**16.9**	NC	**21.5**	**21.0**	**18.4**	NC	**16.6**	**20.7**	**21.6**	**19.7**	**18.5**	**10.3**

[1] Near Surface Measurements Only

[2] NC = Not Collected per Study Plan

Bolded results are over the water quality criteria limits as defined in Chap NR 102 of the Wisc. Admin. Code.

*Result recorded on September 12, 2022. DO limit for this date is 6 mg/L.

TABLE 7. SUMMARY OF WATER QUALITY PARAMETER SAMPLE ANALYSIS FOR THE TREGO HYDROELECTRIC PROJECT (2022)

	Trego Location #1 (Upstream)						Trego Location #2 (Deep Hole)						Trego Location #3 (Downstream)					
Parameter	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**
Ammonia (µg/L)	44.1	34.3	33.4	24.2	33.0	51.0	NC[2]	NC	67.5	NC	NC	NC	59.9	41.3	92.6	50.3	57.0	29.0
***E. coli* (MPN)**	22.8	72.7	93.2	114.5	36.4	13.5	3.0	NC	2.0	2.0	<1.0	NC	7.5	4.1	3.1	2.0	9.8	3.0
Chloride (mg/L)	5.8	6.5	6.2	5.2	7.5	7.5	5.7	NC	6.6	6.4	6.7	NC	5.7	6.7	5.2	6.6	7.0	7.0
Chlorophyll-*a* (µg/L)	NC	NC	2.80	1.20	1.08	NC	NC	NC	1.49	1.27	0.98	NC	NC	NC	2.10	1.81	1.26	NC
Color (PCU)[1]	NC	NC	NC	NC	NC	NC	NC	NC	34	NC	NC	NC	NC	NC	NC	NC	NC	NC
Dissolved Phosphorus (µg/L)	4.1	2.7	3.6	1.5	5.8	2.3	2.5	NC	4.1	4.4	6.2	NC	1.9	3.2	3.4	2.3	5.3	3.3
Iron (µg/L)	NC	NC	NC	NC	NC	NC	470	NC	188	180	202	NC	NC	NC	NC	NC	NC	NC
Manganese (µg/L)	NC	NC	NC	NC	NC	NC	77.0	NC	61.3	38.5	48.2	NC	NC	NC	NC	NC	NC	NC
Nitrate + nitrite (µg/L)	139.2	122.4	118.2	92.3	91.6	112.1	NC	NC	46.4	NC	NC	NC	114.2	68.1	63.5	41.1	78.9	77.2
Sulfide (mg/L)	NC	NC	NC	NC	NC	NC	<1.0	NC	<1.2	<1.2	<1.2	NC	NC	NC	NC	NC	NC	NC
Sulfate (mg/L)	<0.71	NC	NC	NC	NC	NC	<0.71	NC	NC	NC	NC	NC	<0.71	NC	NC	NC	NC	NC
Total Mercury (µg/L)	<0.16	NC	NC	NC	NC	NC	<0.16	NC	NC	NC	NC	NC	<0.16	NC	NC	NC	NC	NC
Total Nitrogen (mg/L)	0.58	0.62	0.40	0.37	0.31	0.31	NC	NC	0.47	NC	NC	NC	0.66	0.69	0.47	0.31	0.32	0.32
Total Phosphorus (µg/L)	5.3	4.8	9.0	6.8	15.5	11.2	10.0	NC	6.2	6.1	11.6	NC	5.4	4.3	7.0	8.2	16.4	9.7
Total Suspended Solids (mg/L)	8.6	6.1	8.7	3.7	4.4	5.9	3.8	NC	5.5	3.3	3.8	NC	2.6	4.8	5.2	2.6	4.8	9.2

[1] PCU = Platinum Cobalt Units, [2] NC = Not Collected per Study Plan

TABLE 8. SUMMARY OF WATER QUALITY FIELD PARAMETER RESULTS FOR THE TREGO HYDROELECTRIC PROJECT (2022)

Field Measurements[1]	Trego Location #1 (Upstream)						Trego Location #2 (Deep Hole)						Trego Location #3 (Downstream)					
	May	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**
Specific Conductance (µS/cm)	293	NC[2]	187	191	205	204	279	NC	197	194	207	NC	280	NC	197	195	207	205
DO (mg/L)	8.77	NC	7.37[3]	7.79	8.75	10.20	7.87	NC	7.27[3]	9.28	7.58	NC	9.05	NC	6.29[3]	8.16	7.95	10.41
pH (s.u.)	7.51	NC	7.74	7.67	7.64	7.78	7.47	NC	7.84	8.17	7.76	NC	7.53	NC	7.62	7.72	7.71	7.79
Secchi depth (inches)	NC	NC	NC	NC	NC	NC	57	NC	87	114	150	NC	NC	NC	NC	NC	NC	NC
Temperature (ºC)	14.3	**21.9**	19.6	19.4	14.7	9.4	**18.8**	NC	**24.6**	22.5	**19.6**	NC	**17.9**	19.8	23.5	20.9	**19.0**	**11.6**

[1] Near Surface Measurements Only

[2] NC = Not Collected per Study Plan

[3] Value calculated using DO (% saturation), water temperature, and elevation

Bolded results are over the water quality criteria limits as defined in Chap NR 102 of the Wisc. Admin. Code.

Continuous Monitoring of Water Temperature, pH, DO, and Specific Conductance

Continuous temperature data was collected at the upstream and downstream locations at both Projects using Hobo Tidbits from May 17 to October 11, 2022. Continuous DO, pH, and conductivity data was collected at the upstream and downstream locations of each Project, using YSI EXO3 sondes, from July 12 or 13 to September 28, 2022, with some deviations from the study plan as discussed below.

Recorded water temperatures were compared to the monthly ambient water temperature limits for non-specific (warm-large) waters (Trego) and cold waters (Hayward) as defined in chapter NR 102 of the Wisconsin Administrative Code. Hourly DO readings for Trego were compared to the minimum attainment value of 5 mg/L. Hourly DO readings for Hayward were compared to the criteria for cold waters which states that cold surface waters shall attain (a.) a minimum dissolved oxygen concentration of 6.0 mg/L at all times, and (b.) a minimum dissolved oxygen concentration of 7.0 mg/L when cold water fish are spawning through fry emergence from their redds, or gravel nests. For Hayward, this period is from September 15 through May 15. pH readings were compared with the range of 6.0 to 9.0 as defined in chapter NR 102 of the Wisconsin Administrative Code. The range, mean, and median of temperature, pH, DO, and specific conductance readings collected during continuous (hourly) monitoring are presented in Tables 9 (Hayward) and 10 (Trego). Plots of the hourly data collected are presented in Appendix B.

Hayward Hydroelectric Project

Water temperatures displayed consistent daily and seasonal patterns and ranged from a minimum of 6.24 °C to a maximum of 26.21 °C, with both readings recorded at Location #1. The average (19.24°C Hobo Tidbit recording, 19.95°C sonde recording) and median (20.15°C Hobo Tidbit recording, 20.47°C sonde recording) water temperatures were higher at Location #3 than at Location #1. The water temperatures collected by the Hobo Tidbit and YSI EXO3 sonde displayed almost identical patterns for both Hayward locations (see water temperature plots in Appendix B).

Water temperatures recorded at Hayward Locations #1 and #3 were above the month-by-month state regulatory thresholds for cold waters for at least one hourly measurement per day for almost all of the deployment period (see plots in Appendix B). Days when all of the hourly temperature measurements fell below the state regulatory threshold for Location #1 include:

- May 22, 26
- August 13
- September 23-24, 26-30

Days when all of the hourly temperature measurements fell below the state regulatory threshold for Location #3 include:

- September 27-30

There were no instances at Location #1 or Location #3 of DO readings below the 6.0 mg/L attainment threshold between sonde deployment and September 14, 2022. The minimum DO recorded during this time was 6.15 mg/L (Location #1). There were no instances at Location #1

or Location #3 of DO readings below the 7.0 mg/L attainment threshold between September 15 and sonde retrieval. The minimum DO recorded during this time was 7.54 mg/L (Location #1). DO at Location #1 ranged from 6.15 mg/L to 11.85 mg/L with an average and median DO of 8.92 mg/L and 8.81 mg/L, respectively. DO at Location #3 ranged from 6.46 mg/L to 10.32 mg/L with an average and median DO of 8.39 mg/L and 8.45 mg/L, respectively.

Specific conductance ranged from 148.7 µS/cm to 199.7 µS/cm at Location #1 and averaged 184.9 µS/cm. At Location #3, specific conductance ranged from 163.6 µS/cm to 221.40 µS/cm and averaged 192.4 µS/cm. A small jump in specific conductance occurred on August 25, 2022 for both Locations #1 and #3 (Appendix B). This jump was due to an in-field calibration performed on the sondes, necessary due to drift in specific conductance over time.

All pH values recorded at Location #1 and Location #3 fell within the range of 6.0 to 9.0 as defined in chapter NR 102 of the Wisconsin Administrative Code. pH at Location #1 ranged from 7.38 to 8.69 and averaged 7.84. pH at Location #3 ranged from 7.43 to 8.40 and averaged 7.82.

TABLE 9. RANGE OF CONTINUOUS TEMPERATURE, PH, DO, AND SPECIFIC CONDUCTANCE READINGS FOR HAYWARD HYDROELECTRIC PROJECT, MAY 17, 2022 TO OCTOBER 11, 2022

	Hayward Location #1 (Upstream)					Hayward Location #3 (Downstream)				
	Hobo Tidbit Temp (°C)	Temp (°C)	DO (mg/L)	Specific Conductance (µS/cm)	pH	Hobo Tidbit Temp (°C)	Temp (°C)	DO (mg/L)	Specific Conductance (µS/cm)	pH
Min	6.24	7.23	6.15	148.7	7.38	10.00	11.57	6.46	163.6	7.43
Max	26.21	25.60	11.85	199.7	8.69	25.50	25.31	10.32	221.4	8.40
Mean	17.43	17.66	8.92	184.9	7.84	19.24	19.95	8.39	192.4	7.82
Median	18.05	18.03	8.81	191.8	7.78	20.15	20.47	8.45	201.5	7.80

Trego Hydroelectric Project

Water temperatures at the Trego Hydroelectric Project ranged from 8.45°C (Hobo Tidbit recording) to 28.29°C (sonde recording), with both extremes recorded at Location #1. The average (20.31°C Hobo Tidbit recording, 21.21°C sonde recording) and median water temperatures (21.38°C Hobo Tidbit recording, 21.63°C sonde recording) were higher at Location #3 than at Location #1. The water temperatures collected by the Hobo Tidbit and YSI EXO3 sonde displayed almost identical patterns for both Trego locations (see water temperature plots in Appendix B).

Water temperatures recorded at Location #1 were above the month-by-month state regulatory thresholds for at least one hourly measurement per day for almost all of the deployment period (see plots in Appendix B). Days when all of the hourly temperature measurements fell below the state regulatory threshold for Location #1 include:

- May 22-23, 26
- June 1-13, 16
- July 2-4, 10-11, 13-14, 24-29

- August 7, 12-22, 24-31
- September 11, 22-30
- October 8, 11

Days when all of the hourly temperature measurements fell below the state regulatory threshold for Location #3 include:

- May 23-28
- June 1-18
- July 1-7, 13-16, 26-31
- August 1, 13-31
- September 24-30

There were no instances at Trego Locations #1 or #3 of DO readings below the 5.0 mg/L attainment threshold. DO at Location #1 ranged from 6.23 mg/L to 11.91 mg/L with an average of 8.83 mg/L and median of 8.68 mg/L. DO at Location #3 ranged from 5.69 mg/L to 9.94 mg/L with an average and median of 7.93 mg/L and 7.98 mg/L, respectively.

Specific conductance ranged from 168.0 µS/cm to 215.5 µS/cm at Location #1 and averaged 194.5 µS/cm. At Location #3, specific conductance ranged from 187.8 µS/cm to 221.9 µS/cm and averaged 207.5 µS/cm. A small jump in specific conductance occurred on August 25, 2022 for Locations #1 and #3 (Appendix B). This jump was due to an in-field calibration performed on the sondes, necessary due to drift in specific conductance over time.

All pH values recorded at Locations #1 and #3 fell in the range of 6.0 to 9.0 as defined in chapter NR 102 of the Wisconsin Administrative Code. pH at Location #1 ranged from 7.54 to 8.65 and averaged 7.96. pH at Location #3 ranged from 7.58 to 8.33 and averaged 7.81.

TABLE 10. RANGE OF CONTINUOUS TEMPERATURE, PH, DO, AND SPECIFIC CONDUCTANCE READINGS FOR TREGO HYDROELECTRIC PROJECT, MAY 17, 2022 TO OCTOBER 11, 2022

	Trego Location #1 (Upstream)					Trego Location #3 (Downstream)				
	Hobo Tidbit Temp (°C)	Temp (°C)	DO (mg/L)	Specific Conductance (µS/cm)	pH	Hobo Tidbit Temp (°C)	Temp (°C)	DO (mg/L)	Specific Conductance (µS/cm)	pH
Min	7.16	8.50	6.23	168.0	7.54	11.64	14.14	5.69	187.8	7.58
Max	28.28	28.29	11.91	215.5	8.65	26.23	26.19	9.94	221.9	8.33
Mean	19.10	20.19	8.83	194.5	7.96	20.31	21.21	7.93	207.5	7.81
Median	19.71	20.52	8.68	185.4	7.93	21.38	21.63	7.98	214.0	7.78

Raw field data, including field notes and depth profile data, are provided in Appendix C. Analytical data, including laboratory analysis results, are provided in Appendix D.

Deviations from the Study Plan

Due to field technician error while downloading data from the YSI EXO3 sondes, no continuous data was collected between July 29 and August 16, 2022 at Hayward Location #1, Hayward Location #3, or Trego Location #3. The sonde at Trego Location #1 remained in operation

during that time. The Hobo Tidbit water temperature data loggers were deployed at all monitoring locations from May 17 to October 11, 2022 with no interruption in data logging.

GLEC developed a regression model to predict DO and temperature for the missing data points based on temperature data bracketing the missing dates. By developing a simple linear regression for each downstream monitoring station, GLEC was able to determine that there is only a 5% chance (using the 95% prediction interval) that the true DO value fell outside of what was predicted with the regression. Figures 6 and 7 show the predicted DO values based on the simple linear regressions for each monitoring station. The data indicate that it is very unlikely that any of the missing DO data fell below the thresholds of 6.0 mg/L and 7.0 mg/L for Hayward and 5.0 mg/L for Trego. An explanation of the methods used to develop the regressions follows.

Regression Model Structure
To estimate the hourly DO values between July 29 and August 16, 2022, observed water temperature from the adjacent Hobo Tidbit temperature logger was used as a regressor variable for pairs of observed DO and water temperature. Regression analysis was performed on data collected at both Hayward Location #3 (downstream) and Trego Location #3 (downstream). Water temperature is a reasonably good predictor of DO if the nutrient-DO and ammonia-DO dynamics of a stream system are fairly simple and invariable. Other water quality parameters, such as pH, would have been better predictors for DO but that information also was not available.

Several linear, univariate model forms of DO and temperature were explored using ordinary least-squares regression (OLS), including a simple linear form, a quadratic form, a $\log_e$-temperature form, a $\log_e$-$\log_e$ model, and a square root of temperature form. None of the more complicated linear models offered any improvement compared to the simple linear model. A non-linear univariate model was also constructed. As in the more complex linear models, the non-linear model also did not show an improved model fit.

Regression diagnostics for the simple linear model of DO and water temperature for Hayward Location #3 and Trego Location #3 showed an R^2 of 0.5053 and 0.4963, respectively, and a residual standard error of 0.4867 and 0.6028, respectively.

Prediction Intervals
The upper and lower boundary of predicted hourly DO is termed a prediction interval (Figures 6 and 7). For a given, observed, hourly water temperature (using the Hobo Tidbit data in °C), a prediction of hourly DO (in mg/L) was made and an associated 90% or 95% prediction interval was calculated. Prediction intervals are based on predicting an individual DO value at a particular water temperature value. The 90% interval, for example, can be explained as given a large number of random samples (i.e., hourly data for the period July 12 to September 28, 2022, or 1,873 observations) from a population of all months and years of water temperature and DO observations for a location, then 90% of those prediction intervals would contain the true (unknown) DO for that single hourly DO value selected at random. The same explanation would apply for the 95% prediction interval.

In comparison to traditional confidence intervals, prediction intervals make use of the standard deviation of the *fitted value* as opposed to that of the *observed value*. Confidence intervals are used for estimating the population mean from the array of regressor variables.

Figures 6 and 7 display the hourly distribution of observed water temperature (Hobo Tidbit) and observed DO (YSI EXO3 sonde), including 24-hr moving averages to represent a "daily average" for the downstream locations at Hayward and Trego, respectively. Also shown is the fitted DO, using univariate OLS regression as a function of water temperature, and its corresponding 90% and 95% prediction interval. The prediction period extends from July 11 to September 28, 2022.

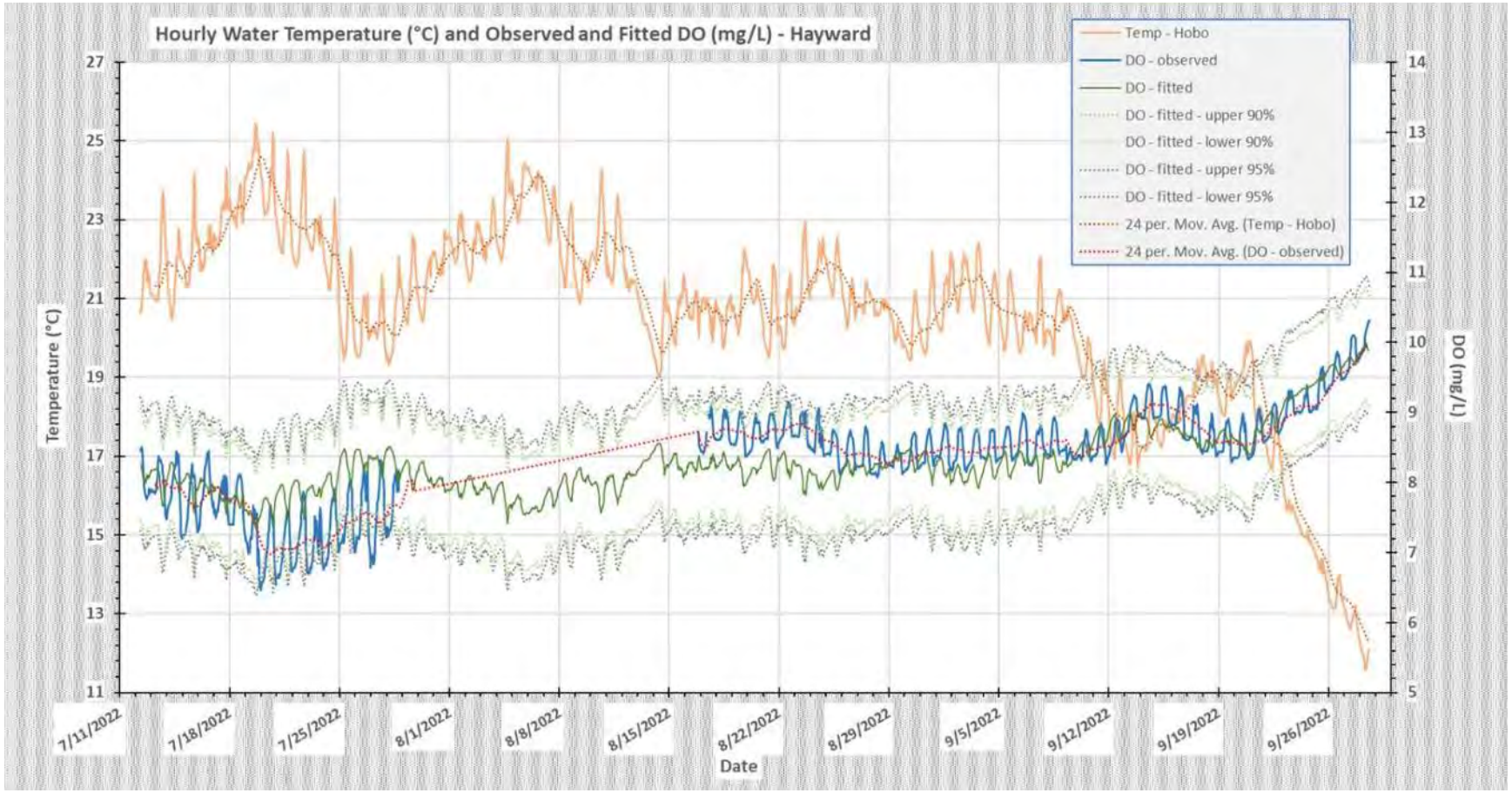


FIGURE 6. PREDICTION OF MISSED HOURLY DO VALUES FOR HAYWARD LOCATION #3 (DOWNSTREAM)

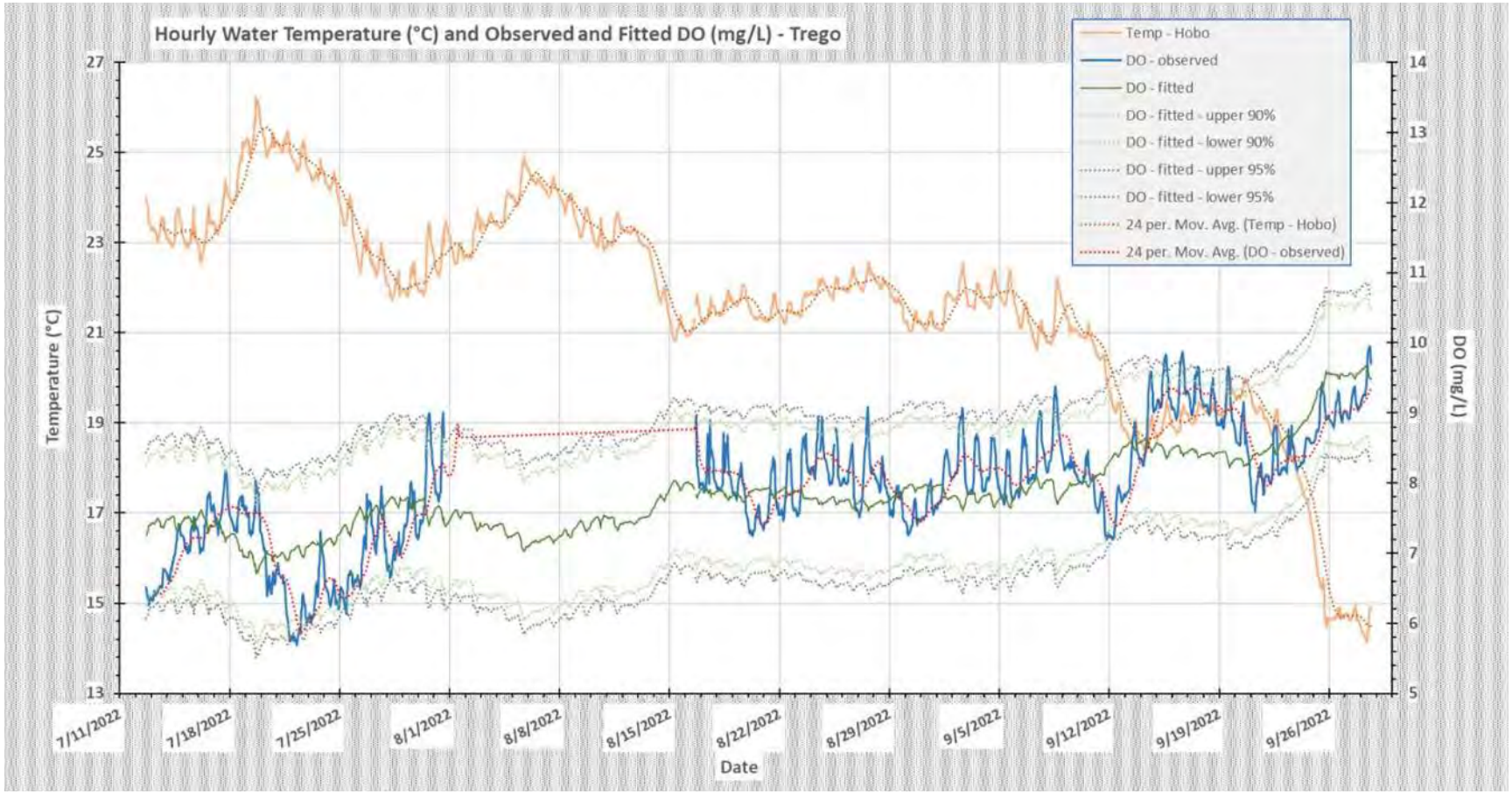


FIGURE 7. PREDICTION OF MISSED HOURLY DO VALUES FOR TREGO LOCATION #3 (DOWNSTREAM)

Analysis and Discussion

Hydrographic Profiles

Hydrographic profiles were conducted at the deep hole locations of the reservoirs for both Projects in May, July, August, and September, 2022 (Appendices A and C). Analysis of the hydrographic profile data collected at Hayward Location #2 (deep hole) indicate that the Hayward impoundment was not stratified in terms of temperature or dissolved oxygen throughout the study. In July, August, and September, water temperature in the Hayward impoundment showed a slight thermocline around 2 meters below the surface, but DO levels remained above 8 mg/L at the bottom of the impoundment for each profiling event.

Hydrographic profiles completed at Trego Location #2 (deep hole) showed no stratification in terms of water temperature with the exception of a slight thermocline in August around 3 meters below the surface. DO measured during the Trego impoundment profiling events generally remained above 6 mg/L with a few exceptions. Due to an error on the part of the field technician recording the data, in July the DO values were recorded in percent saturation instead of mg/L. DO values in mg/L were calculated for this event based on the water temperature, barometric pressure, and DO values recorded in percent saturation. These calculated DO values indicate that the DO in mg/L dropped by approximately 1 mg/L between four and five meters below the surface and DO at the bottom of the impoundment in July was below 5 mg/L. In August, DO values dropped by almost 2 mg/L between two and three meters below the surface. However, DO at the bottom of the impoundment was above 6 mg/L in August. The hydrographic profile taken at Trego #2 in September indicated that DO levels declined between three and four meters below the surface to around 5.8 mg/L, but then increased again towards the bottom of the impoundment. DO at the bottom of the impoundment measured almost 7 mg/L in September.

Overall, hydrographic profiles at the deep holes at both Hayward and Trego indicate that neither impoundment became stratified to the point where temperature or DO levels would have had an impact on aquatic life.

Discrete Multi-parameter Water Quality Measurements and Continuous Data Collection

Chapter NR 102 of the Wisconsin Administrative Code defines water quality standards and criteria for the protection of waterbody designated uses that are intended to protect human and ecosystem health (Figure 8).

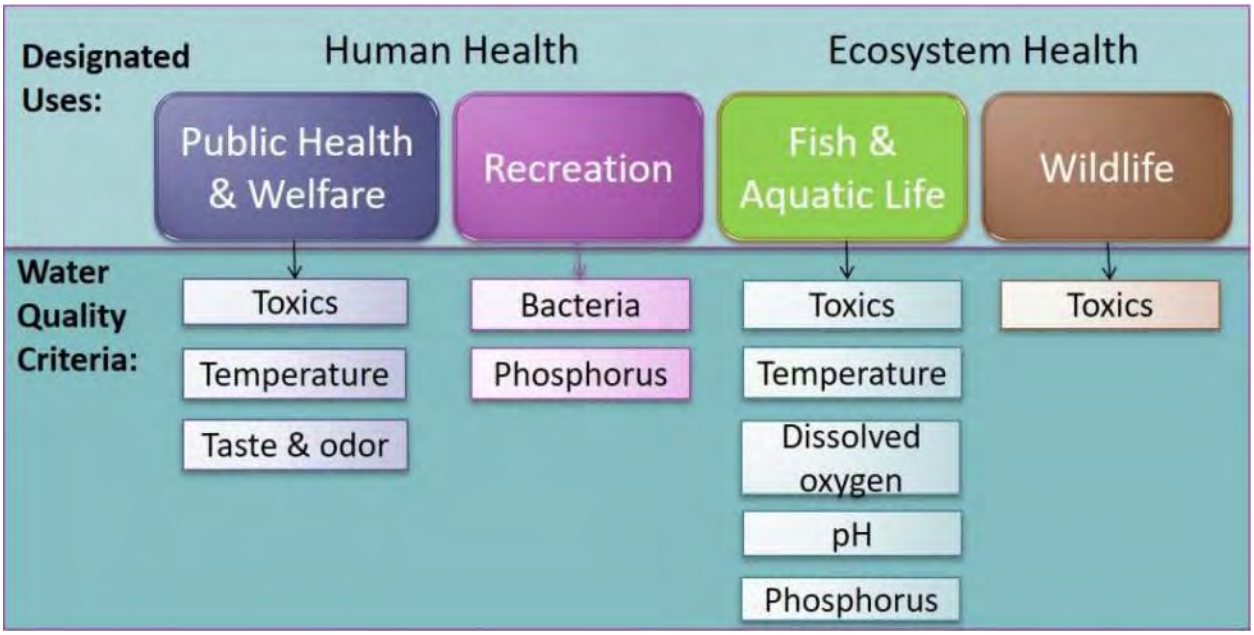


FIGURE 8. WISCONSIN GRAPHIC OF SURFACE WATER STANDARDS AND CRITERIA (Source: https://dnr.wisconsin.gov/topic/SurfaceWater/Standards.html)

Hayward Lake (impoundment) is listed by the Wisconsin DNR as a "Healthy Waterbody" and Trego Lake (impoundment) is listed as an "Impaired Waterbody" due to excess algal growth from nutrients and eutrophication (https://dnr.wisconsin.gov/topic/SurfaceWater/ConditionLists.html: Appendix E). None of the analyzed parameters or collected samples used in laboratory analysis exceeded Wisconsin water quality criteria or standards. A narrative for each measured parameter is provided in the following paragraphs and the corresponding recorded values are presented in Tables 5-8 and Appendix D.

Temperature

Wisconsin Administrative Code NR 102.24 and 102.29 states that temperature of a water of the state or a discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state. The temperature measurements collected from the Hayward Hydroelectric Project and the Trego Hydroelectric Project did not exceed this standard. Most of the temperatures recorded during the discrete measurements and/or the continuous measurements for Hayward were above the ambient temperature criteria for cold waters. There were also numerous instances at Trego when the discrete measurements and/or the continuous measurements were above the ambient temperature criteria for warm-large waters. However, it is unlikely that the impoundments caused artificial warming. Water temperature plots for both Hayward and Trego upstream and downstream locations (Appendix B) illustrate that when water was above the criteria in the downstream locations, it was also above the criteria in the upstream locations during the same time period.

pH

The purpose of a pH standard is to protect aquatic organisms from changes in pH that would affect their health and reproduction. Wisconsin Administrative Code NR 102.04 (c) states that the pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum. None of the pH measurements collected at either the Hayward or Trego Hydroelectric Projects exceeded this standard.

Dissolved Oxygen

Chapter NR 102.04 of the Wisconsin Administrative Code states that, for Trego, the dissolved oxygen content in surface waters may not be lowered to less than 5 mg/L at any time. None of the surface water dissolved oxygen measurements taken from Trego were lower than 5 mg/L. For Hayward, the code states that surface waters shall attain (a.) a minimum dissolved oxygen concentration of 6.0 mg/L at all times and (b.) a minimum dissolved oxygen concentration of 7.0 mg/L when cold water fish are spawning through fry emergence from their redds, or gravel nests. For Hayward, this period is from September 15 through May 15. None of the surface water dissolved oxygen measurements recorded at the Hayward Hydroelectric Project were lower than 6.0 mg/L from sonde deployment through September 14, 2022 and no measurements below 7.0 mg/L between September 15 and sonde retrieval.

Iron

Iron (Fe) is a trace element required by both plants and animals. It is a vital part of the oxygen transport mechanism in the blood (hemoglobin) of all vertebrates and some invertebrate animals. Ferrous (Fe^{2+}) and ferric (Fe^{3+}) ions are the primary ions of concern in the aquatic environment. The ferrous ion (Fe^{2+}) can persist in water devoid of dissolved oxygen and usually originates from groundwater or mines that are pumped or drained. Black or brown swamp waters may contain iron concentrations of several mg/L in the presence (ferric iron) or absence (ferrous iron) of dissolved oxygen, but these iron ions have little effect on aquatic life. The concentration of total iron during the study ranged between 215 and 330 µg/L at the Hayward deep hole location and between 180 and 470 µg/L at the Trego deep hole location, which is typical of waterbodies in this area of Wisconsin.

Manganese

Manganese is primarily regulated as a secondary drinking water standard because it can create aesthetic problems with the use of the water. These problems include the presence of black particles (MnO_2), black coatings and films on porcelain, a bitter/ metallic taste to the water, stains on laundry, and black films on automatic dishwashers and on dishes.

Manganese and iron together may affect the role of reduction and oxidation (redox) processes in lake and reservoir sediments in the vicinity of a redox boundary such as at the sediment water interface at the bottom of the reservoir. Mechanisms of redox include the role of micro-organisms, however, they appear to play a smaller role in the transport of trace metals and

phosphorus than what was once believed. Various lacustrine environments, sediments, the sediment-water interface and anoxic and oxygenated waters, are considered within a unifying context of the processes occurring at a redox boundary. The concentration of total manganese in this study ranged between 31.1 and 45.0 µg/L at the Hayward deep hole location and between 38.5 and 77.0 µg/L at the Trego deep hole location which is typical of waterbodies in this area of Wisconsin.

Total Mercury

Mercury is a naturally occurring metal that is released through the weathering of rock. It can also be released into the environment through coal combustion and industrial waste. Mercury is of concern because it is easily absorbed into the food chain. Total mercury levels were measured both Projects during the May sampling event only and results for all samples were below detection.

Chloride

Chloride is present in rainwater, streams, groundwater, seawater, wastewater, urban runoff, humans, geologic formations, and animal waste streams. Chloride is commonly associated with other ions, such as sodium, potassium, carbonates, and sulfate. Elevated chloride levels can be associated with oil/natural gas drilling, saltwater intrusion, landfill leachate, fertilizers, septic system effluent, road salt storage, salt mining, deicing agents, and saline/brine water deposits. The concentration of total chloride in this study ranged between 0.7 and 11.1 mg/L for Hayward and between 5.2 and 7.5 mg/L for Trego, which is typical of waterbodies in this area of Wisconsin. At these concentrations, there is no evidence of anthropogenic input.

Chlorophyll *a*

Chlorophyll *a* is tested in lakes to determine how much algae is in the lake. Algae is an important factor in the health of lakes because it adds oxygen to the water as a by-product of photosynthesis. However, if there is too much algae in a lake it can produce a foul odor and be unpleasant for swimming. The concentration of Chlorophyll *a* in this study ranged between 1.12 and 2.71 µg/L for Hayward and 0.98 and 2.80 µg/L for Trego, which are very low concentrations and typical of waterbodies in this area of Wisconsin.

Sulfide and Sulfate

Sulfides are stable in low oxygen environments whereas sulfates are stable in high oxygen environments. When sulfides are exposed to a high oxygen environment, or when sulfates move into a low oxygen environment, the ions can end up in water as they change to a more stable form in the new environment.

Certain bacteria can take advantage of the oxidation or reduction of sulfur because such chemical changes are a source of energy. Sulfur-reducing bacteria thrive when sulfate-rich water moves into a low oxygen environment. Such bacteria mediate the transformation of sulfate into hydrogen sulfide which, being a gas, can dissolve into water; this is the important exception to

sulfides being very insoluble in water. Sulfur-oxidizing bacteria do the opposite, deriving energy by mediating the oxidation of sulfides into sulfates in oxygen-rich environments. The concentrations of sulfide and sulfate at both the Hayward and Trego Projects were below or just above detection.

Bacteria (*E. coli*)

E. coli is part of the total coliform group of bacteria which is a gram-negative, rod-shaped facultative anaerobic coliform bacteria. These bacteria tend to inhabit the gastrointestinal system of warm-blooded animals in a symbiotic relationship where the bacteria aid in making available vitamin K to the host organism. There are a number of subspecies of *E. coli*, but only a few are pathogenic or disease causing.

Humans can be exposed to *E. coli* bacteria through a number of routes including foodborne or waterborne vectors. The Wisconsin recreational standard for *E. coli* is under the WDNR's beach advisory program. A beach advisory is issued when a beach reaches the "Beach Action Value" of 235 counts per 100 mL and a beach closure is issued at 1000 counts per 100 mL, unless site-specific conditions indicate use of an alternate metric. Using the IDEXX methodology, *E. coli* concentration is given as a "Most Probable Number" or MPN that is equivalent to colony counts per 100 mL, *E. coli* colony counts for Hayward ranged between 2.0 and 24.3 MPN and counts for Trego ranged between <1.0 and 114.5 MPN. Consequently, the Wisconsin standard for *E. coli* was not exceeded at either the Hayward or Trego Project.

Total and Dissolved Phosphorus

Phosphorus is usually measured in two ways in lakes; ortho-phosphate (soluble reactive phosphorus or dissolved phosphorus) and total phosphorus. Ortho-phosphate is the chemically active dissolved form of phosphorus that is taken up directly by plants. Ortho-phosphate levels fluctuate daily and are typically low in lakes because it is incorporated into plants quickly. Total phosphorus (TP) is a better way to measure phosphorus in lakes because it includes both ortho-phosphate and the phosphorus in plant and animal fragments suspended in lake water. TP levels are more stable, and an annual mean can be a good indicator of the lake's water quality and trophic state.

Another means by which phosphorus can enter a lake is from the sediment on the lakebed. When the bottom of a lake is anoxic (usually in late summer and late winter), chemical processes at the sediment/water interface cause phosphorus to be released from the sediments. This phenomenon is called internal loading because the phosphorus is coming from within the lake (from the sediment). When the lake mixes again, this increased phosphorus fuels algae growth.

For stratified reservoirs, total phosphorus criterion is 30 µg/L. For reservoirs that are not stratified, total phosphorus criterion is 40 µg/L (Wisc. Adm Code 102.04(5)). Phosphorus is a nutrient important for plant growth. In most lakes, phosphorus is the limiting nutrient, which means that everything that plants and algae need to grow is available in excess (sunlight, warmth, water, nitrogen, etc.), with the exception of phosphorus. This means that phosphorus

has a direct effect on plant and algal growth in lakes – the more phosphorus that is available, the more plants and algae there are in the lake.

Phosphorus originates from a variety of sources, many of which are related to human activities. Major sources include human and animal wastes, soil erosion, detergents, septic systems and runoff from farmland or fertilized lawns. The concentration of total phosphorus and dissolved phosphorus at Hayward and Trego is far less than the concentration that would support unwanted plant growth. In this study, total phosphorus ranged from 4.0 to 17.1 µg/L at Hayward and 4.3 to 16.4 at Trego. Dissolved phosphorus ranged from <1.5 to 6.5 µg/L at Hayward and 1.5 to 6.2 µg/L at Trego.

Color

Lakes exist in many sizes and shapes, but often the most obvious characteristic of a lake is its color. The differences in color or transparency between lakes can be rather striking due to geology, surrounding wetlands and suspended solids. Lake color can tell you many things about the waterbody including nutrient load, algal growth, water quality and the surrounding landscape. There are three main categories of lake color: blue water lakes, green water lakes and brown water lakes. Hayward Lake and Trego Lake would be considered brown water lakes due to the input of tannins from adjacent wetlands and the surrounding geologic characteristics of the watershed. Color was measured once (in July) at Hayward (41 PCU) and Trego (34 PCU). According to Wisconsin Administrative NR 102.04, "Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state." The color values for Hayward and Trego are typical of lakes in this region.

Nitrate/Nitrite

Nitrates, a form of nitrogen, are found in several different forms in terrestrial and aquatic ecosystems. These forms of nitrogen include ammonia (NH_3), nitrates (NO_3), and nitrites (NO_2). Nitrates are essential plant nutrients, but in excess amounts they can cause significant water quality problems. Together with phosphorus, nitrates in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in a waterbody. This, in turn, affects dissolved oxygen, temperature, and other environmental indicators.

Excess nitrates can also cause hypoxia (low levels of dissolved oxygen) and can become toxic to warm-blooded animals at high concentrations (10 mg/L or higher) under certain conditions. The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L Nitrate/Nitrite). Total nitrogen at Hayward ranged between <0.021 and 0.55 mg/L. Total nitrogen at Trego ranged between 0.31 and 0.69 mg/L. Nitrate-nitrite concentrations ranged from 6.4 to 77.9 µg/L (0.0064 to 0.0779 mg/L) at Hayward and 41.1 to 139.2 µg/L (0.0411 to 0.1392 mg/L) at Trego. Consequently, total nitrogen and nitrate/nitrite concentrations are not a concern at either Project.

Ammonia

Ammonia is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a waterbody at elevated concentrations and indirect effects on aquatic life, ammonia may cause direct toxic effects on aquatic life. Ammonia is produced for commercial fertilizers and other industrial applications. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes.

Ammonia can enter the aquatic environment via direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as nitrogen fixation, air deposition, and runoff from agricultural lands. When ammonia is present in water at high levels, it is difficult for aquatic organisms to sufficiently excrete the toxicant, leading to toxic buildup in internal tissues and blood, and potentially death. Environmental factors, such as pH and temperature, can affect ammonia toxicity to aquatic animals. Ammonia concentrations at Hayward ranged between <13.0 and 80.6 µg/L (0.0130 and 0.0806 mg/L, respectively). At Trego, ammonia concentrations ranged between 24.2 and 92.6 µg/L (0.0242 and 0.0926 mg/L, respectively). These concentrations are far below the toxicity threshold of freshwater aquatic organisms. For example, the 2013 EPA Final Acute Value (weighted average acute toxicity) for freshwater organisms is 33.52 mg/L (USEPA 2013).

Total Suspended Solids (TSS)

Total suspended solids (TSS) are waterborne particles that exceed 2 microns (µm) in size. Any particle that is smaller than 2 microns is considered a total dissolved solid (TDS). The majority of total suspended solids are comprised of inorganic materials; however, algae and bacteria may also be considered TSS. TSS could be anything that floats or "suspends" in water, including sand, sediment, and plankton. When certain water sources are contaminated with decaying plants or animals, the organic particles released into the water are usually suspended solids. While some sediment will settle at the bottom of a waterbody, other TSS will float on the water's surface or remain suspended somewhere in between. TSS affects water clarity; the higher a water source's TSS content, the less clear it will be. Water typically appears clear when the TSS concentration is 20 mg/L or less. TSS at Hayward ranged between 3.1 and 6.3 mg/L and TSS at Trego ranged between 2.6 and 9.2 mg/L. TSS concentrations in this range are considered very low.

Agency Correspondence and Consultation

There was no correspondence with any agency during the study.

LITERATURE CITED

IDEXX Colilert. 2022. IDEXX Water Testing Solutions. IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092 USA (https://www.idexx.com/en/water/)

Northern States Power Company – Wisconsin, dba Xcel Energy. 2020. Pre-Application Document-Gile Flowage Storage Reservoir Project. Prepared by Mead & Hunt. October 27, 2020.

Wisconsin Department of Natural Resources. 2021. American Whitewater. 2021. Comments on Notice of Intent, Scoping Document 1, Preliminary Application Document, and Studies Request for the Gile Flowage Storage Reservoir Project (P-15055-000) Licensing. March 5, 2021.

Wisconsin Department of Natural Resources. 2015. Nutrient Chemistry Grab Sampling (V3.3). WDNR - PUB-WY-019-2015. February 26, 2015. Wisconsin Department of Natural Resources. 2022.

Wisconsin Consolidated Assessment and Listing Methodology (WisCALM) 2022. Guidance # 3200-2021-01. January 14, 2021.

Wisconsin Department of Natural Resources. 2022. Wisconsin Water Quality Standards and Classifications. https://dnr.wisconsin.gov/topic/SurfaceWater/Standards.html

United States Office of Water Environmental Protection Agency. 2013. Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013. EPA 822-R-18-002 April 2013.

United States Environmental Protection Agency (USEPA). 2022. Aquatic Life Water Quality Criteria. https://www.epa.gov/wqc/aquatic-life-criteria

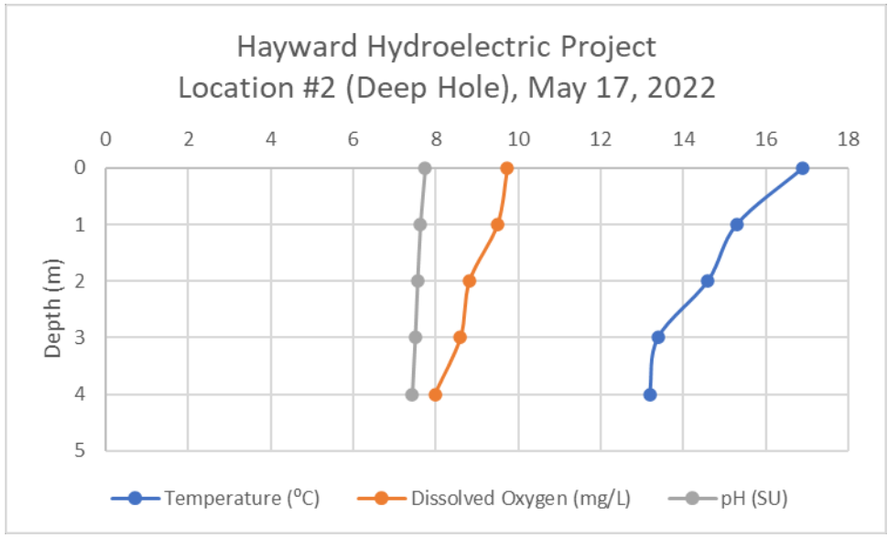
Wisconsin Department of Natural Resources (WDNR). 2022. Surface Water Quality Standards. https://dnr.wisconsin.gov/topic/SurfaceWater/Standards.html

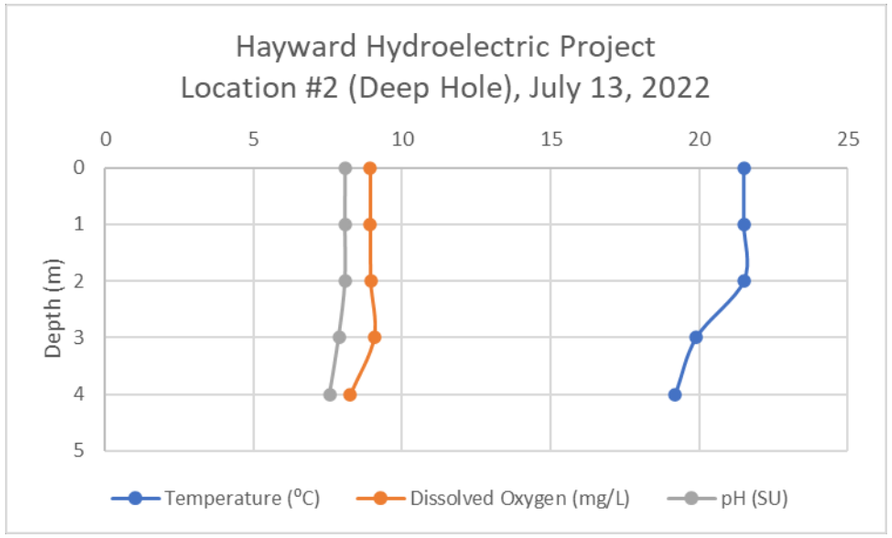
Wisconsin Administrative Code. 2022. Water Quality Standards and Criteria. https://docs.legis.wisconsin.gov/code/admin_code/nr/100/102

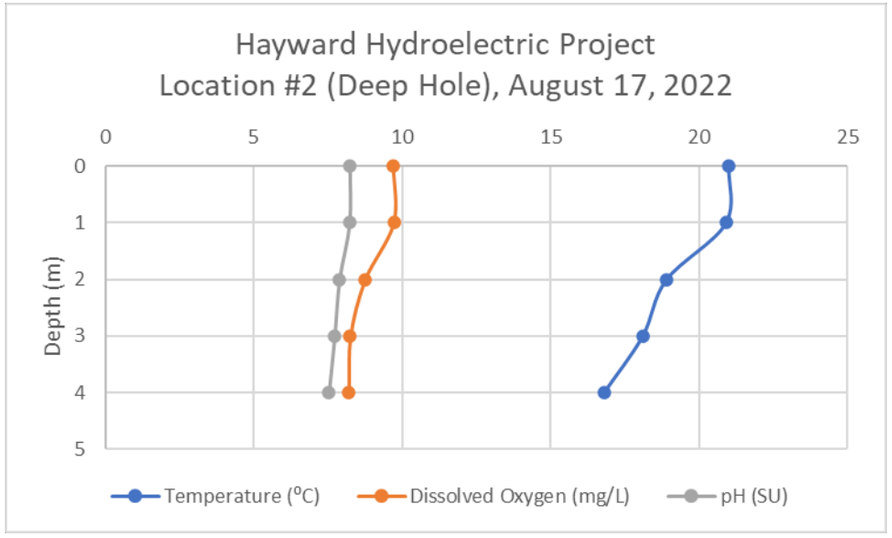
Wisconsin Department of Natural Resources (WDNR). 2022. Surface Water Condition Lists. (https://dnr.wisconsin.gov/topic/SurfaceWater/ConditionLists.html

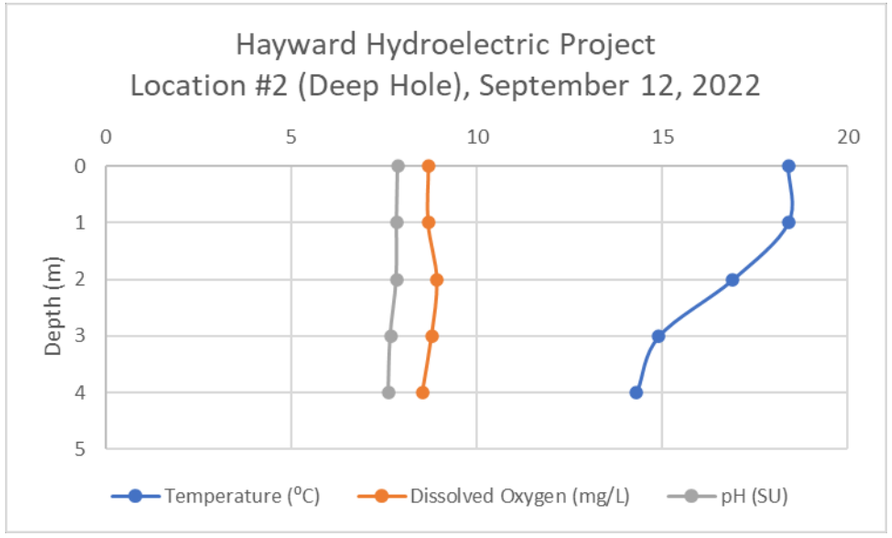
APPENDIX A

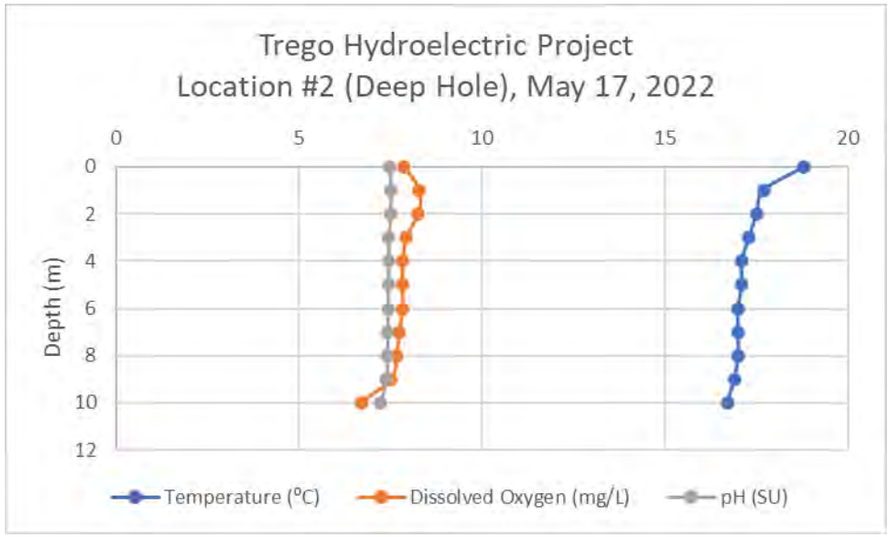
Temperature, Dissolved Oxygen, and pH Depth Profiles

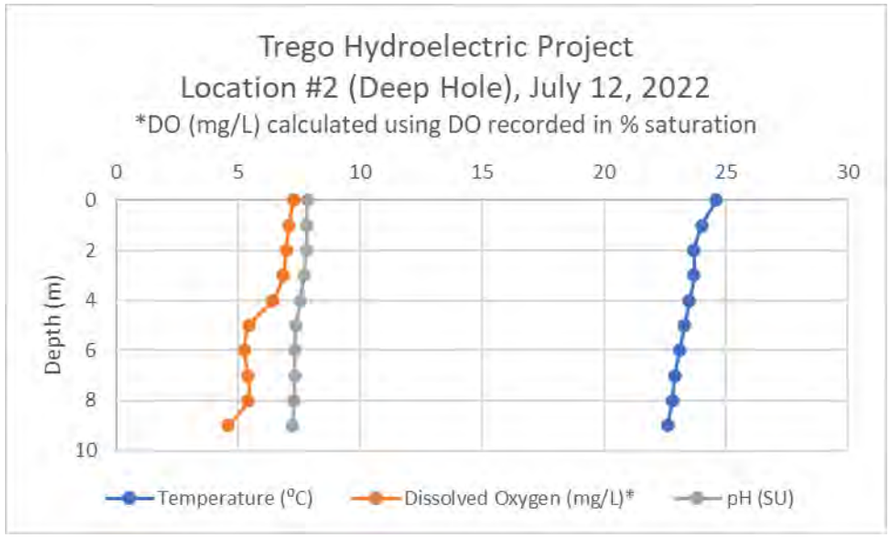

Hayward Hydroelectric Project
Location #2 (Deep Hole), May 17, 2022
0 2 4 6 8 10 12 14 16 18
0 1 2 3 4 5
Depth (m)
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)

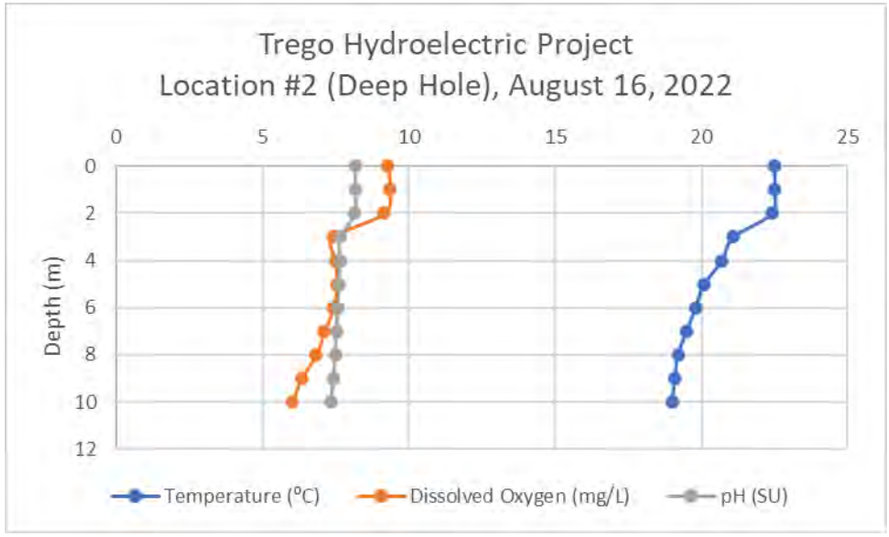

Hayward Hydroelectric Project
Location #2 (Deep Hole), July 13, 2022
0 5 10 15 20 25
0 1 2 3 4 5
Depth (m)
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)

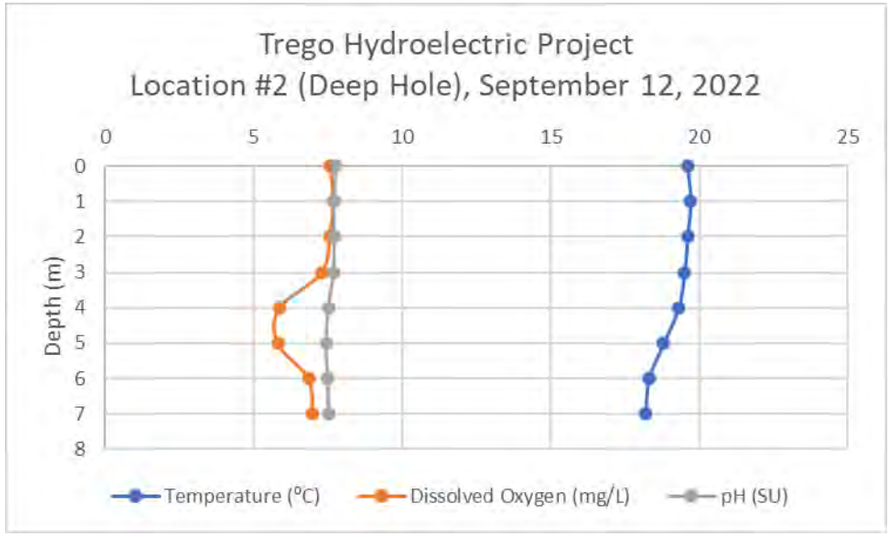

Hayward Hydroelectric Project
Location #2 (Deep Hole), August 17, 2022
0 5 10 15 20 25
0 1 2 3 4 5
Depth (m)
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)


Hayward Hydroelectric Project
Location #2 (Deep Hole), September 12, 2022
0 5 10 15 20
0 1 2 3 4 5
Depth (m)
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)


Trego Hydroelectric Project
Location #2 (Deep Hole), May 17, 2022
0
5
10
15
20
Depth (m)
0
2
4
6
8
10
12
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)

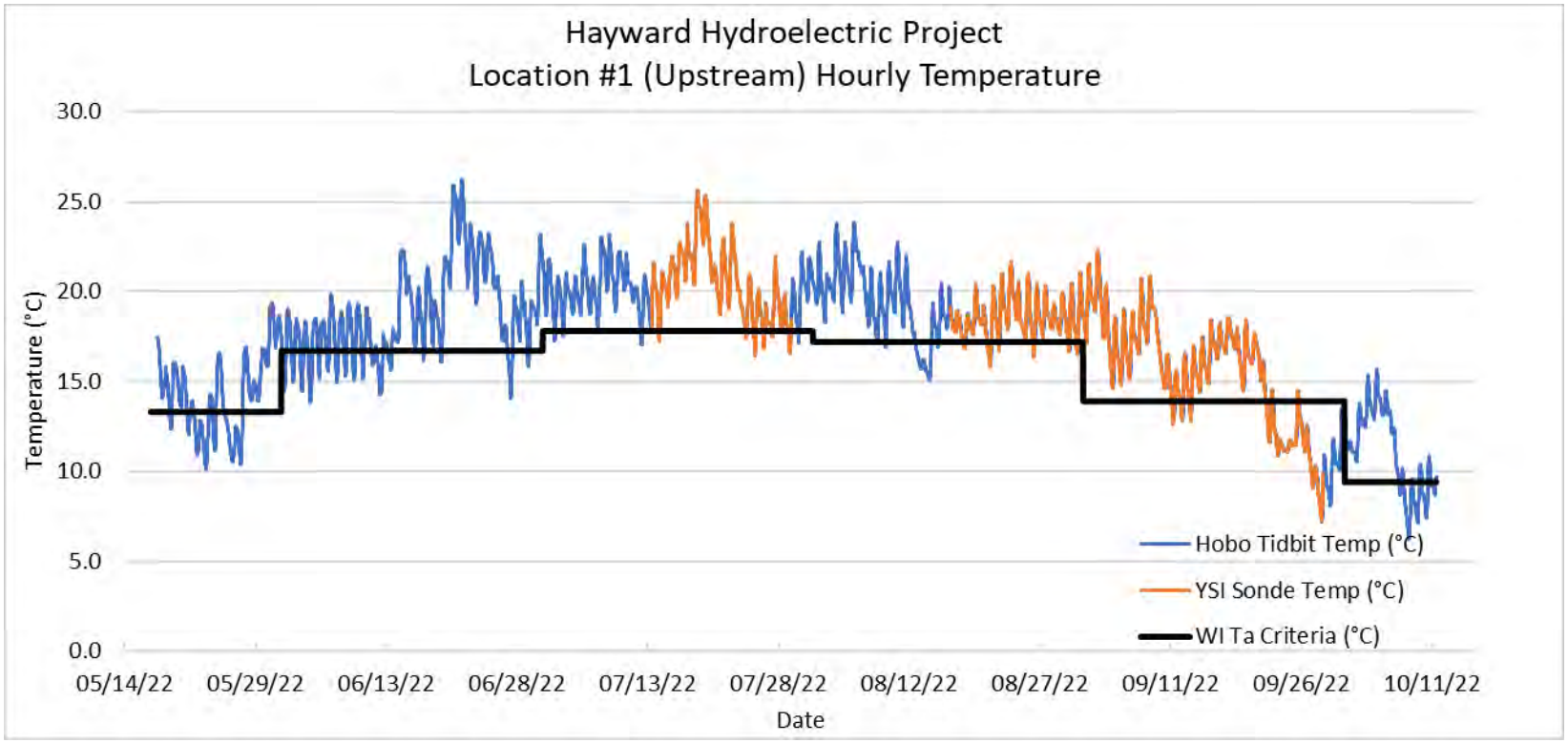

Trego Hydroelectric Project
Location #2 (Deep Hole), July 12, 2022
*DO (mg/L) calculated using DO recorded in % saturation
0
5
10
15
20
25
30
Depth (m)
0
2
4
6
8
10
Temperature (°C)
Dissolved Oxygen (mg/L)*
pH (SU)

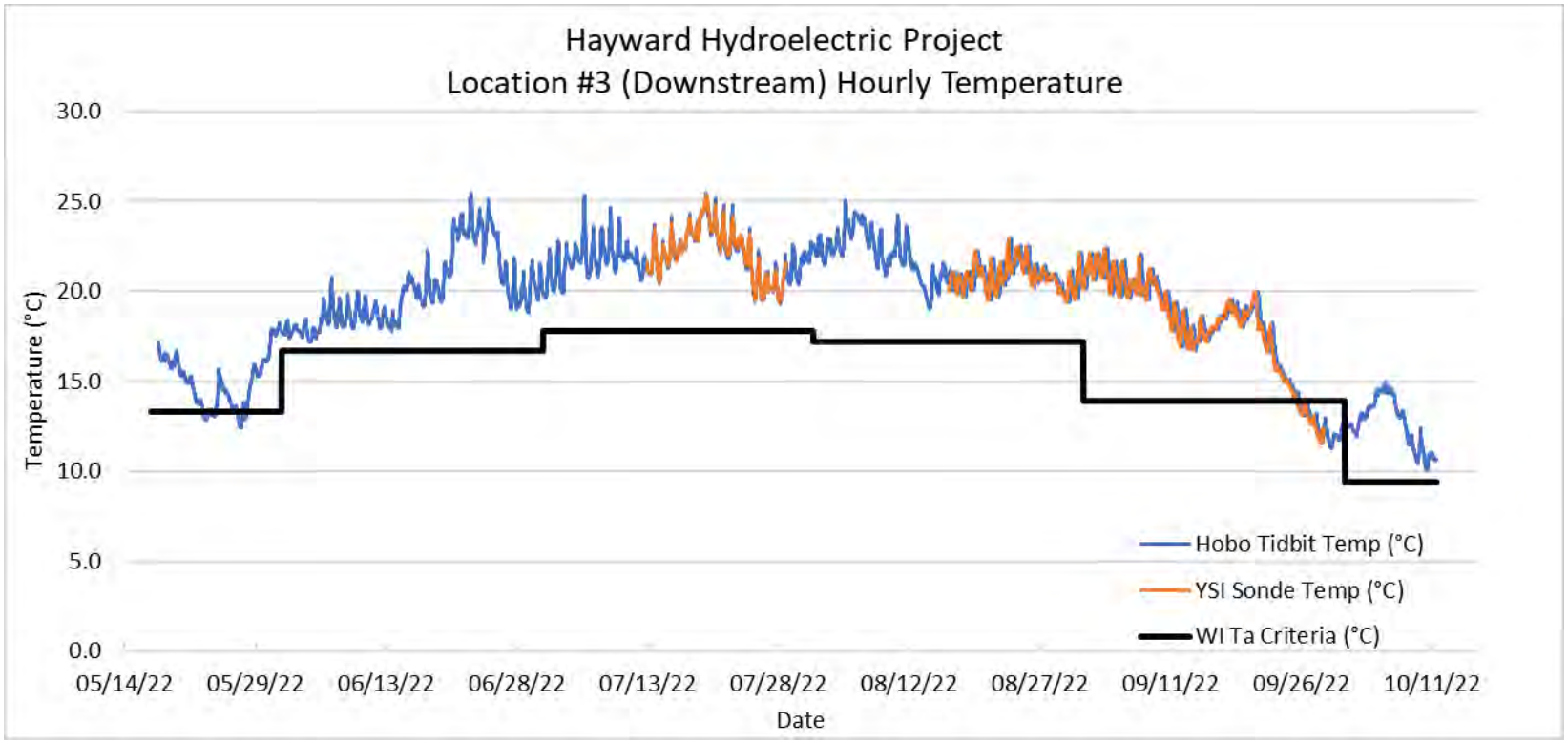

Trego Hydroelectric Project
Location #2 (Deep Hole), August 16, 2022
0
5
10
15
20
25
Depth (m)
0
2
4
6
8
10
12
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)

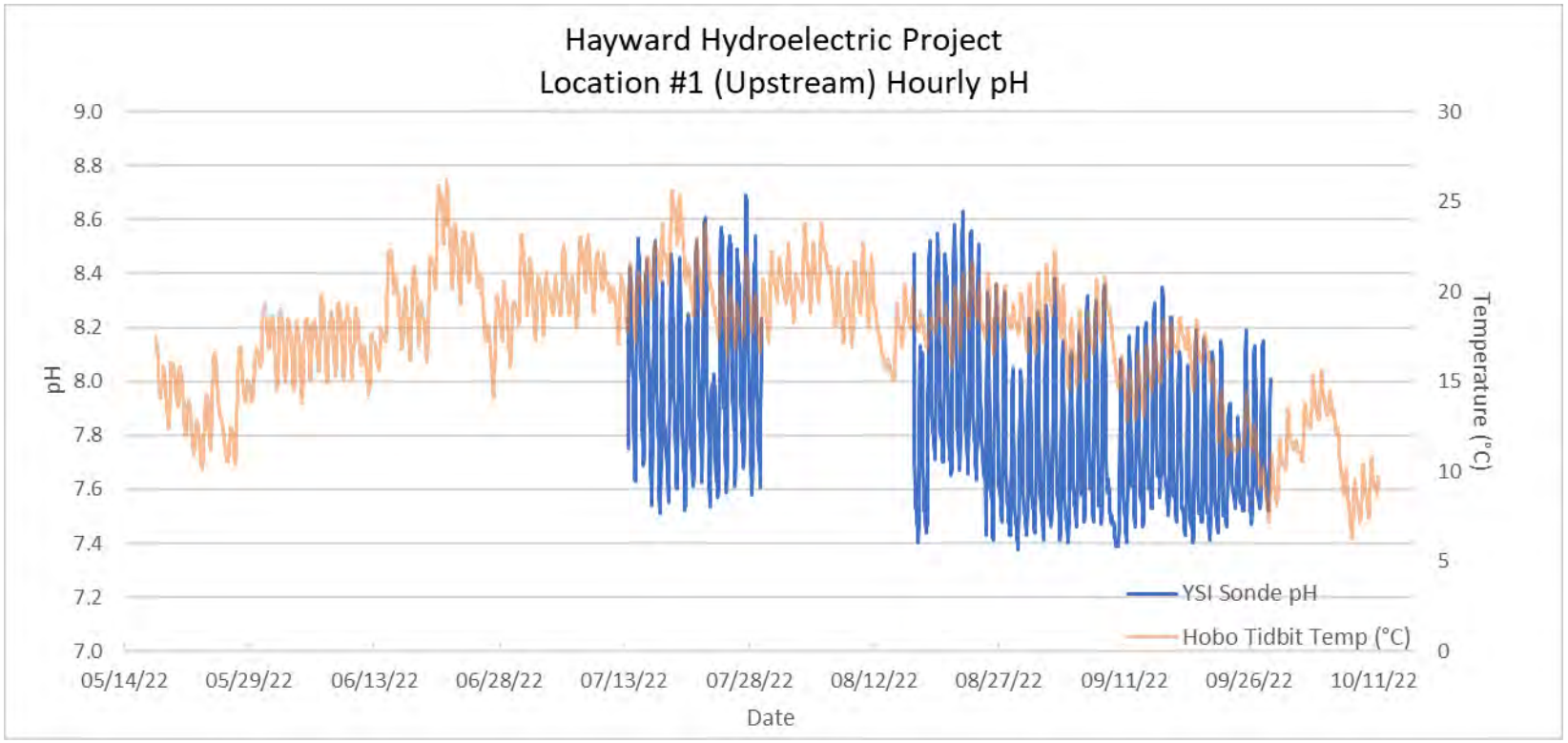

Trego Hydroelectric Project
Location #2 (Deep Hole), September 12, 2022
0
5
10
15
20
25
Depth (m)
0
1
2
3
4
5
6
7
8
Temperature (°C)
Dissolved Oxygen (mg/L)
pH (SU)

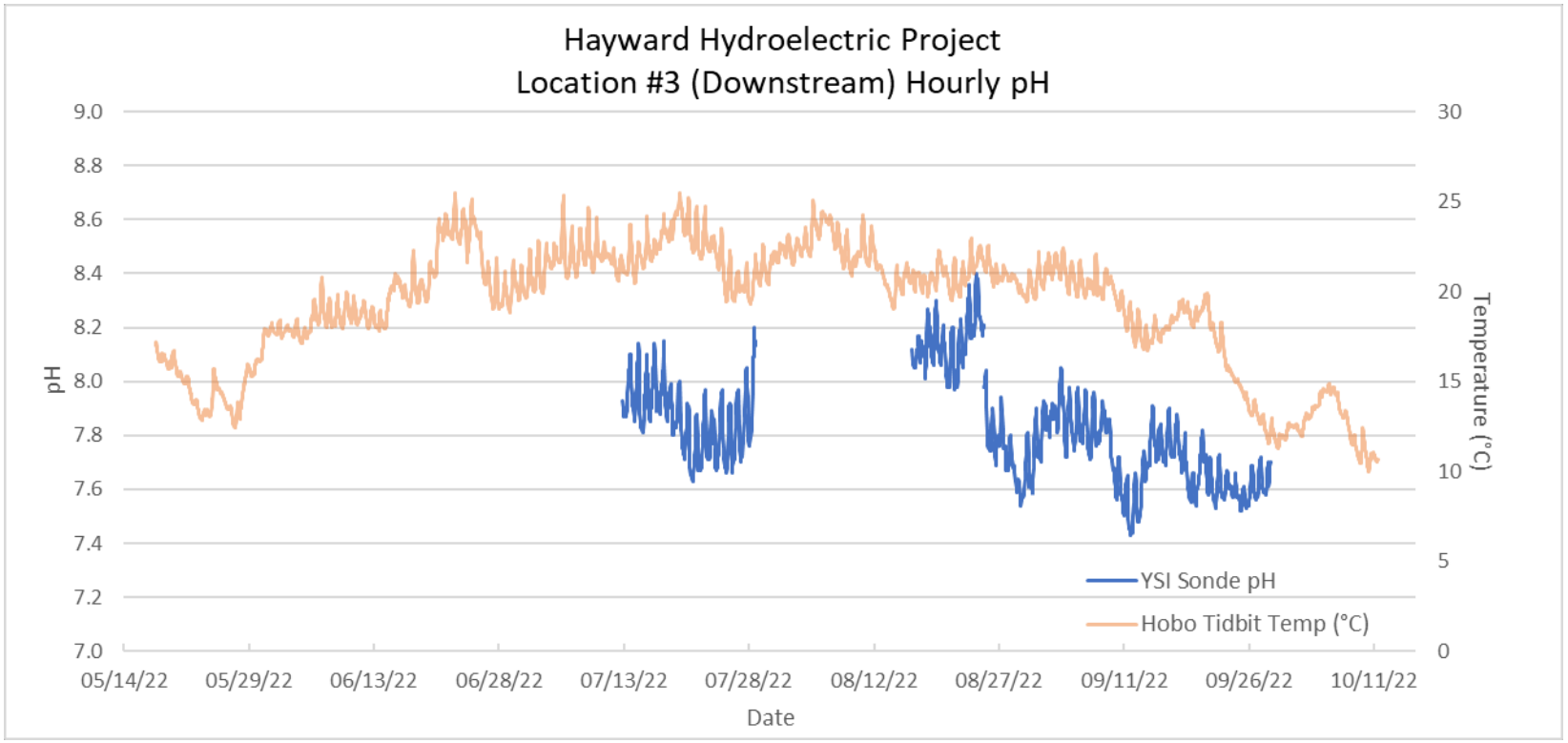
APPENDIX B

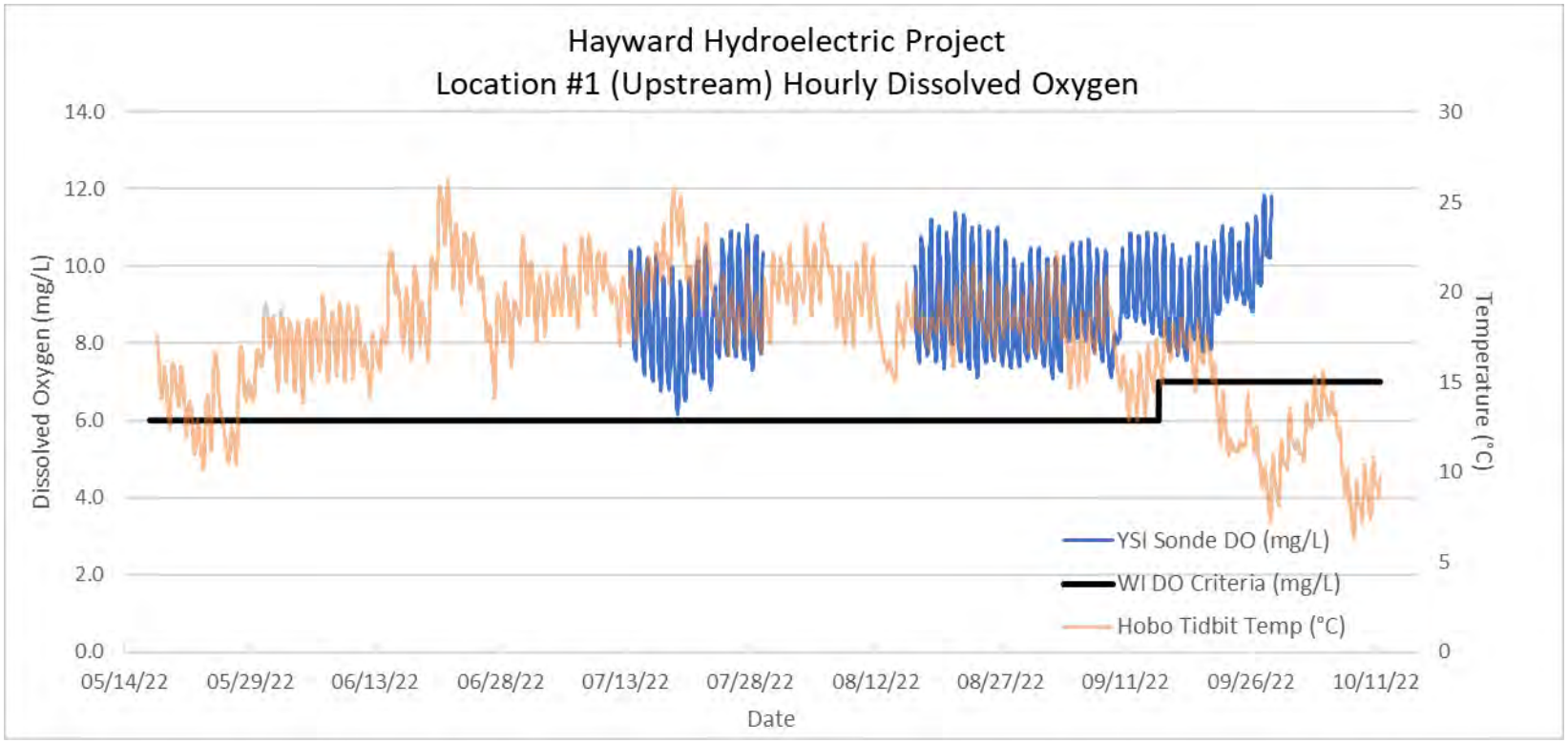
Continuous Temperature, DO, pH and Conductivity Plots

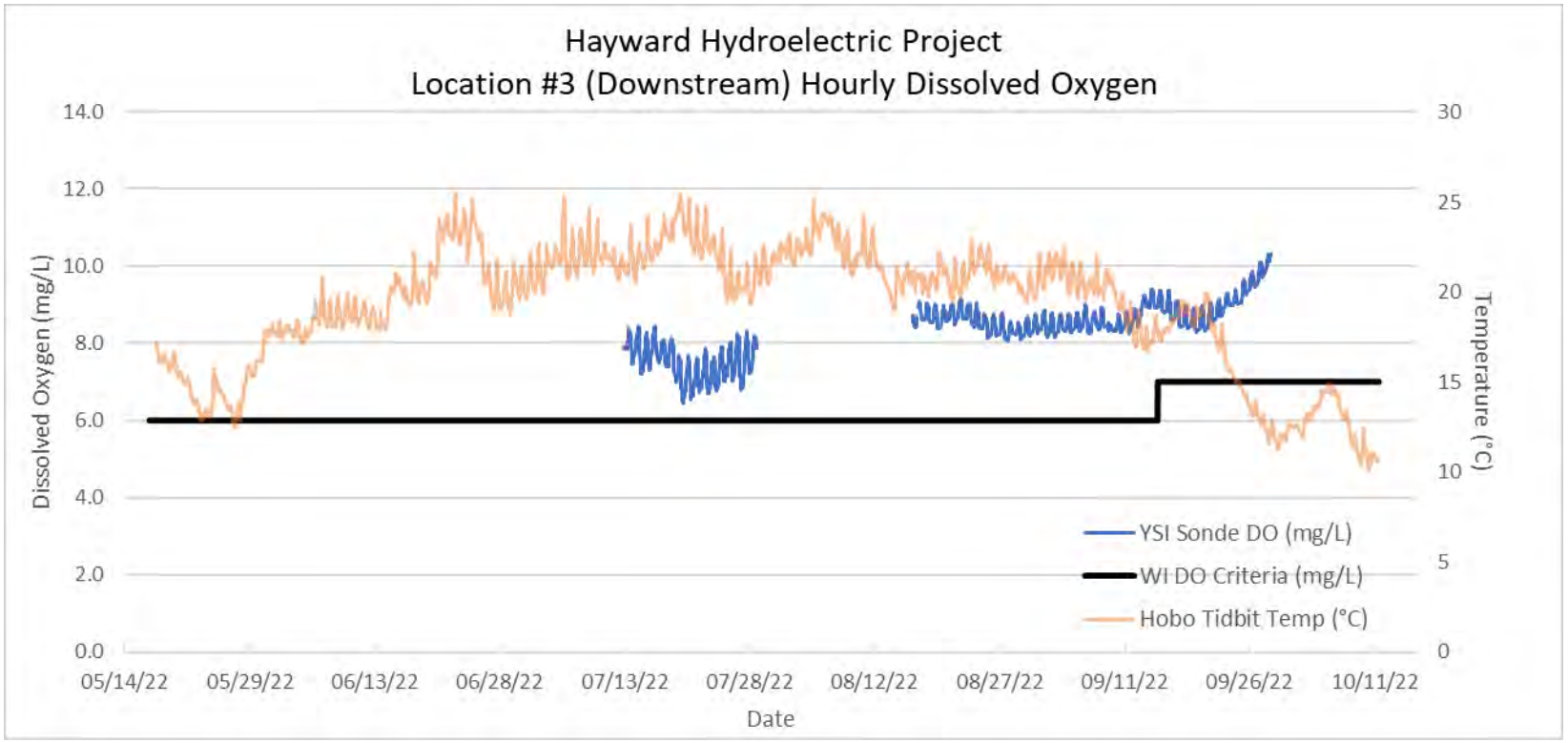

Hayward Hydroelectric Project
Location #1 (Upstream) Hourly Temperature
Temperature (°C)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

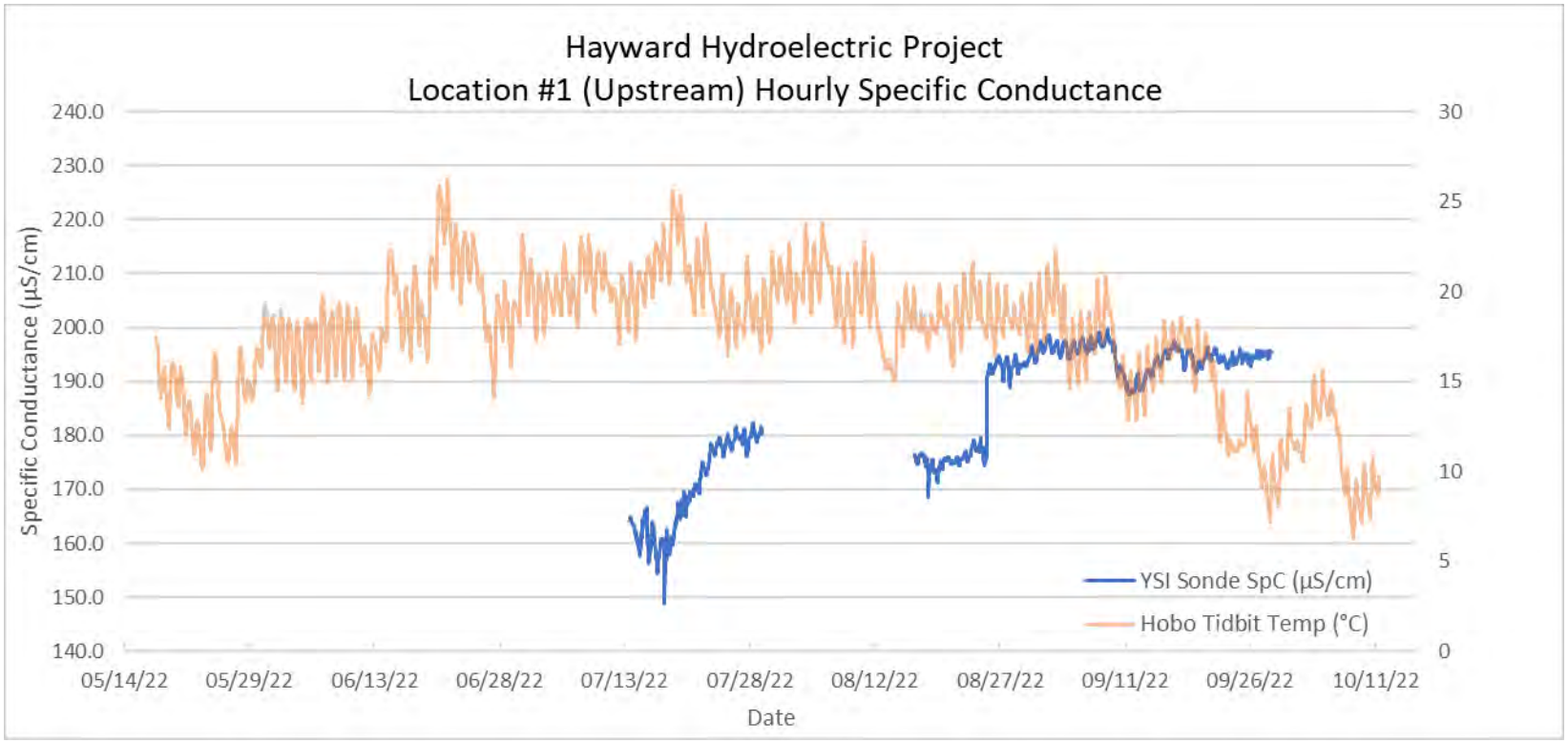

Hayward Hydroelectric Project
Location #3 (Downstream) Hourly Temperature
Temperature (°C)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

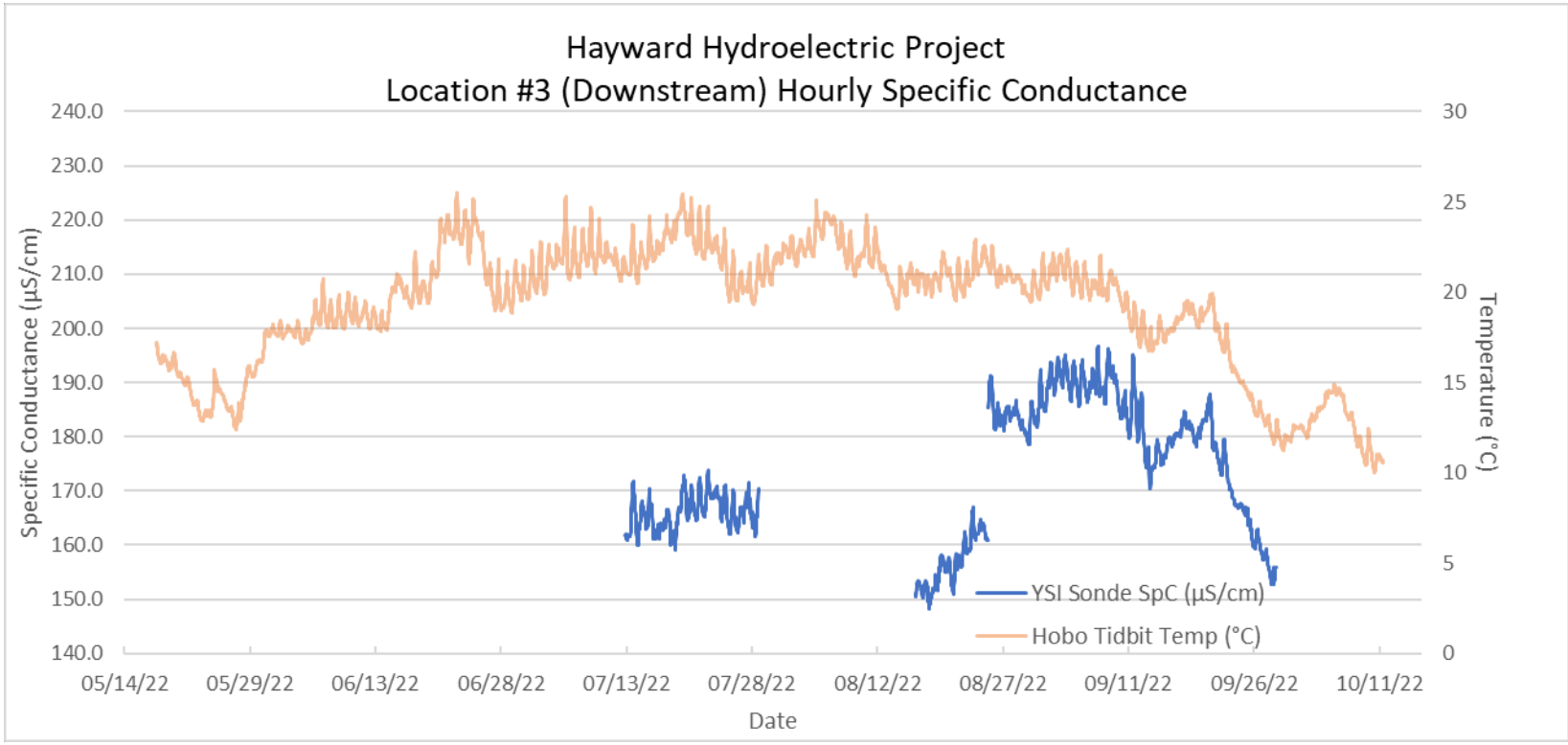

Hayward Hydroelectric Project
Location #1 (Upstream) Hourly pH
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
pH
30
25
20
15
10
5
0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde pH
Hobo Tidbit Temp (°C)

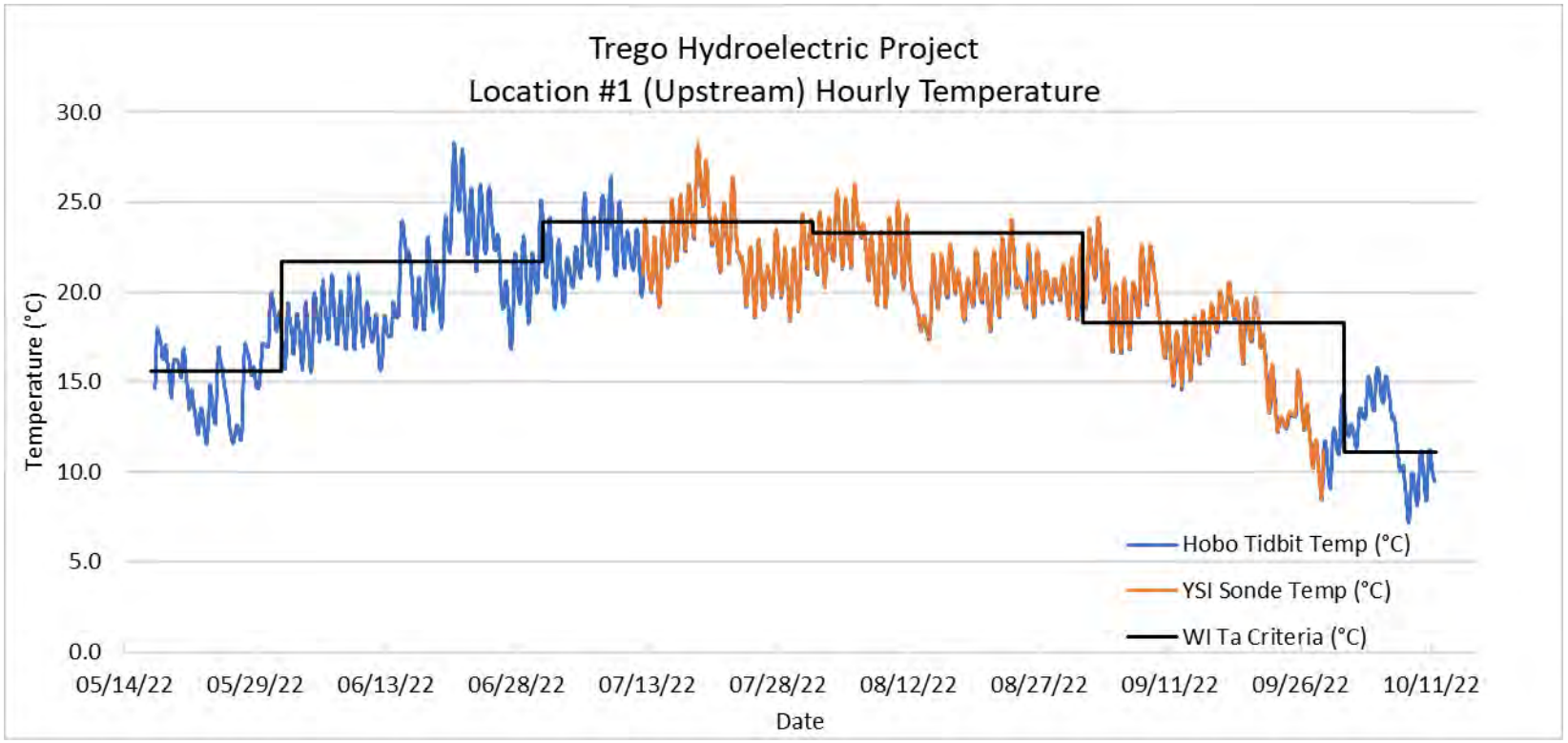

Hayward Hydroelectric Project
Location #3 (Downstream) Hourly pH
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
pH
30
25
20
15
10
5
0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde pH
Hobo Tidbit Temp (°C)

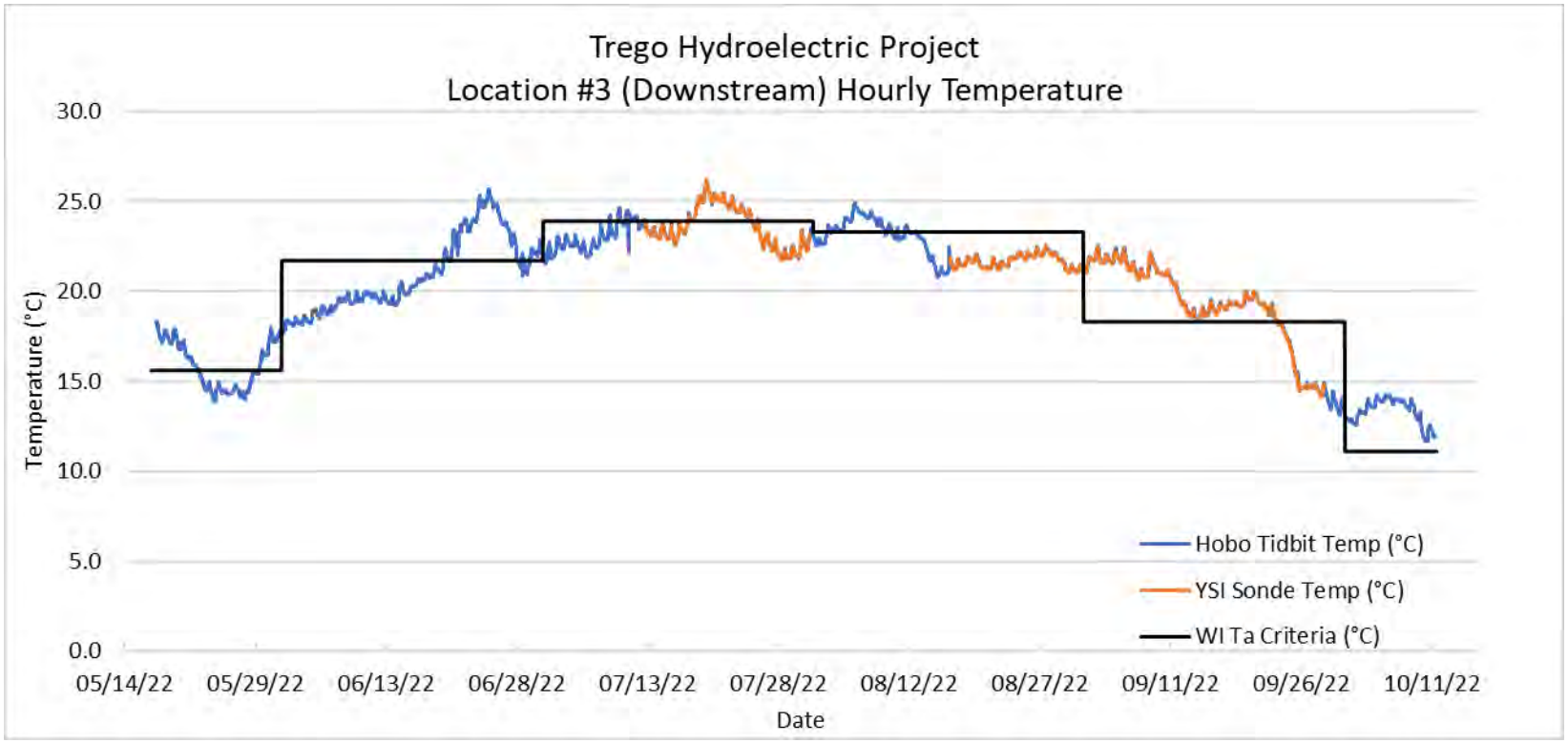

Hayward Hydroelectric Project
Location #1 (Upstream) Hourly Dissolved Oxygen
Dissolved Oxygen (mg/L)
Temperature (°C)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde DO (mg/L)
WI DO Criteria (mg/L)
Hobo Tidbit Temp (°C)

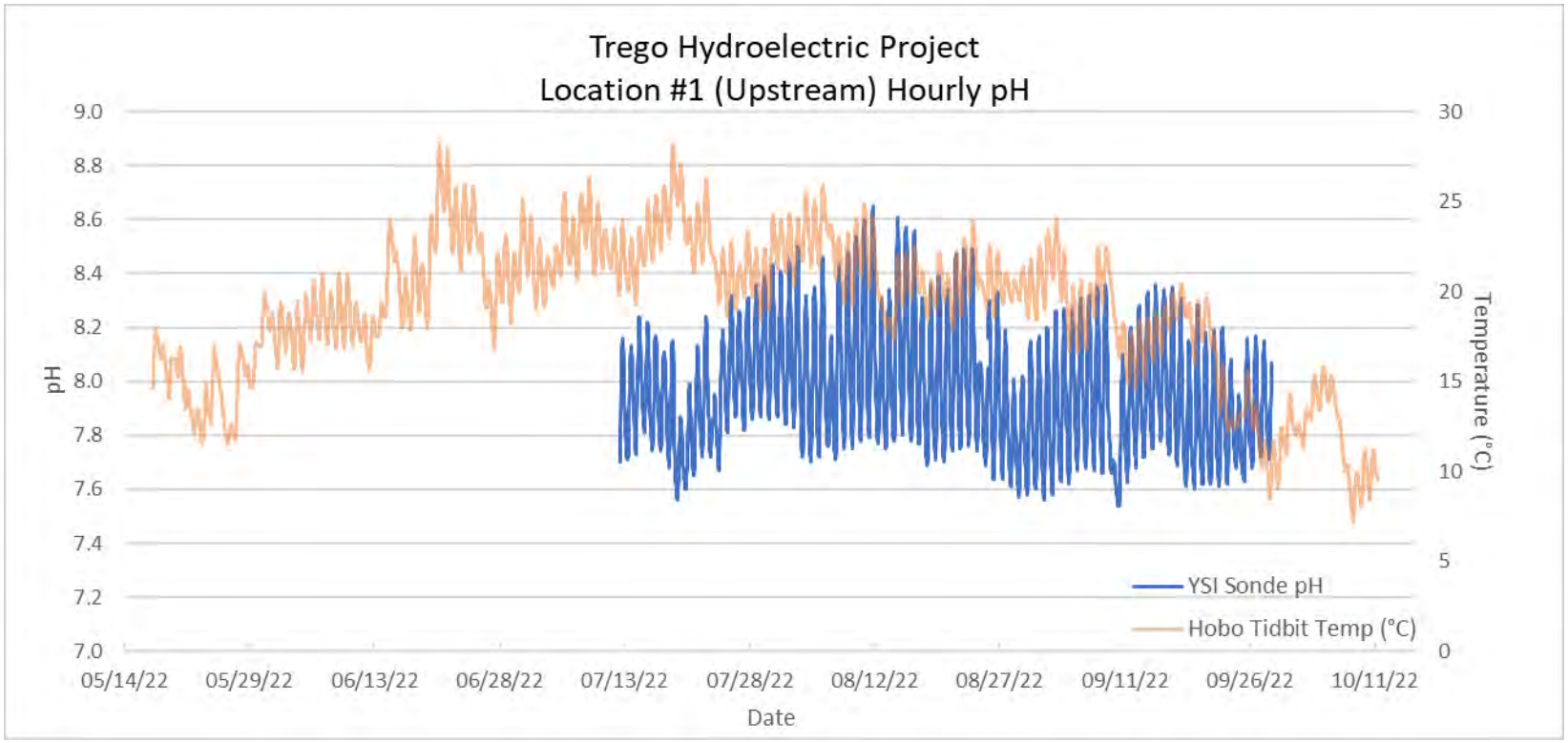

Hayward Hydroelectric Project
Location #3 (Downstream) Hourly Dissolved Oxygen
Dissolved Oxygen (mg/L)
Temperature (°C)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde DO (mg/L)
WI DO Criteria (mg/L)
Hobo Tidbit Temp (°C)

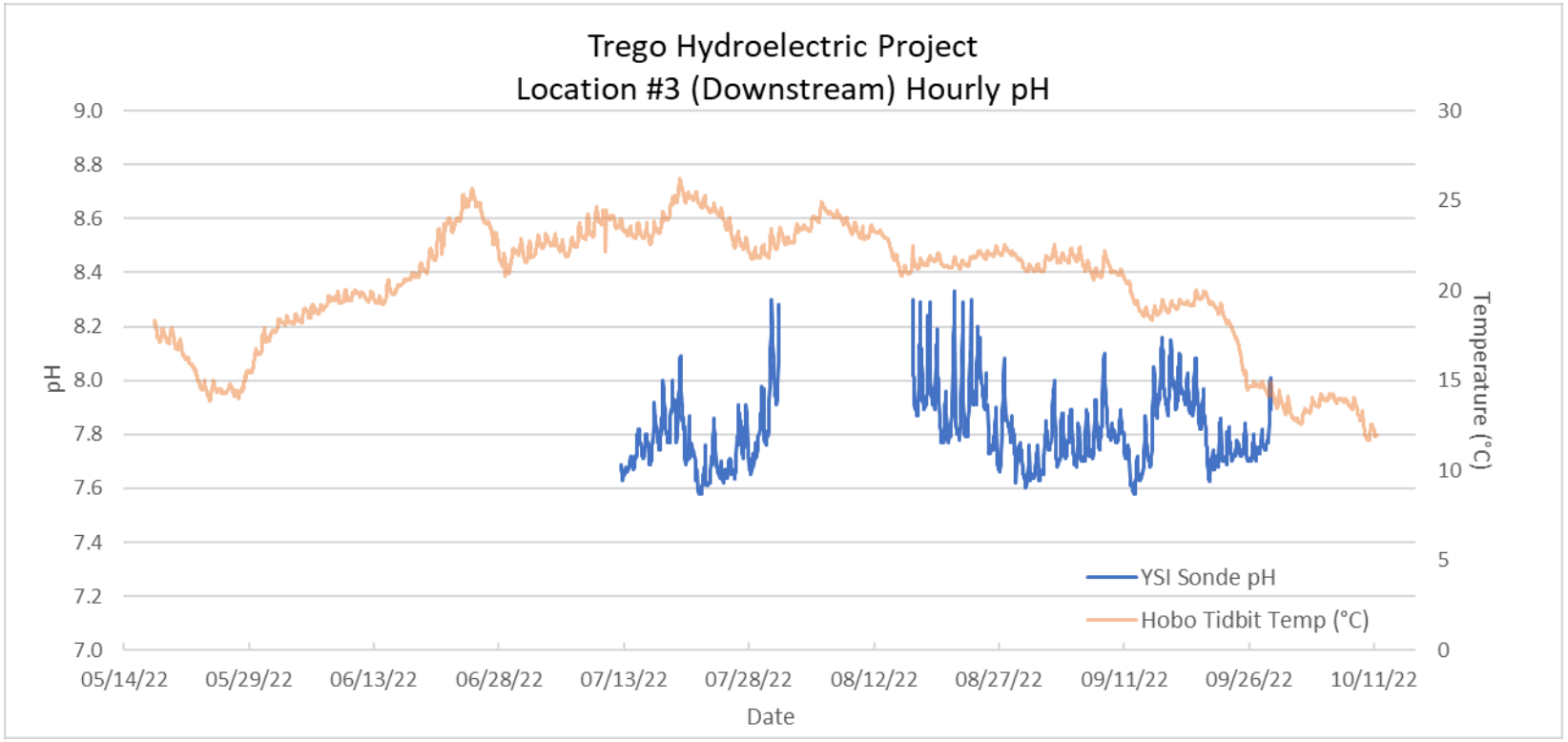

Hayward Hydroelectric Project
Location #1 (Upstream) Hourly Specific Conductance
Specific Conductance (µS/cm)
240.0
230.0
220.0
210.0
200.0
190.0
180.0
170.0
160.0
150.0
140.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde SpC (µS/cm)
Hobo Tidbit Temp (°C)

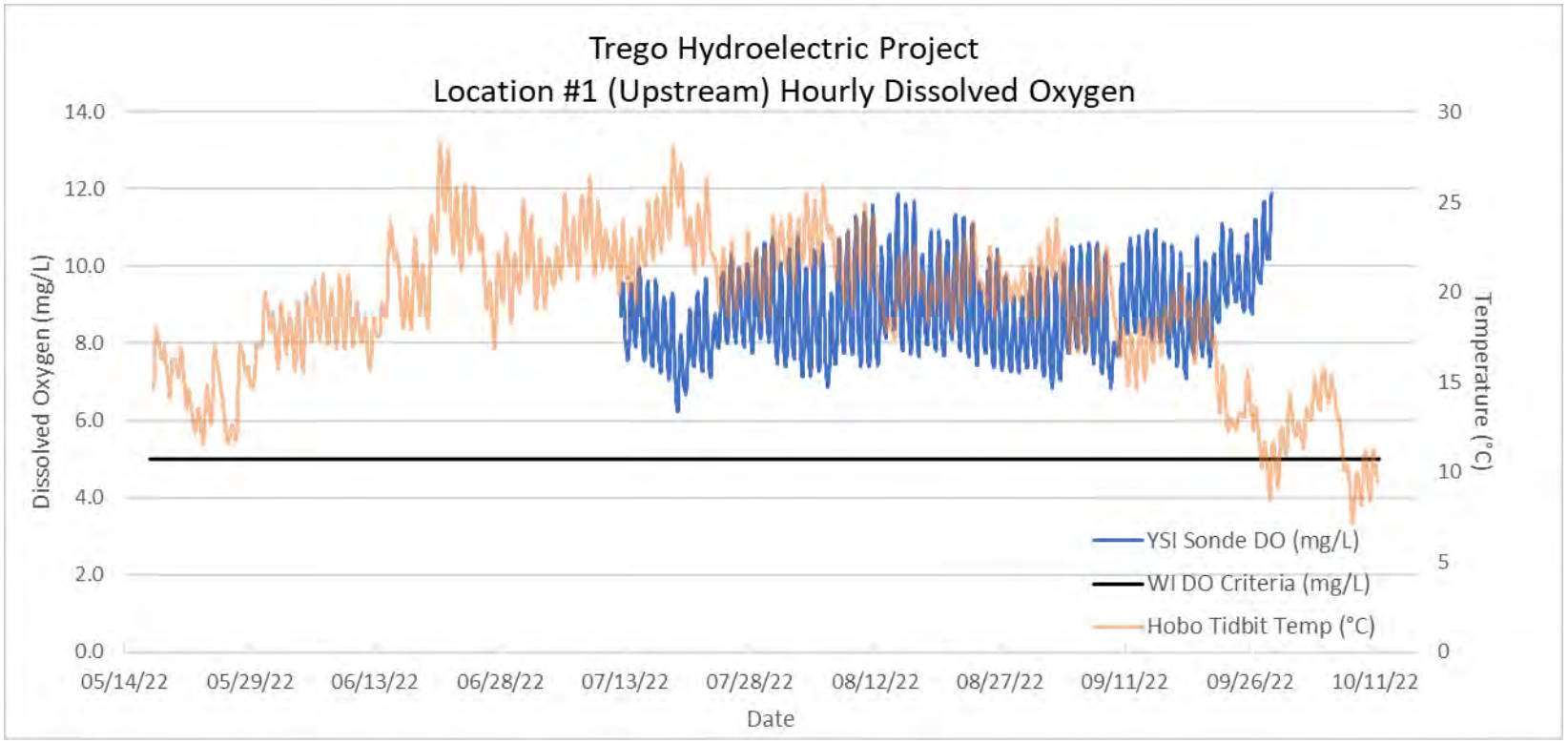

Hayward Hydroelectric Project
Location #3 (Downstream) Hourly Specific Conductance
Specific Conductance (µS/cm)
Temperature (°C)
240.0
230.0
220.0
210.0
200.0
190.0
180.0
170.0
160.0
150.0
140.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde SpC (µS/cm)
Hobo Tidbit Temp (°C)

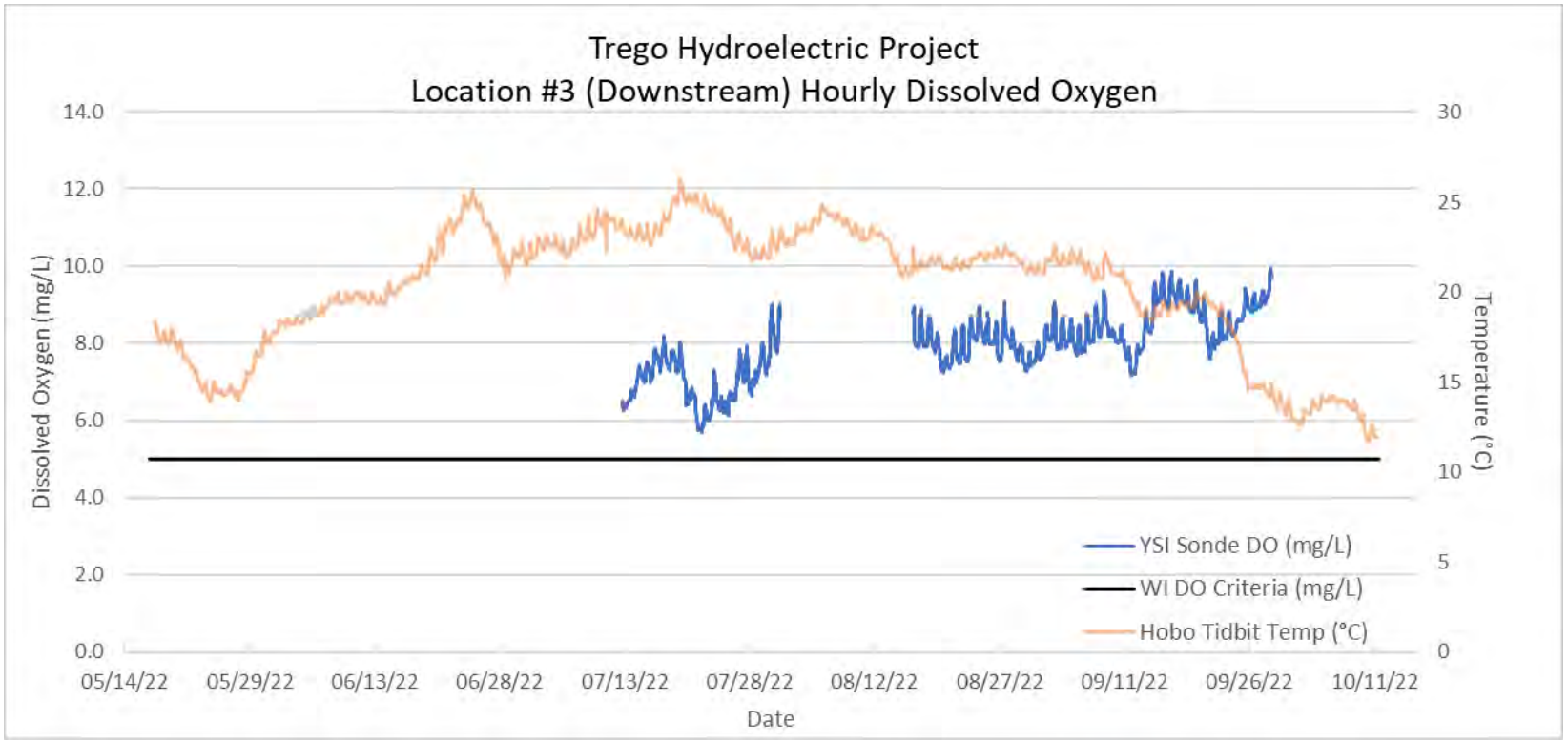

Trego Hydroelectric Project
Location #1 (Upstream) Hourly Temperature
Temperature (°C)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

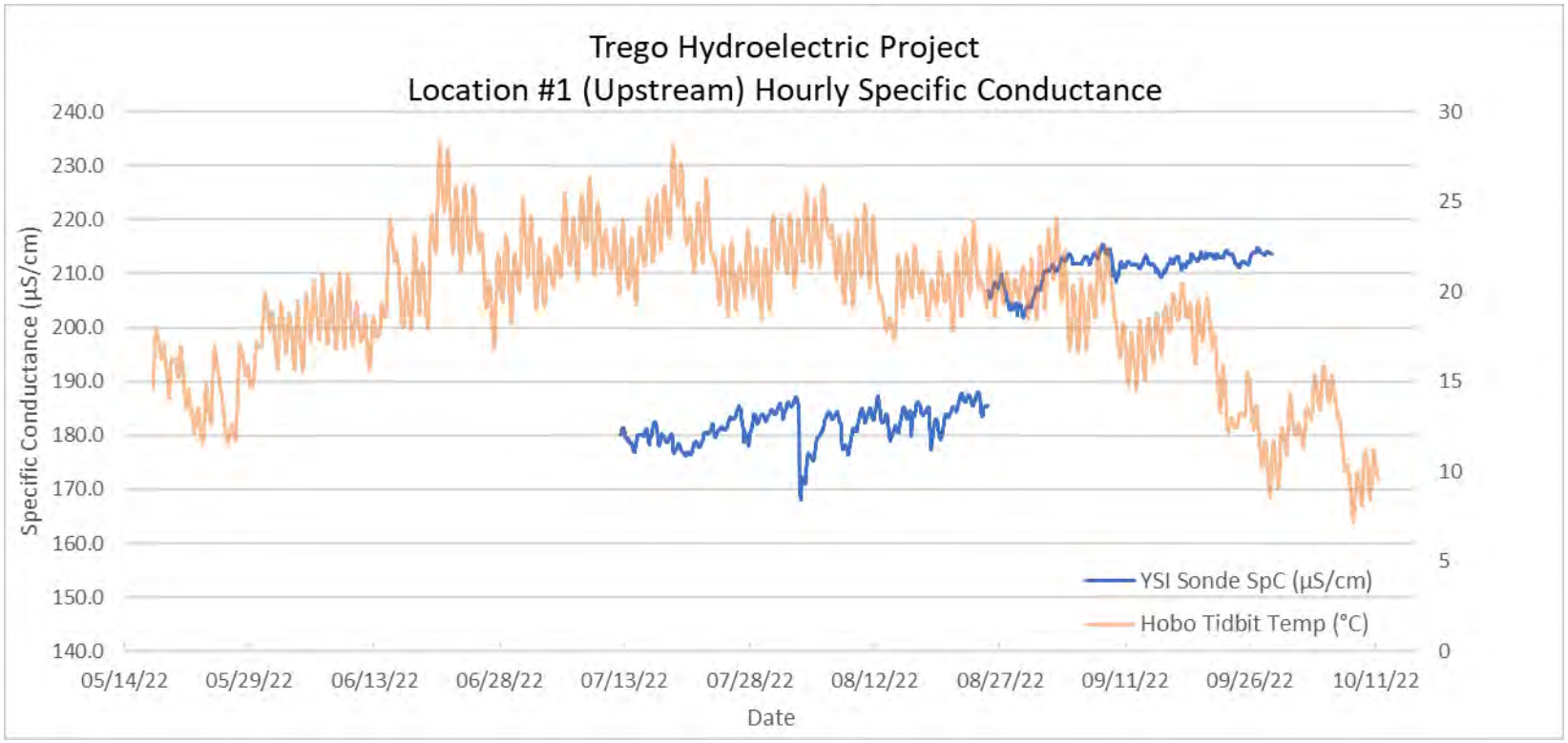

Trego Hydroelectric Project
Location #3 (Downstream) Hourly Temperature
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

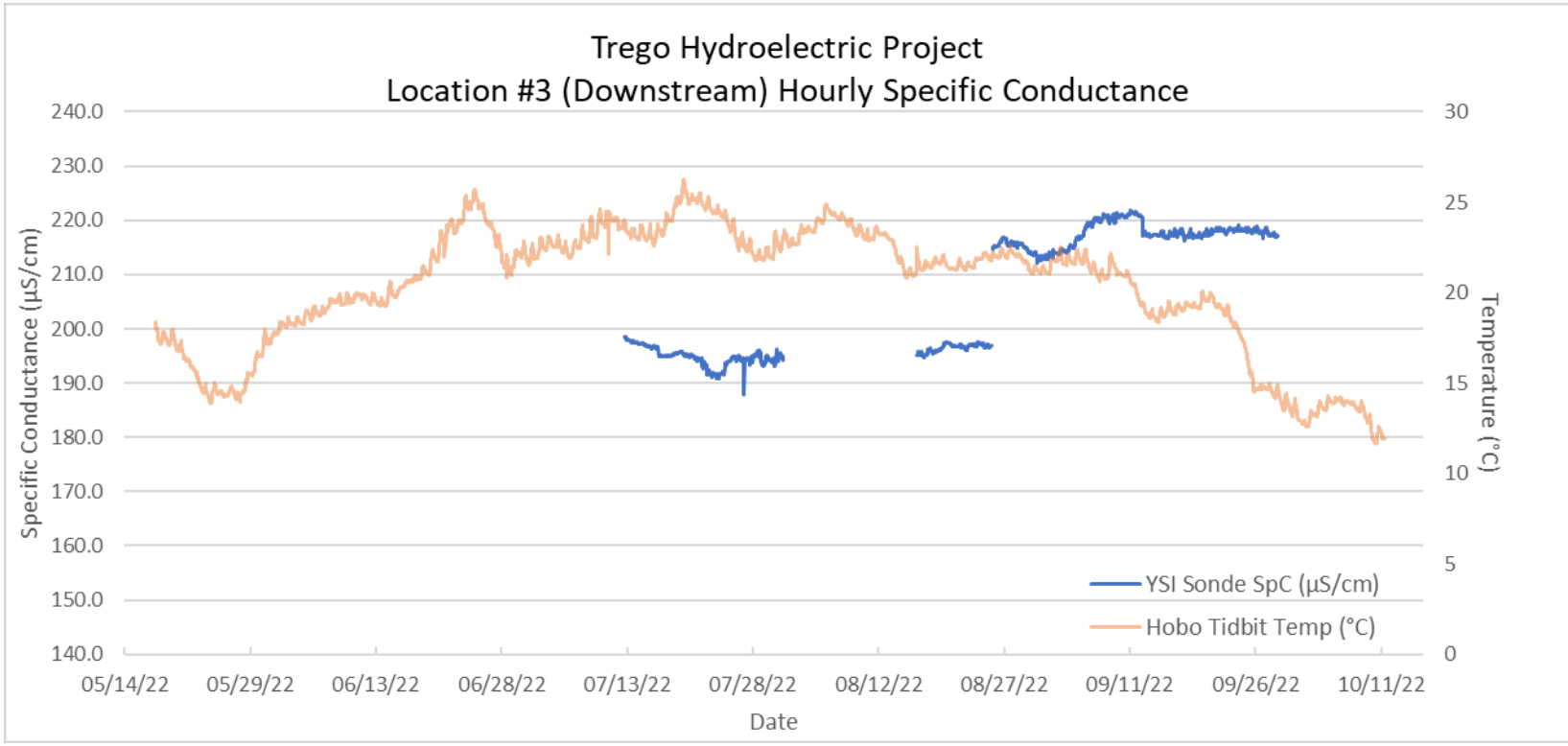

Trego Hydroelectric Project
Location #1 (Upstream) Hourly pH
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
pH
30
25
20
15
10
5
0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde pH
Hobo Tidbit Temp (°C)


Trego Hydroelectric Project
Location #3 (Downstream) Hourly pH
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
pH
30
25
20
15
10
5
0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde pH
Hobo Tidbit Temp (°C)


Trego Hydroelectric Project
Location #1 (Upstream) Hourly Dissolved Oxygen
Dissolved Oxygen (mg/L)
Temperature (°C)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde DO (mg/L)
WI DO Criteria (mg/L)
Hobo Tidbit Temp (°C)


Trego Hydroelectric Project
Location #3 (Downstream) Hourly Dissolved Oxygen
Dissolved Oxygen (mg/L)
Temperature (°C)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde DO (mg/L)
WI DO Criteria (mg/L)
Hobo Tidbit Temp (°C)


Trego Hydroelectric Project
Location #1 (Upstream) Hourly Specific Conductance
Specific Conductance (µS/cm)
240.0
230.0
220.0
210.0
200.0
190.0
180.0
170.0
160.0
150.0
140.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde SpC (µS/cm)
Hobo Tidbit Temp (°C)


Trego Hydroelectric Project
Location #3 (Downstream) Hourly Specific Conductance
Specific Conductance (µS/cm)
Temperature (°C)
240.0
230.0
220.0
210.0
200.0
190.0
180.0
170.0
160.0
150.0
140.0
30
25
20
15
10
5
0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde SpC (µS/cm)
Hobo Tidbit Temp (°C)

APPENDIX C

Raw Field Data Including Field Notes and Depth Profile Data (sent as a separate Excel file)

APPENDIX D

Analytical Data Including Laboratory Analysis Results (sent as a separate Excel file)

WOOD & BLANDING'S TURTLE STUDY REPORT

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Lake Hayward and Trego Lake Wood and Blanding's Turtle Nesting Habitat Study Report

Northern States Power Company
Hayward and Trego Hydroelectric Projects

GAI Project Number: R220323.02
| FERC Nos. 2417 and 2711
January 2023

Prepared by:
GAI Consultants, Inc.
3313 S Packerland Drive, Suite E
De Pere, Wisconsin 54115

Prepared on behalf of:
Mead & Hunt
1702 Lawrence Drive
De Pere, Wisconsin 54115

Lake Hayward and Trego Lake
Wood and Blanding's Turtle Nesting Habitat Study Report

Northern States Power Company
Hayward Hydroelectric Project (FERC Project No. 2417)
Trego Hydroelectric Project (FERC Project No. 2711)

GAI Project Number: R220323.02
FERC #s: 2417, 2711

January 2023

Prepared for:
Mead & Hunt
1702 Lawrence Drive
De Pere, WI 54115

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Attachment A Photo Log

1.0 Project Overview

The Hayward and Trego Hydroelectric Projects (Project or Projects) are located in the Town of Hayward, Sawyer County, Wisconsin and the Town of Trego, Washburn County, Wisconsin, respectively (Figures 1 and 2). The Projects are owned, operated, and maintained by Northern States Power Company, a Wisconsin corporation (Licensee) and operate under the authority of the Federal Energy Regulatory Commission (FERC). The current FERC license for both Hayward and Trego expire on November 30, 2025. As part of the relicensing process, the Wisconsin Department of Natural Resources (WDNR) requested the Licensee complete a wood and Blanding's turtle nesting habitat study to identify areas with suitable nesting habitat within the existing and proposed Project boundaries. On behalf of Mead & Hunt, GAI is pleased to submit the results of a Wood and Blanding's Turtle Nesting Habitat Study (Study or Studies) conducted June 6-8, 2022, to fulfill this request. This Study report provides baseline data on available suitable nesting habitat in the following areas for both Projects:

- Reservoir shorelines upstream (surveyed by boat) and downstream (surveyed on foot) of the Hayward and Trego dams,
- Upland shoreline owned by the Licensee and open to the public (Figure 3; surveyed on foot), and
- Upland areas within 200 feet of the river's edge for wood turtles and at least 984 feet for Blanding's turtles (surveyed on foot where feasible, and via remote desktop where access was not appropriate (i.e., private lands not owned by Licensee).

2.0 Introduction

Lake Hayward is a 191-acre impoundment located in the middle of the Namekagon River Watershed which is primarily forest and wetland. It is considered an outstanding/exceptional resource water under NR102 under the WDNR Fisheries Program. The city of Hayward, and in effect the lake's namesake, came from the last name of its founder who realized the potential of this area of the Namekagon River as a mill pond for timber storage. Dams were first constructed in 1882 for this purpose, a year after the railroad was constructed in this area. The large wood posts from the old railway that transported the lumber are still present in the lake today, now fulfilling a purpose as fish habitat.

Trego Lake is a 383-acre impoundment, also located in the middle of the Namekagon River Watershed and is considered an outstanding/exceptional resource water under NR102. As with most communities in the area, the Town of Trego was created in part by the railroads and a need for logging in the 1800s. The area is now popular for recreational activities. Trego Lake is managed for power generation, fishing, and swimming but is currently considered impaired due to excess algal growth per the WDNR Surface Water Data Viewer. Since 1989, the Trego Lake District has been working to improve the lake and water quality.

Both lakes are located on the mainstem of the Namekagon River, placing them within the St. Croix National Scenic Riverway.

The wood turtle (G*lyptemys insculpta*) is a state threatened species known to be present within the boundaries of both Projects. Wood turtles prefer flowing rivers and streams with adjacent wetlands and upland deciduous forests. The turtle is unique in that it is more terrestrial than many other turtles of Wisconsin, preferring to forage in open wet meadows and shrub-carr habitats. They overwinter in river areas that are protected from freezing solid such as deep holes and undercut banks. After emerging in the spring, these turtles will forage up to 300 meters (984 feet) from their waterbody. Wood turtles will build nests from late May to early July within 61 meters (200 feet) from water's edge, in open gravel or sandy areas. The young hatch the same summer and do not overwinter in the nest as some Wisconsin turtle species (WDNR 2015).

The Blanding's turtle (*Emydoidea blandingii*) is a Wisconsin special concern species that is also known to be present near both Projects. Blanding's turtles are most commonly found in shallow, slow-moving waters that have plentiful vegetation. Marshes that are adjacent to rivers provide ideal habitat. During the active season, adults prefer shallow water, and for overwintering, they prefer deeper water, up to 3 feet. Blanding's turtles are only be found in uplands when moving between wetlands, nesting, or moving to overwintering sites. Adults will travel up to several miles during the active season when foraging. Nesting occurs from mid-late May through early July and hatchlings emerge from early August through mid-October. Hatchlings do not typically overwinter in nests. Blanding's turtles have the slowest maturation of any turtle in the state, reaching sexual maturity between 17-20 years of age (WDNR 2017).

While wood turtles and Blanding's turtles are known to be present within or near both Project boundaries, and known suitable habitat is present for both species in the vicinity of both Projects, survey data is limited. As part of the relicensing process, the WDNR requested a wood and Blanding's turtle study to further the knowledge of turtle distribution within the watershed. This Study identifies areas of suitable wood turtle nesting habitat within 200 feet of the shoreline of Lake Hayward and Trego Lake and within 984 feet of the shoreline for Blanding's turtles. Surveys for presence/absence of basking and nesting wood turtles along the shoreline were conducted concurrently with the mapping efforts. This report summarizes the results of the 2022 Wood Turtle and Blanding's Turtle Nesting Habitat Study.

3.0 Methodology

Prior to performing the field work, GAI mapped 200-foot and 984-foot buffers of the shorelines within the Projects' areas (Figures 4 and 5). Topography maps and parcel ownership were then reviewed for terrestrial access feasibility. A portion of the buffer of the Hayward Project is predominantly urban-residential, defined by the WDNR as ground cover that consists of impermeable surfaces, landscaped areas, and manicured lawns having consistent grass coverage with height less than 6 inches between mowing. This landcover type is not considered suitable habitat for nesting turtles, and therefore was not surveyed (Figure 6).

Shorelines within the existing and proposed boundaries of each Project were surveyed for the presence of wood and Blanding's turtle nesting habitat. The reservoirs' shorelines were surveyed by boat, moving slowly, parallel to the shore and using binoculars to provide a good view into the riparian and upland areas (Figures 6 and 7). The bypassed reach at Hayward and the Namekagon River downstream of the Trego dam were surveyed on foot, as were the areas accessible to the public (Figure 3). Roads within the nesting buffers were driven to identify suitable nesting habitat in upland areas such as road shoulders, roads, driveways, and on private property that could be seen from the road.

Suitable turtle nesting habitat was mapped using a Trimble R1 GNSS Receiver with a GPS device. Any additional areas (i.e., those areas which could not be viewed from a publicly accessible vantage point) were assessed via desktop using the information gained from the road and boat surveys to approximate the extent of suitable nesting habitat as completely as possible. Surveys took place at Trego on June 6 and 8, and at Hayward on June 6 and 7, 2022 when air temperatures were between 50 - 80 degrees Fahrenheit (° F). High temperatures ranged from 69° F to 77° F. Suitable nesting habitat included a sand or gravel substrate that was either unvegetated or sparsely vegetated, received sun exposure for most of the day during late spring or summer, and was within 984 feet of the river's edge.

In addition to mapping the nesting habitat, the presence and species of any basking turtles was recorded as was any observed evidence of turtle nesting activity within the survey area. Visual encounter surveys (VES) for presence/absence of basking and nesting wood and Blanding's turtles on shorelines and along roadways were conducted concurrently, approximating WDNR survey guidelines

(WDNR PUB-ER-684, WDNR PUB-ER-683). Shoreline VES were completed by motoring around the perimeter of each lake by boat.

Licensee-owned property open to the public within 984 feet of the water was meandered on foot (Figure 3). Within these areas, two surveyors walked abreast approximately 10-15 meters apart along the shoreline, adjusting the intervals to accommodate for topography and vegetation restrictions. Roads within the nesting buffers were driven to look for turtles on road shoulders, roads, driveways, and on private property that could be seen from the road. Because the wood and Blanding's turtles are known to be present within the vicinity of both Projects, and it was assumed that the species are also present within the Project boundaries, the surveys to identify nesting and basking wood and Blanding's turtles were conducted only once, concurrent with the nesting habitat surveys.

4.0 Results and Discussion

During the visual encounter surveys, no wood or Blanding's turtles were observed at either the Hayward or Trego Projects. Basking painted turtles were observed at Hayward and were restricted to the eastern half of the lake, which contains substantially more natural shoreline and basking areas. Many painted turtles (*Chrysemys picta*), softshell turtles (*Apalone* spp.) and snapping turtles (*Chelydra serpentina)* were observed in the Trego Project area. The Trego Project had a higher number of turtles observed than the Hayward Project. On one log alone, 17 painted turtles and 1 snapping turtle were observed. Turtles were present throughout the lake and basking logs along the shoreline of Trego Lake were plentiful. Fewer logs and turtles were observed upstream where the project is more riverine. Observed species consisted primarily of painted turtles; however snapping and softshell turtles were also seen in more than one location. Photographs of turtle nesting habitat around Hayward and Trego Lakes can be found in Attachment A.

4.1 Hayward Project

A total of 1,529,800 square feet (35.12 acres) of turtle nesting habitat was mapped within 984 feet of Lake Hayward and therefore suitable for Blanding's turtle nesting; 278,653 square feet (6.40 acres) of this nesting habitat was within 200 feet of the shore and therefore suitable for wood turtle nesting (Figure 6). The majority of nesting habitat mapped consisted of gravel roads, road shoulders, driveways, and parking lots. Lake Hayward has a heavily developed shoreline and minimal suitable nesting habitat is present. Shoreline residential areas were generally dominated by manicured lawns and devoid of basking logs in the water; only a few residential property shorelines had small sandy areas that could be suitable for turtle nesting.

Wood and Blanding's turtles have been previously documented in the river below the Hayward Dam. This area presents high quality habitat for both turtles, providing flowing water, varied in-stream habitat, natural shorelines, and forage areas, yet suitable nesting area is relatively low in the more natural areas. The shoreline below the dam is mostly thick vegetation and alder thicket. The downstream shoreline also had an area of steep sloped bank, a creek, and an area having standing water. This type of habitat provides basking and forage habitat for both species.

While wood and Blanding's turtles are likely using the river where they have been documented below the Hayward Dam, and possibly the riverine area upstream of the impoundment (currently undocumented), it is less likely that they are using the lake proper. Shoreline development around the lake, lack of flow and shallow water, and lack of basking areas make Lake Hayward undesirable for both species. It is possible, however, that the turtles are using the lake to overwinter.

Aside from roads, driveways, and parking areas, only two very small natural areas were mapped below the dam as potential nesting habitat. High levels of open sandy/gravel areas associated with human transportation may increase human induced mortality, however, a

recent study has suggested that anthropogenic perturbation of this sort may actually increase turtle nesting success (Murphy et al. 2022).

4.2 Trego Project

A total of 1,190,355 square feet (27.33 acres) of turtle nesting habitat was mapped within 984 feet of the Project area shoreline and therefore suitable for Blanding's turtle nesting. Suitable wood turtle nesting habitat within 200 ft of the shoreline comprised approximately 210,344 square feet or 4.83 acres (Figure 7). As with the Hayward Project, most of the suitable nesting habitat mapped within the Trego Project boundary buffers were areas of human disturbance, including roads, roadsides, driveways, parking lots, and single-track off-road routes. However, overall residential development along the shoreline and throughout the buffers was much lower. Several natural sandy areas along the shoreline provided suitable nesting habitat as well as one beach area where basking softshell turtles were observed on multiple occasions.

Overall, high quality and varied habitat is present for turtles throughout the Project buffer, and it is likely that wood and Blanding's turtles are selectively using the adjacent riverine and wetland habitats. Wood turtles have been previously documented in the river below the dam, above the impoundment, and in Mackay Creek. Blanding's turtles have been reported within a mile of the Project, but not within the Namekagon River in this area. The Namekagon River presents high quality habitat for both turtle species, providing flowing water, varied in-stream habitat, natural shorelines, adjacent upland and wetland forage areas, and overwintering habitat. Mackay Creek flowing into the Project area also provides good flow, clear water, and varied natural habitat. This area is bordered by heathy wild rice beds and emergent marsh plants. It is likely that both turtle species are using the river and creek in the Project boundary, and likely to a lesser extent the lake. The lake is deeper than either turtle prefers, and flow velocity in the lake is low. Due to the ample prime habitat in adjacent areas, it is expected that the areas of deep water and low flow are not being selected by these turtles. It is possible that the turtles are using the lake to overwinter, but the adjacent riverine habitats also provide suitable overwintering areas.

5.0 Conclusion

No nesting wood or Blanding's turtles were observed, and no wood or Blanding's turtle nests were found during this survey. While the surveyors on this project did not document nesting turtles or turtle nests of any species, it is likely that nesting success is occurring, an assumption made based on the availability of open sandy/gravel areas that are associated with no or very low human transportation. The lack of observance is likely reflective of the time of day and the short period of time surveys were conducted. Turtles are generally more active in the early mornings and late evenings and possibly after storm events.

Recent research suggests the tradeoff between human induced turtle mortality along roads may be offset by the decrease of predation of nests in these areas (Murphy et al. 2022). Natural landscape in the area was historically wooded with few areas of exposed sandy/gravely substrate suitable for nesting. When suitable nesting areas are limited, many turtles nest in the same area, and predators can easily find the aggregate nests. As anthropogenic development increases, areas of exposed sand and gravel, turtles are able to spread out their nests. Additionally, predation was found to be lower on nests occurring along a road in a linear fashion.

Nest site fidelity and other nesting ecological traits may put the wood turtle at risk (Walde et al. 2007). Female wood turtles have been found to have high nesting site fidelity. In addition, they may stage in an area for several days before completing a nest. Staging, nest-site fidelity, and a relatively short nesting season make them vulnerable to anthropogenic disturbances.

Comparatively, fewer turtles were observed at Hayward than Trego. A lack of basking logs was observed in Hayward compared to Trego. Turtle density has been correlated with the availability of

basking areas and lack of basking logs may have a detrimental effect on turtle densities (Lindeman 1999).

Overall, habitat for both wood and Blanding's turtles was observed to be present and of high quality in both locations. More undeveloped area was present within the Trego Project than the Hayward Project; Hayward having a great amount of anthropogenic development in the 984-foot buffer of that Project. Both Blanding's and wood turtles have been documented within or in the vicinity of each Project boundary, and while ample suitable habitat was mapped in each area, most of it was the result of roads and parking lots. Presence of naturally occurring suitable nesting habitat was low within both Project boundaries; Trego having more than Hayward.

6.0 References

Lindeman, Peter V. 1999. Surveys of basking map turtles *Graptemys* spp. in three river drainages and the importance of deadwood abundance. Biological Conservation 88: 33-42.

Murphy, Rowan E., Amanda E. Martin, and Lenore Fahrig. 2022. Reduced Predation on Roadside Nests Can Compensate for Road Mortality in Road-Adjacent Turtle Populations." Ecosphere13(2): e3946. https://doi.org/10.1002/ecs2.3946.

Walde, Andrew D., J.R. Bider, D. Masse, R.A. Saumure, and R.D. Titman. 2007. Nesting ecology and hatching success of the wood turtle, G*lyptemys insculpta*, in Québec. Herpetological Conservation and Biology 2(1):49-60

Wisconsin Department of Natural Resources. 2015. Wood Turtle (*Glyptemys insculpta*) Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural Resources, Madison, Wisconsin. PUB-ER-684.

Wisconsin Department of Natural Resources. 2017. Blanding's Turtle (*Emydoidea blandingii*) Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural Resources, Madison, Wisconsin. PUB-ER-683.

FIGURE 1
Hayward Hydroelectric Project Location Map

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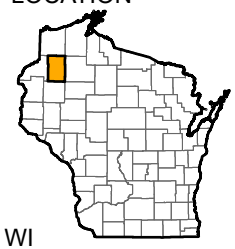
PROJECT LOCATION



SAWYER COUNTY, WI

REFERENCE: ESRI USA TOPO Maps
100k Quadrangles: Spooner (1982) and Solon Springs (1981),
Accessed 8/30/2022. WDNR Counties, 2011.
WISLR Community Boundary 2021.

LEGEND

- Shoreline within Project Area
- Community Boundary
- County Boundary

0 4,000 8,000 16,000 Feet

FIGURE 1
HAYWARD HYDROELECTRIC PROJECT LOCATION MAP

HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

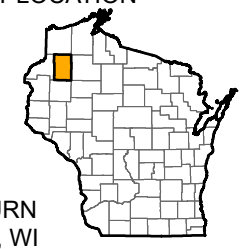
gai consultants | Mead & Hunt

DRAWN BY: EMW | DATE: 8/30/2022
CHECKED: TDB | APPROVED: LLS

G:_2022\R220323.00 - GIS\AGP\Turtle_Mapping\Hayward_and_Trego\R220323_00_Hayward_and_Trego_Turtle_Mapping\R220323_00_Hawyard_Trego_Turtle_Mapping_2022_08_30.aprx

FIGURE 2
Trego Hydroelectric Project Location Map

PROJECT LOCATION



WASHBURN COUNTY, WI

REFERENCE: ESRI USA TOPO Maps
100k Quadrangles: Spooner (1982) and Solon Springs (1981),
Accessed 8/30/2022. WDNR Counties, 2011.
WISLR Community Boundary 2021.

LEGEND

- Shoreline within Project Area
- County Boundary
- Community Boundary

0 4,000 8,000 16,000 Feet

FIGURE 1
TREGO HYDROELECTRIC PROJECT LOCATION MAP

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

gai consultants

Mead & Hunt

DRAWN BY: EMW DATE: 8/30/2022
CHECKED: TDB APPROVED: LLS

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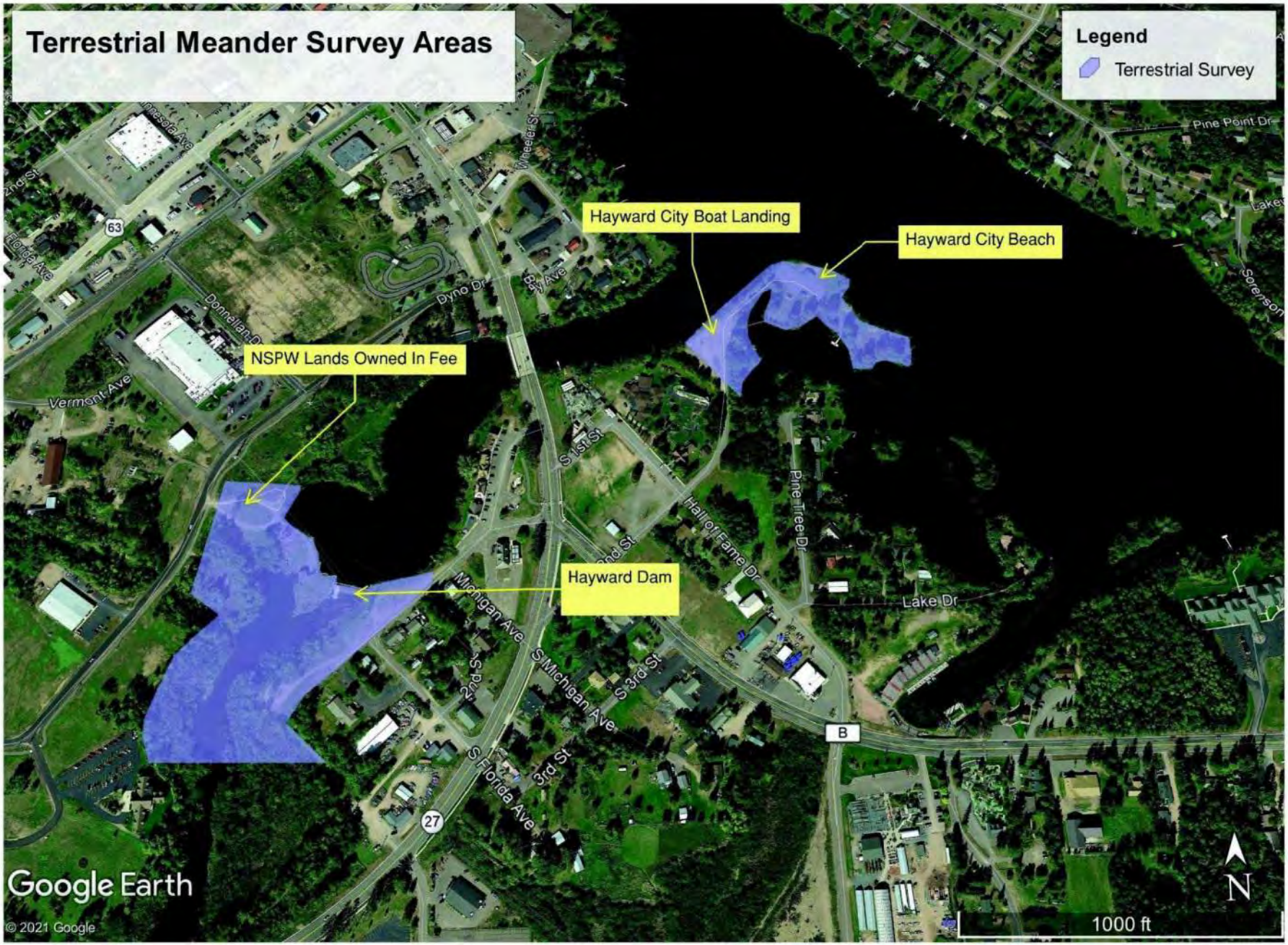
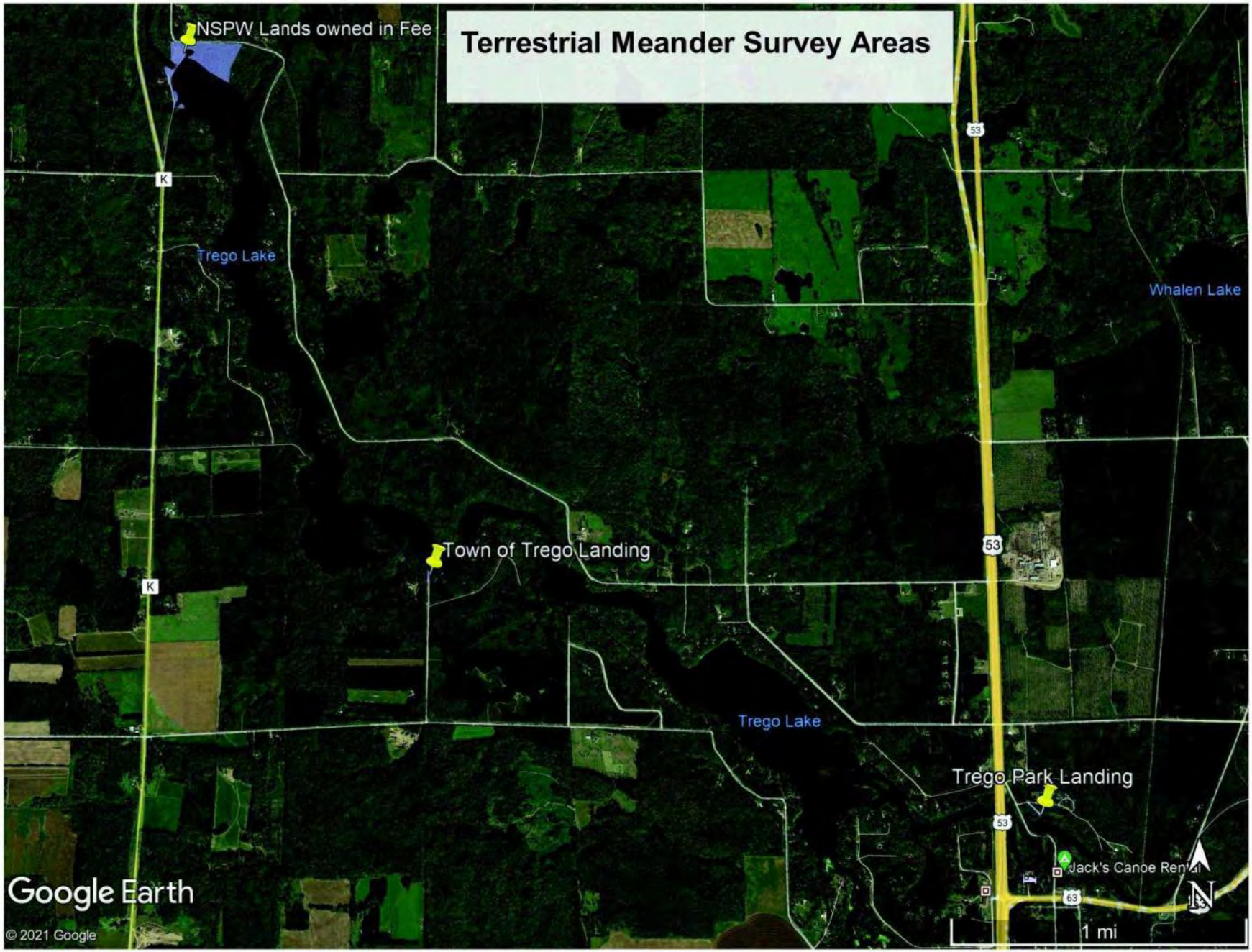
FIGURE 3

Hayward and Trego Lands Owned by Licensee and Open to the Public

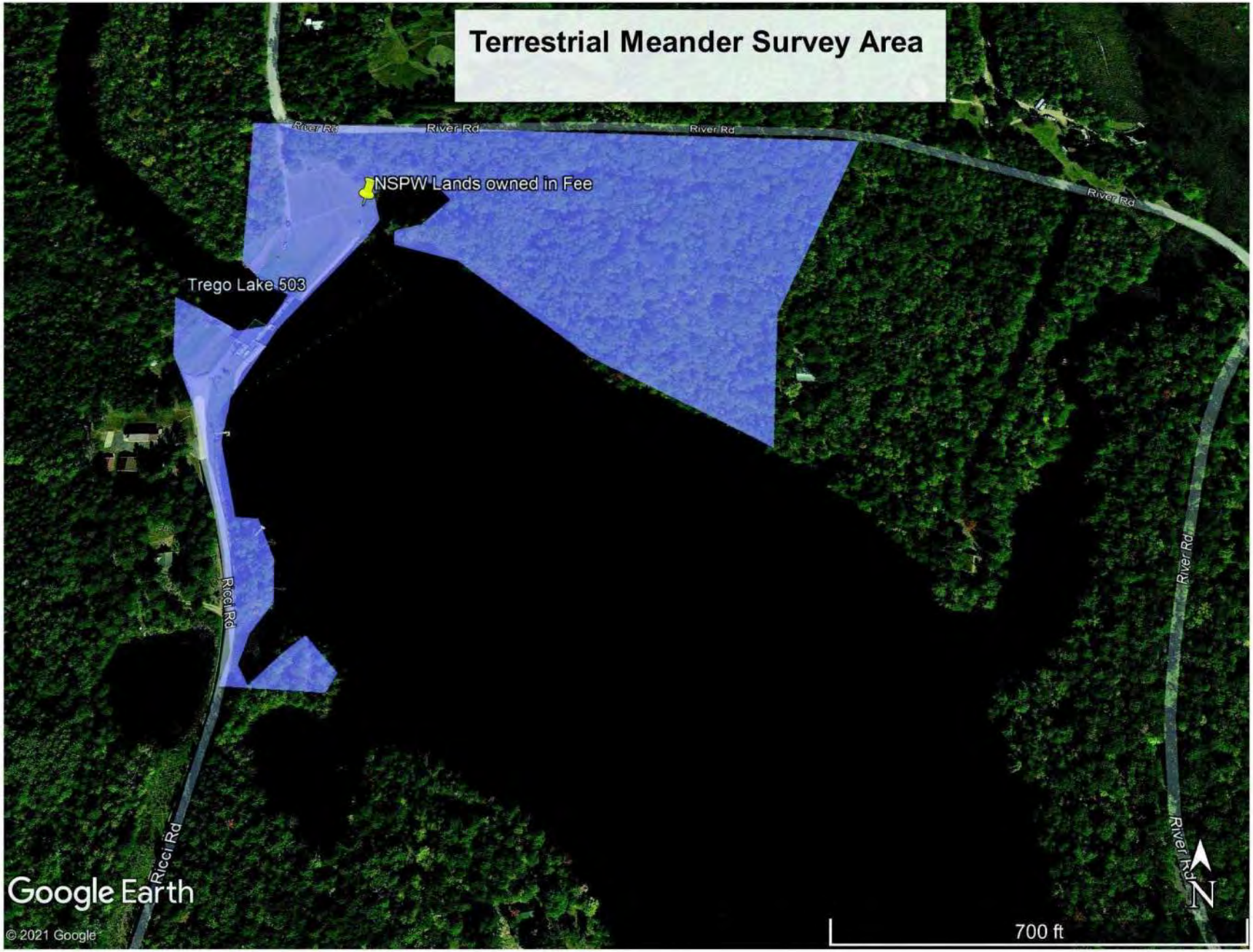
Hayward Hydroelectric Project



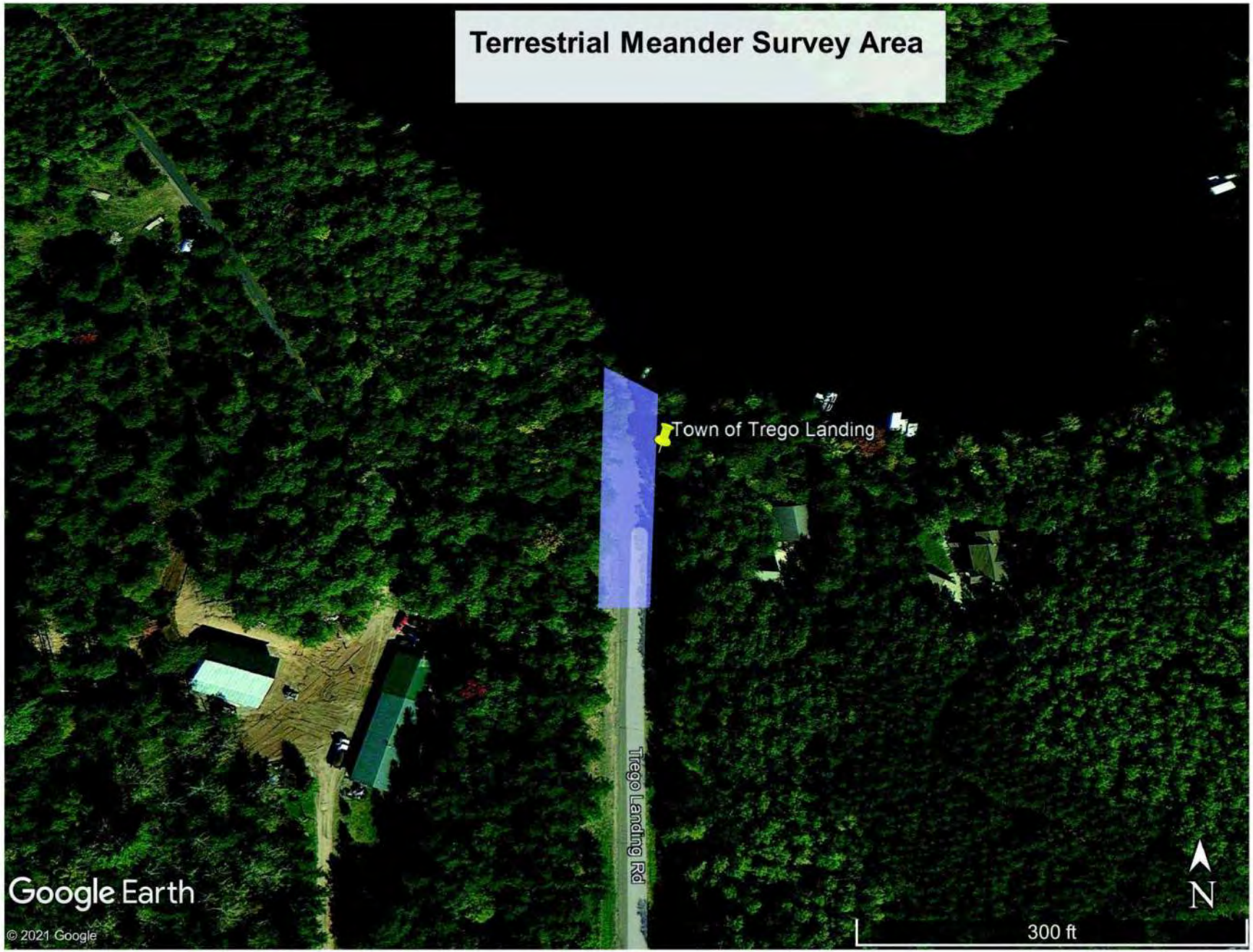
Trego Hydroelectric Project



Trego Hydroelectric Project



Trego Hydroelectric Project



Trego Hydroelectric Project

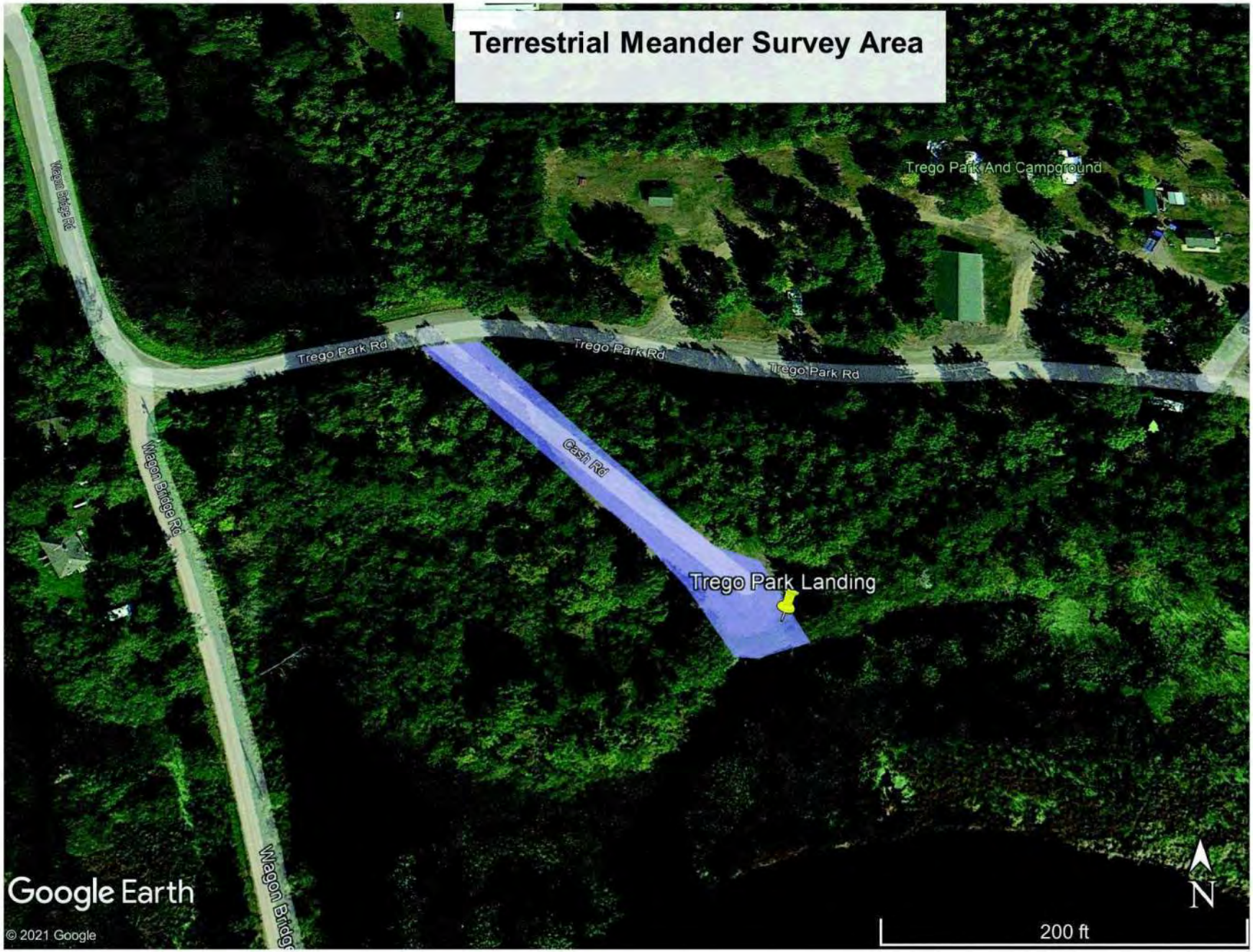
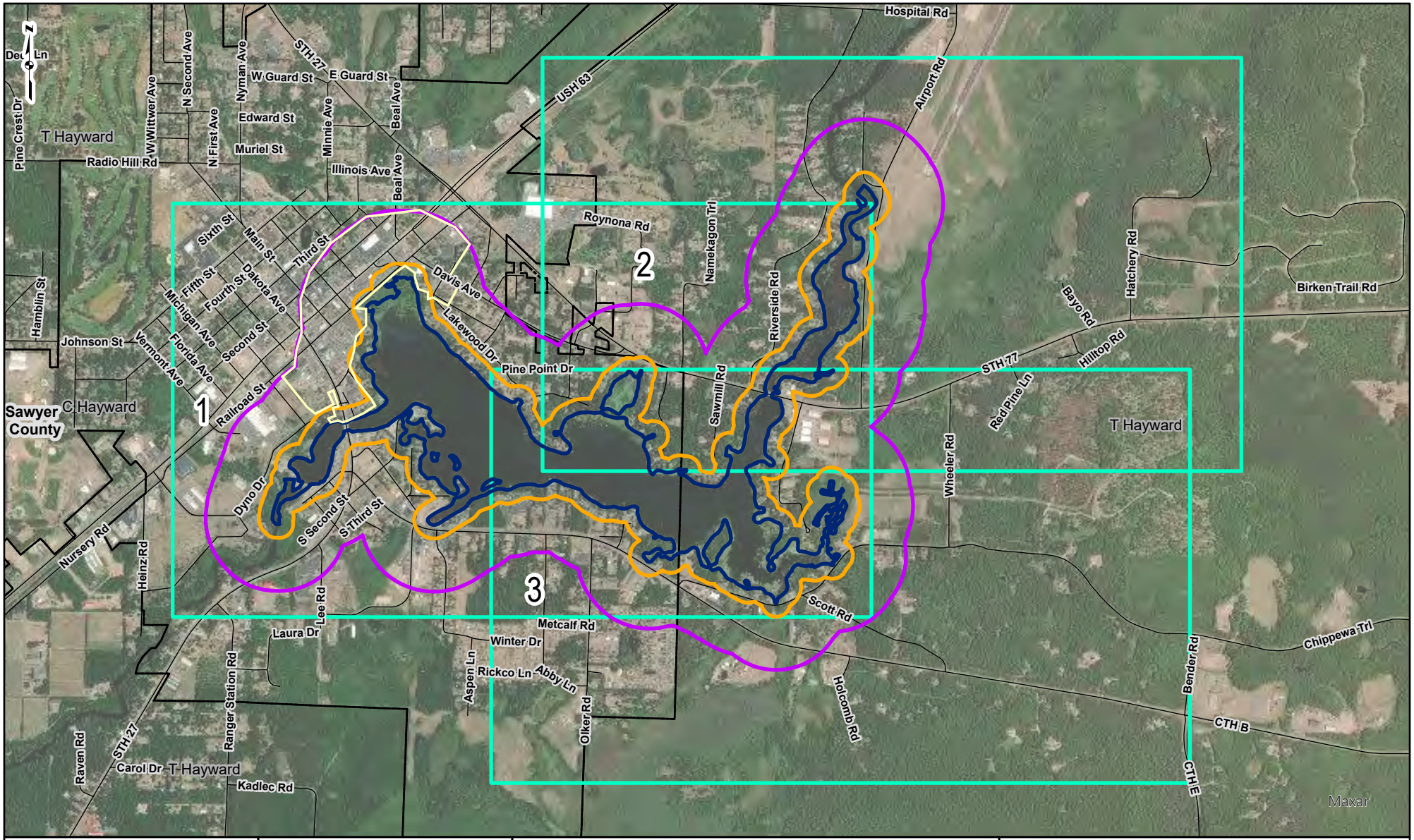
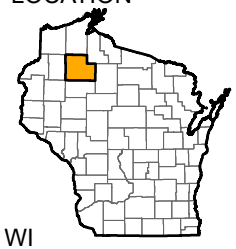


FIGURE 4
Hayward Overview Map



PROJECT LOCATION



SAWYER COUNTY, WI

REFERENCE: ESRI World Imagery, Accessed 8/30/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

LEGEND

- 200' Wood Turtle Buffer
- 984' Blanding's Buffer
- Shoreline within Project
- Sheet Index
- Hayward Urban Area
- Road Centerline
- Community Boundary
- County Boundary

0 1,000 2,000 4,000 Feet

FIGURE 4
HAYWARD OVERVIEW MAP

HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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Mead & Hunt

DRAWN BY: EMW DATE: 8/30/2022

CHECKED: TDB APPROVED: LLS

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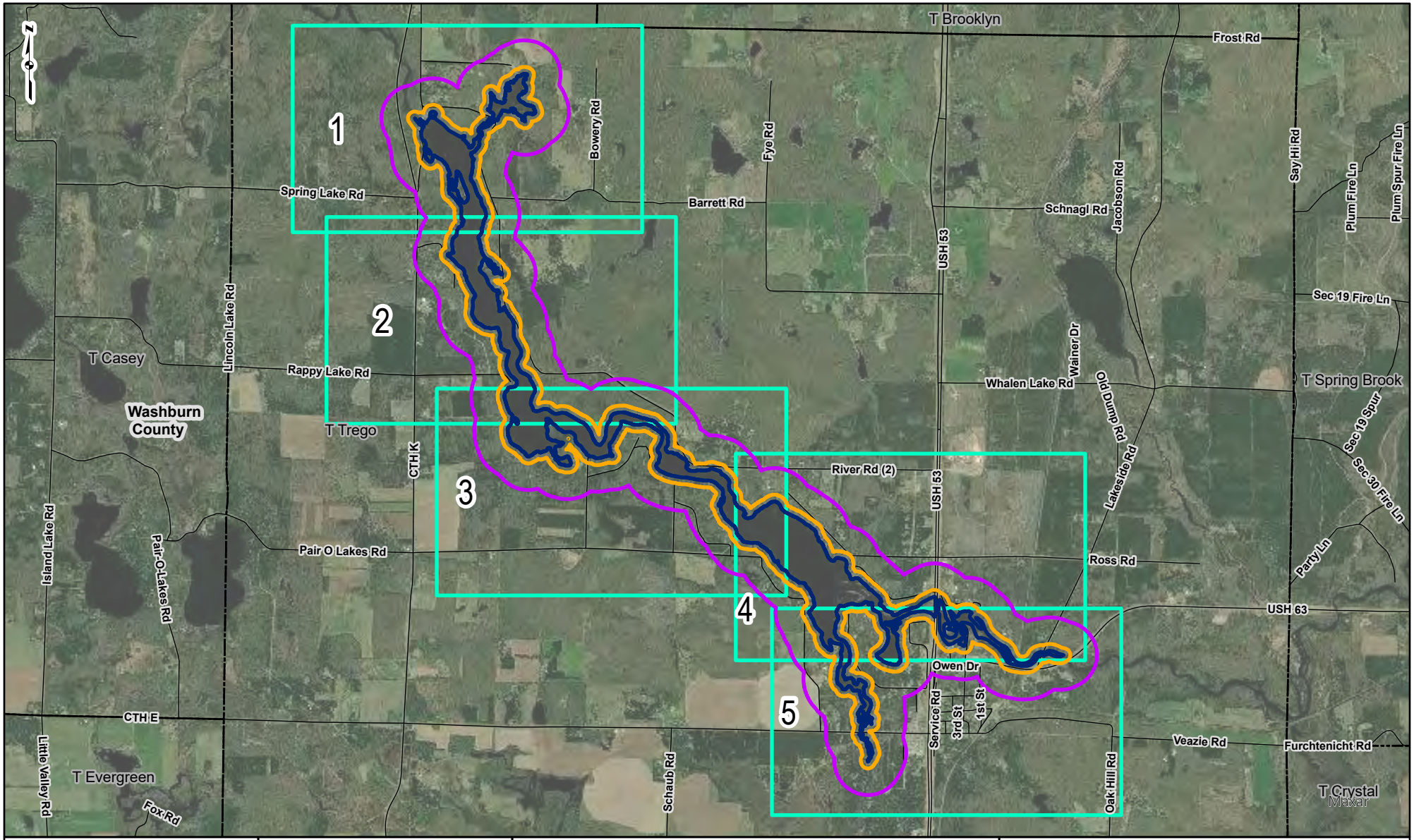
FIGURE 5
Trego Overview Map



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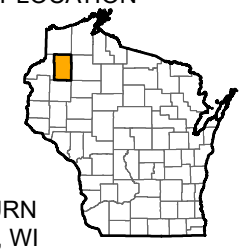

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LEGEND

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- County Boundary

0 2,000 4,000 8,000 Feet

FIGURE 5
TREGO OVERVIEW MAP

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

gai consultants

Mead & Hunt

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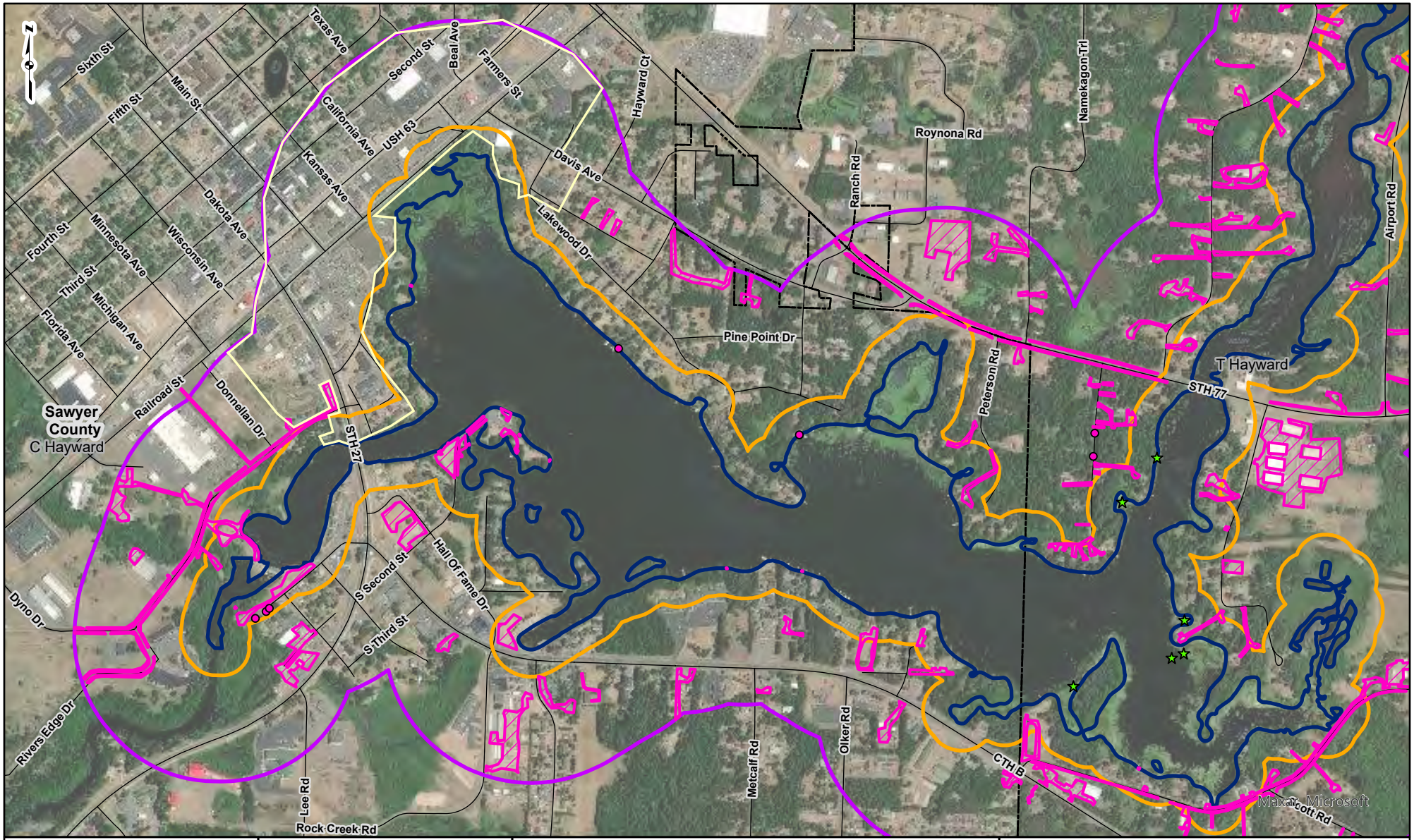
FIGURE 6

Hayward Wood and Blanding's Turtle Nesting Habitat and Basking Areas



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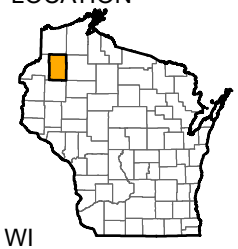

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- County Boundary

0 500 1,000 2,000 Feet

FIGURE 6
HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT AND BASKING AREAS
SHEET 1 of 3

HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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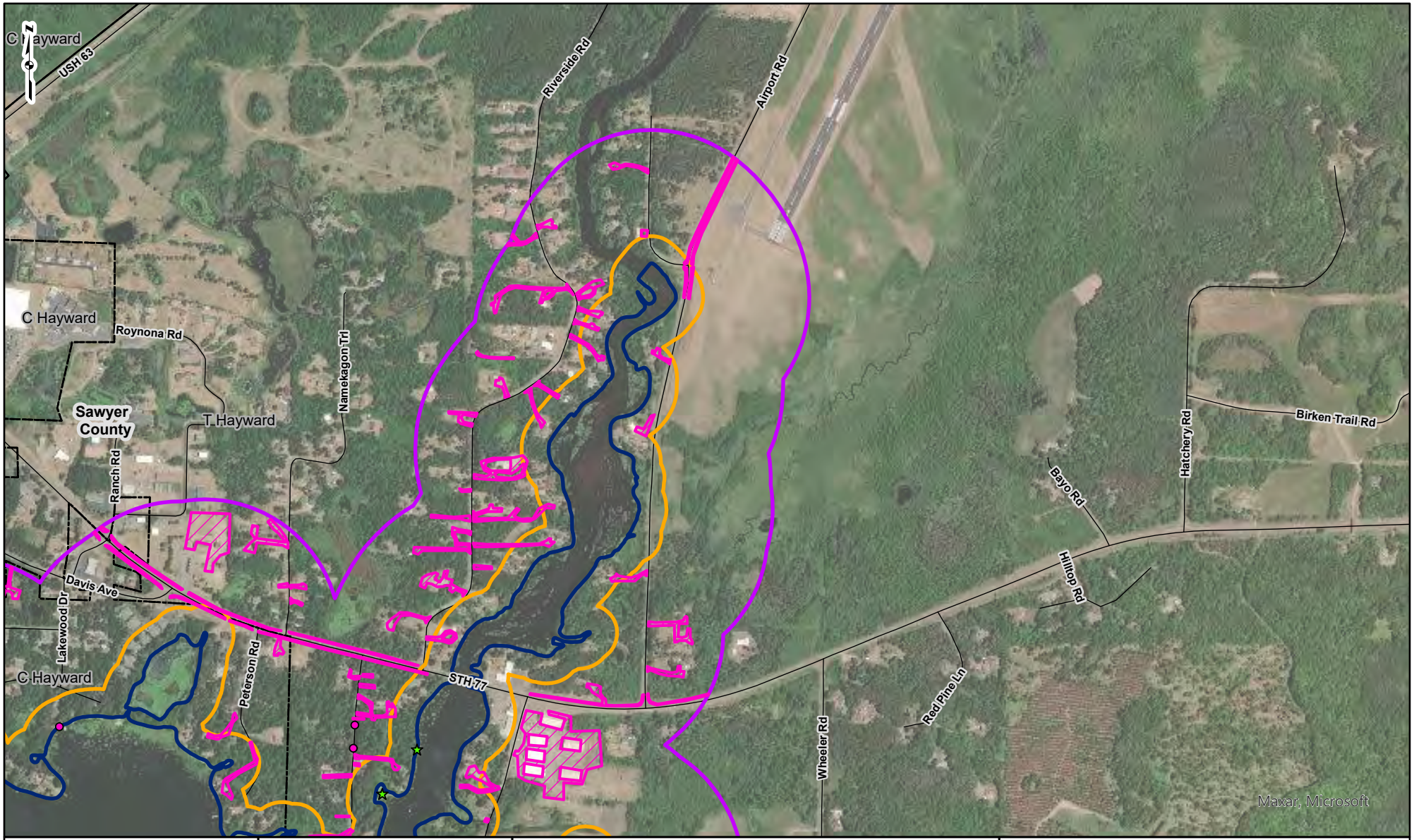
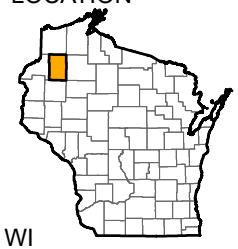


PROJECT LOCATION



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- Hayward Urban Area
- Road Centerline
- Community Boundary
- County Boundary

0 500 1,000 2,000 Feet

FIGURE 6
HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT AND BASKING AREAS
SHEET 2 of 3

HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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Mead & Hunt

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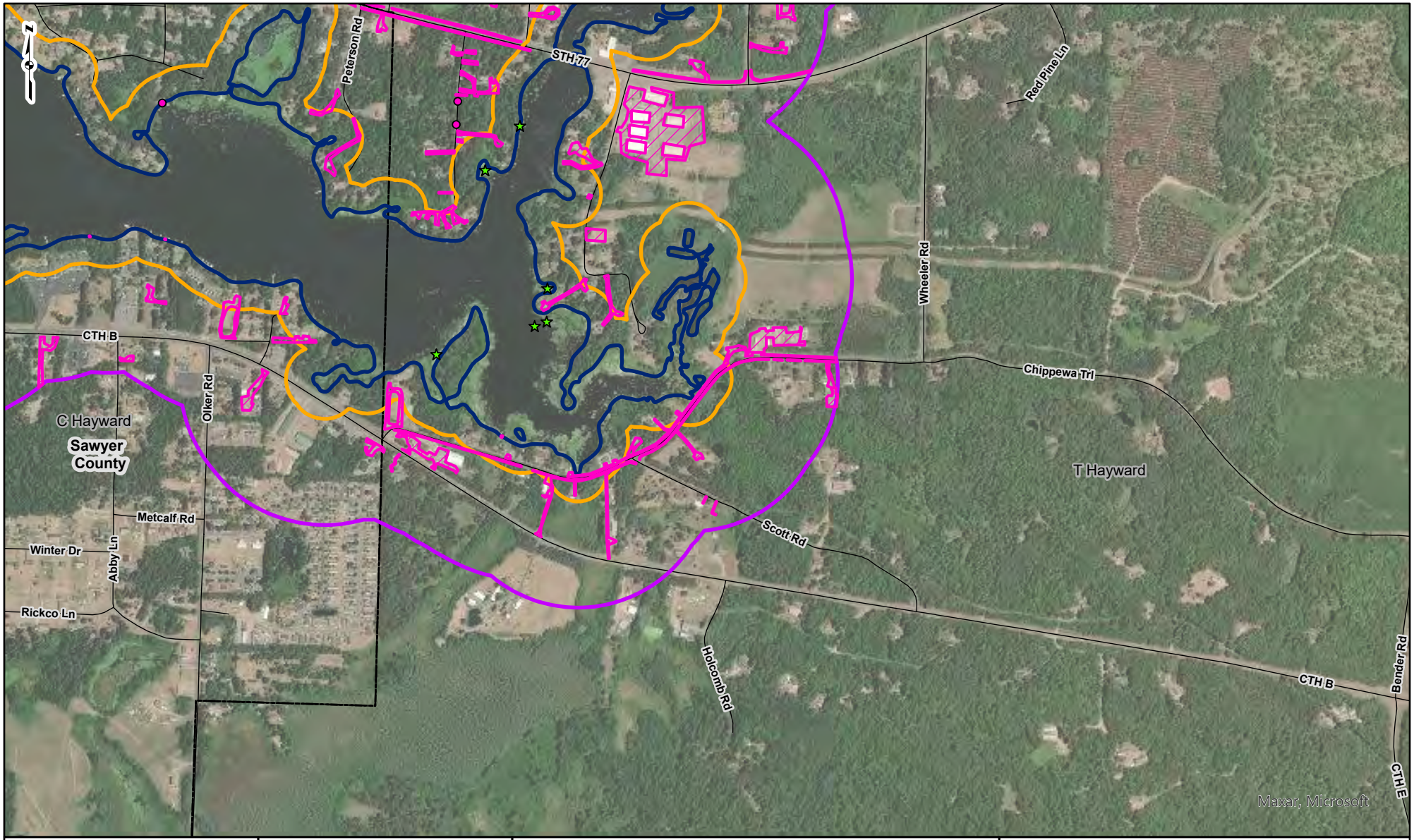

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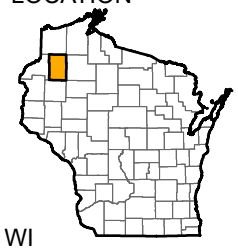

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0 500 1,000 2,000 Feet

FIGURE 6
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SHEET 3 of 3

HAYWARD WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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Mead & Hunt

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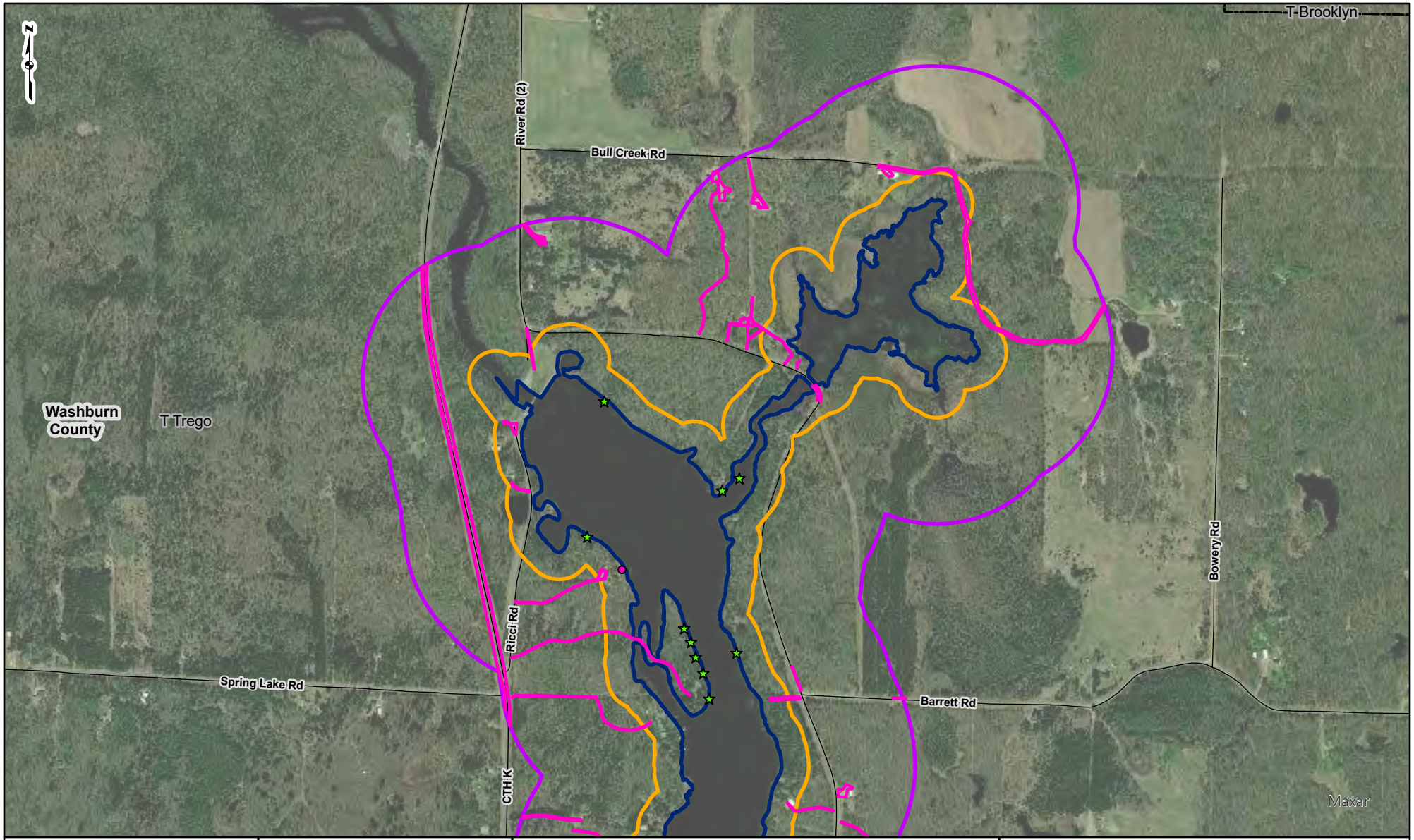
FIGURE 7

Trego Wood and Blanding's Turtle Nesting Habitat and Basking Areas



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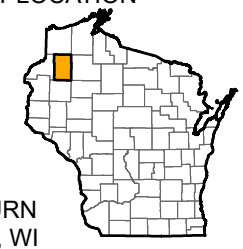

WASHBURN COUNTY, WI

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- Turtle Nesting Habitat
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0 500 1,000 2,000 Feet

FIGURE 7
TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT AND BASKING AREAS
SHEET 1 of 5

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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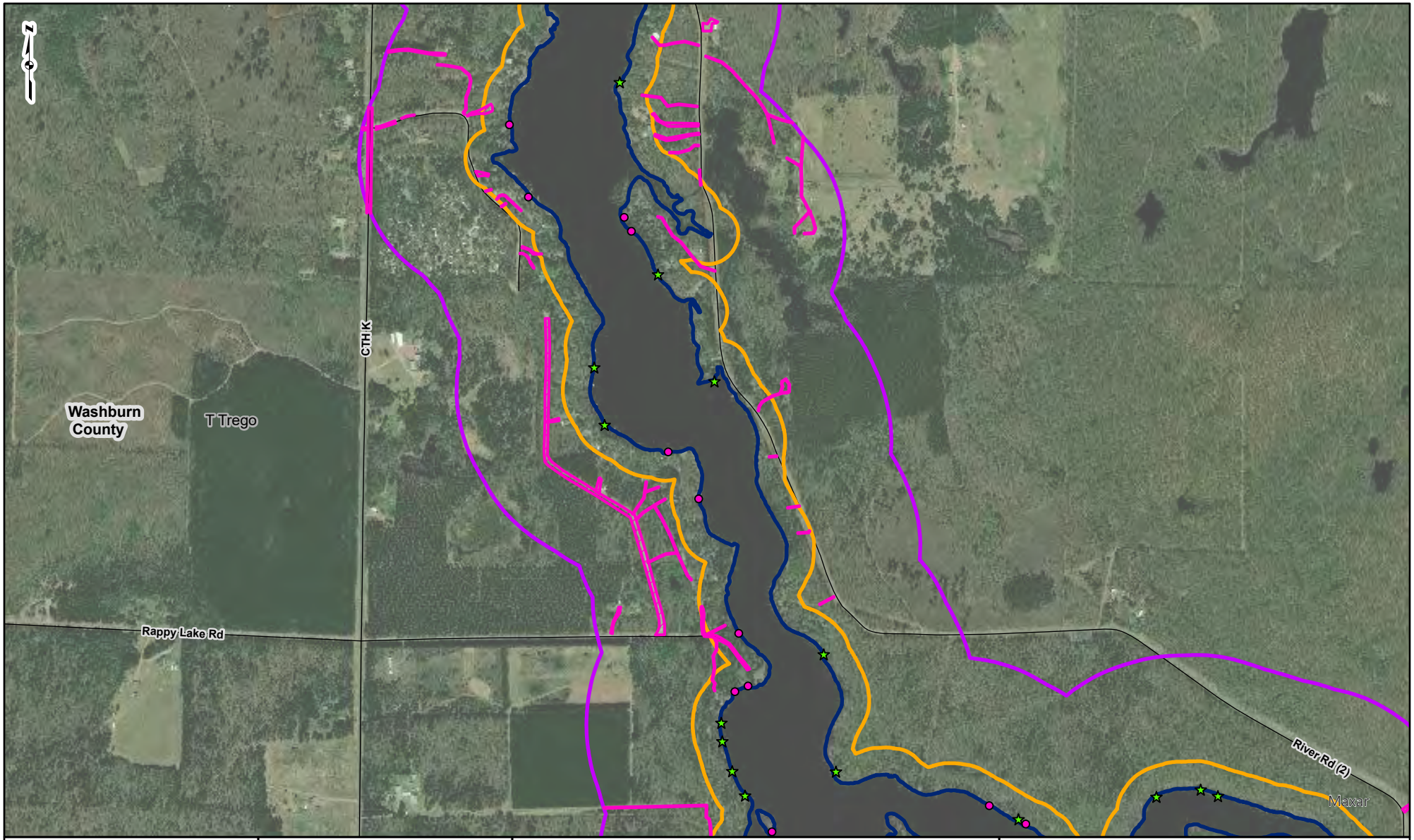

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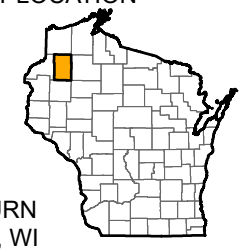

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0 500 1,000 2,000 Feet

FIGURE 7
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SHEET 2 of 5

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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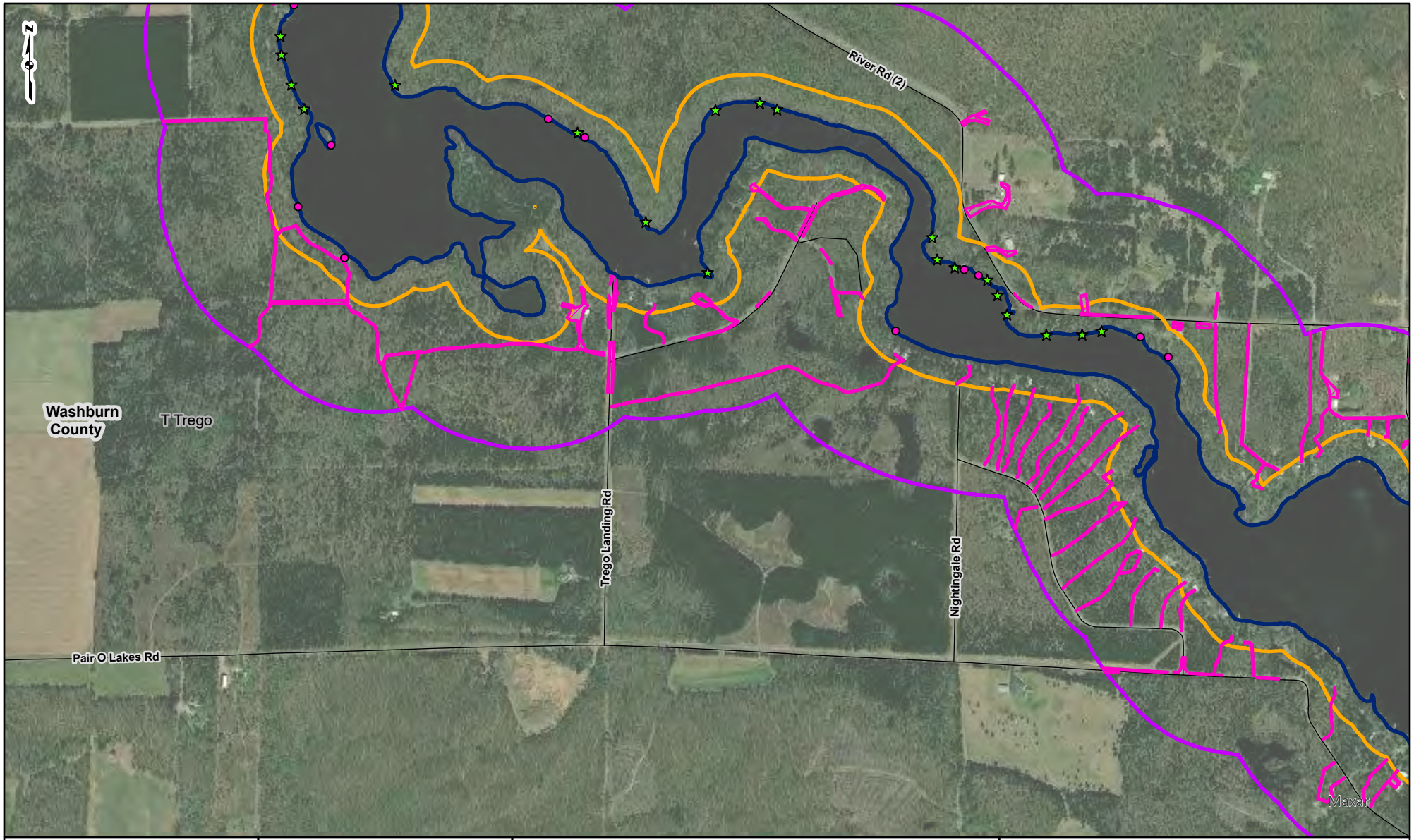

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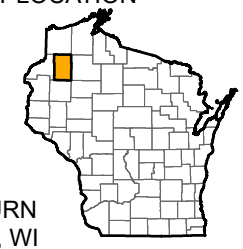

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0 500 1,000 2,000 Feet

FIGURE 7
TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT AND BASKING AREAS
SHEET 3 of 5

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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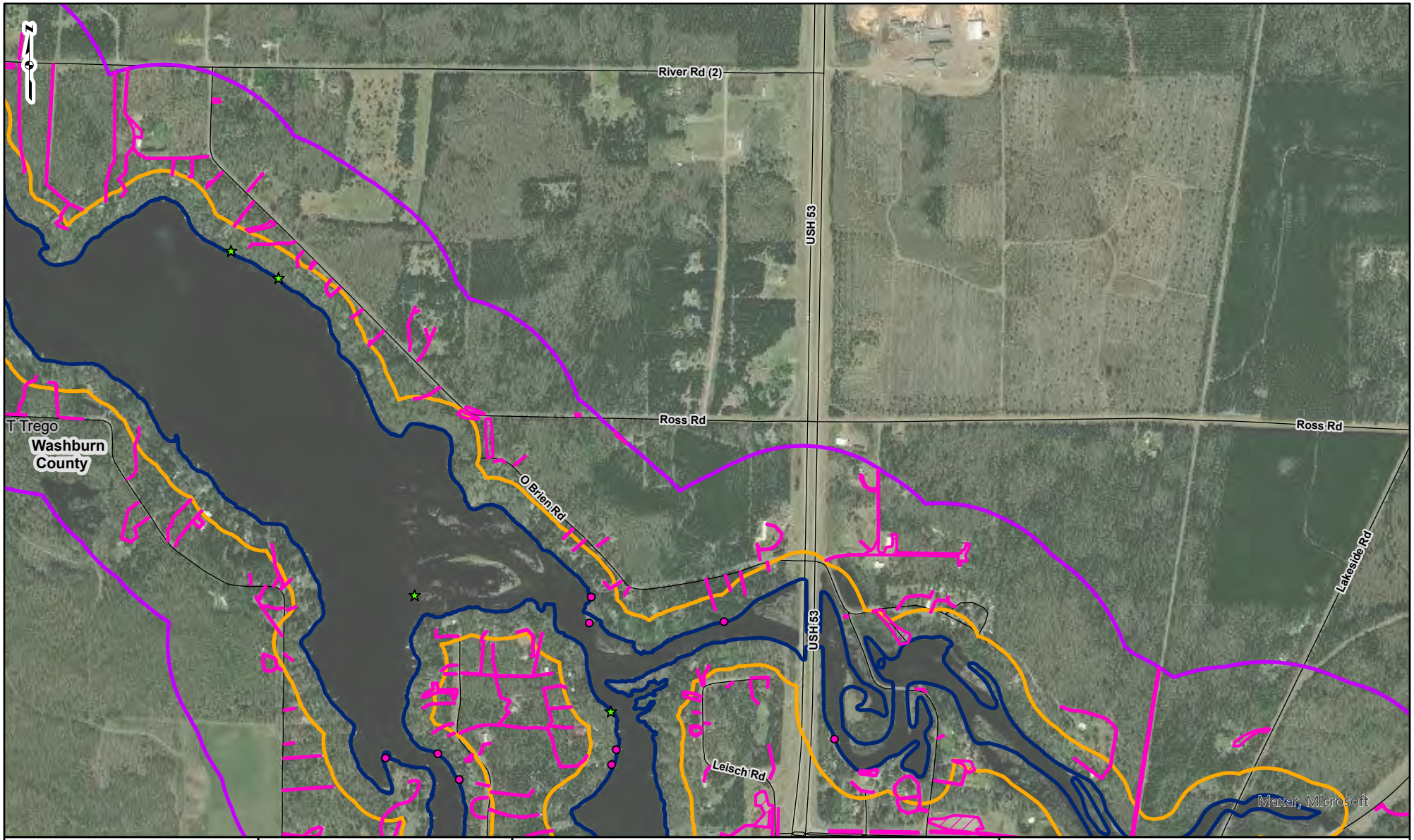

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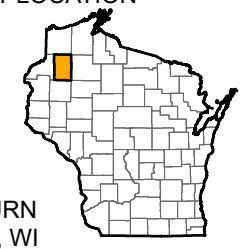

WASHBURN
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0 500 1,000 2,000 Feet

FIGURE 7
TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT AND BASKING AREAS
SHEET 4 of 5

TREGO WOOD AND BLANDING'S TURTLE NESTING HABITAT STUDY

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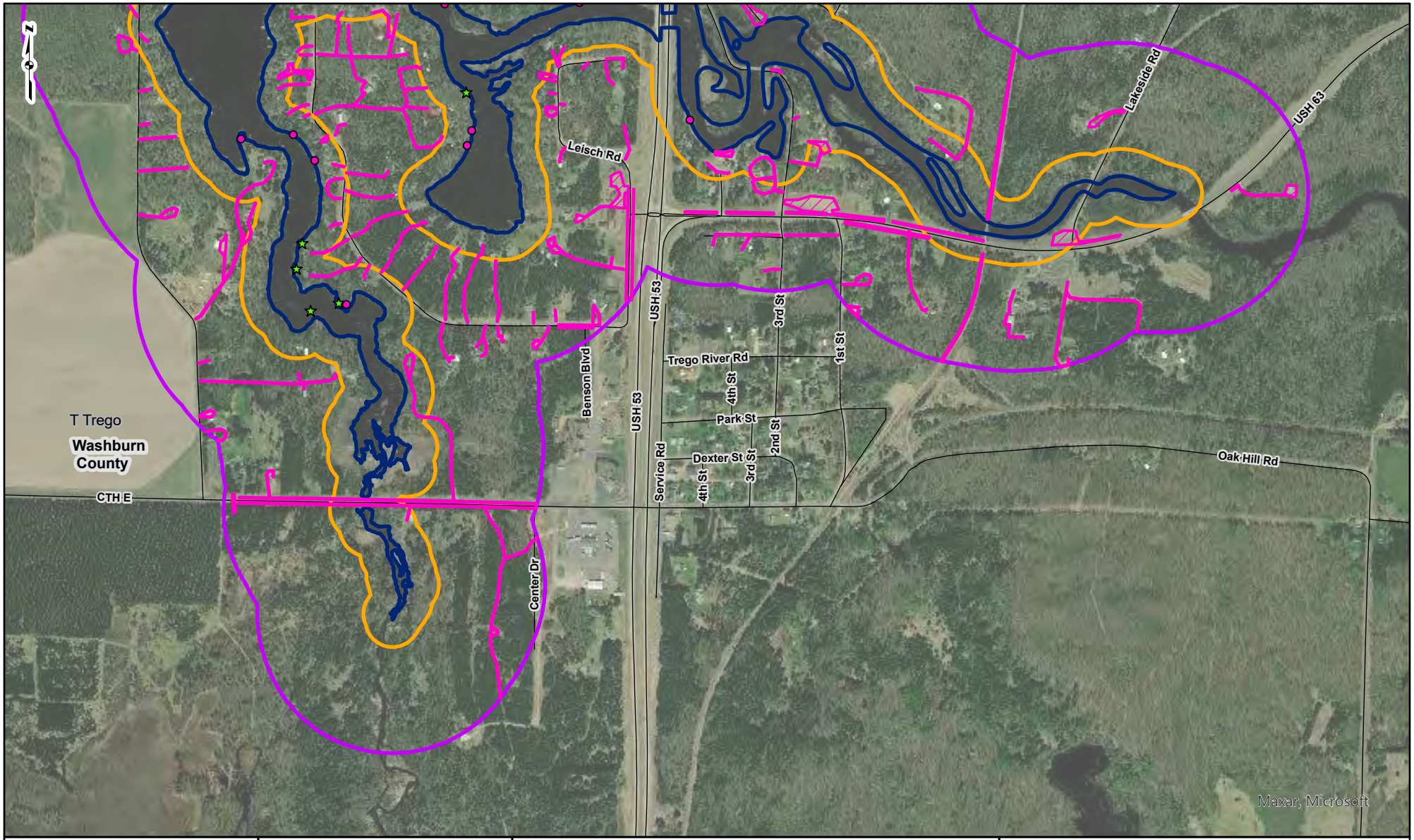

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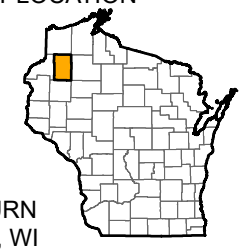

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0 500 1,000 2,000 Feet

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SHEET 5 of 5

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ATTACHMENT A
Photo Log

gai consultants
transforming ideas into reality

Hayward and Trego Lake
Wood and Blanding's Turtle
Nesting Habitat Study
Report Photo Log

	
Turtle nesting habitat along a riparian property owner's shoreline on Hayward Lake. 46.0123972, -91.479827 June 7, 2022	Turtle nesting habitat by the Hayward Lake public boat launch parking lot. 46.00913357, -91.47874544 June 7, 2022
	
Sandy open area along Pair-O-Lakes Road; potential turtle nesting habitat by Trego Lake. 45.91378814, -91.85412314 June 8, 2022	Area of potential suitable turtle nesting habitat at the south end of Trego Lake by the Cash Rd. boat launch. 45.90998076, -91.82530134 August 4, 2022

	
Area of potential turtle nesting habitat near the Hayward dam. 46.0059694167, -91.4842388889 June 7, 2022	Foraging habitat at the north end of Trego Lake. 45.94828775, -91.88574416 August 4, 2022
	
Trego wetland area that appears to be prime habitat for Blanding's turtles. 45.948597, -91.880114 August 15, 2022	Hayward wetland area that appears to be prime habitat for Blanding's turtles. 46.011373, -91.465597 August 5, 2022

NPS Comments on Study Reports

Please Note: These comments have been responded to in Section 1.4.2.2 of the Exhbit E.

United States Department of the Interior

NATIONAL PARK SERVICE
St. Croix National Scenic Riverway
401 North Hamilton Street
Saint Croix Falls, WI 54024

April 21, 2023

Matthew Miller
Environmental Analyst
Xcel Energy
1414 West Hamilton Avenue
Eau Claire, WI 54702
matthew.j.miller@xcelenergy.com

Shawn Puzen
FERC Licensing & Compliance
Mead & Hunt
1702 Lawrence Drive
De Pere, WI 54115
shawn.puzen@meadhunt.com

Re: Study Reports for Invasive Species, Mussels, Recreation, Turtle Nesting Habitat, and Water Quality for Hayward and Trego Hydroelectric Projects (FERC Nos. P-2417 and P-2711), Namekagon River

Dear Mr. Miller and Mr. Puzen:

The St. Croix National Scenic Riverway (Riverway), National Park Service (NPS) appreciates the opportunity to review and provide comments on the study reports for Invasive Species, Mussels, Recreation, Turtle Nesting Habitat, and Water Quality as part of the relicensing efforts for the Hayward and Trego Hydroelectric Projects (FERC Nos. P-2417 and P-2711) on the Namekagon River.

Comments on Study Reports

1. **Hayward and Trego Aquatic and Terrestrial Invasive Species Study Report**
   - Page 1, 2.0 Introduction, paragraph 2: The report should be corrected to state that the entirety of Hayward Lake and Trego Lake are within the boundary of the St. Croix National Scenic Riverway, a unit of the National Park System.
   - Page 2, 3.0 Methodology, 3.1.1, paragraph 1: Given that the study extended sampling further upstream than the WDNR grid, is there a difference in how the vegetation, substrate, and depth are characterized in this added area compared with the area immediately downstream?
   - Page 2, 3.0 Methodology, 3.1.1, paragraph 2 and Figure 19: Does the coarse woody habitat (CWH) greater than 4 inches in diameter and 5 feet in length have cultural resource significance or are they naturally occurring (i.e. from downed trees)? (Page 8, 4.1.4, paragraph 6: "29 pieces of CWH were mapped primarily in near-shore and island areas around the lake. In addition, wood pilings which were part of the historic railroad bridge are also present extending into the lake.")
   - Page 15, 4.3.4 Trego Lake Overall Aquatic Plant Survey Analysis and Observations, paragraph 3: "…all occurrences of wild rice were mapped in the field and accounted for in Fig. 8." What mapping techniques were used to create Figure 8? Given difficulties mapping later season wild rice, can the licensee consider other methods (e.g. aerial surveys) to supplement the documentation of where wild rice occurs, especially since it is dynamic and can change from year to year?

- Page 15, 4.3.4 Trego Lake Overall Aquatic Plant Survey Analysis and Observations, paragraph 4: "…The upstream portion of the Project reservoir was riverine with steady flow and a sandy bottom. Vegetation in this area…" How is vegetation characterized in the vicinity of areas of concern about recreation access and navigability (i.e. Trego Lake District, Trego Park)? How will the information from this study be integrated with Recreation Report issues?
- Page 19, 5.0 Conclusion, paragraph 2: This section describes that Trego Lake has a "protected status" that Lake Hayward does not. This should be corrected to reflect that both Lake Hayward and Trego Lake are within the boundary of the St. Croix National Scenic Riverway.
- Figures 17 and 24: Using the existing data collected, can more detailed maps be created displaying lower depths than the 0–5-foot range that is currently shown? At a minimum, showing depths of 0-1 feet and 0-2 feet may be helpful in understanding potential wild rice areas and areas important for recreation access/navigation.

2. **Freshwater Mussel Study for the Hayward Hydroelectric Project (FERC No. 2417) and Freshwater Mussel Study for the Trego Hydroelectric Project (FERC No. 2711)**
    - The NPS found the results of the mussel studies to be noteworthy in multiple respects and looks forward to working with the licensee and other stakeholders on additional analysis and ensuring these resources are thoughtfully considered in future steps of the licensing process.
    - It appears the Chinese Mystery Snail may be a new finding within this reach. Has this finding been reported to WDNR's Aquatic Invasive Species Program?
    - Per the WDNR permit correspondence, the researchers were asked to make note of any "obvious 'drawdown zone' in any of the river reaches as a result of either consistent drawdown or seasonal drawdowns where no mussels are present due to being dewatered". There were no such zones noted in the reports. It should be clarified if no such zones were observed, if these zones were not looked for, or if it was simply omitted from the report.

3. **Recreation Report for the Hayward Hydroelectric Project (FERC No. 2417) and Trego Hydroelectric Project (FERC No. 2711)**
    - Due to survey methodology, land-based users were better represented within the survey than water-based users. As a result, the study did not adequately capture the perspectives of paddlers and those recreating on the river. As a result, the recreation study failed to address important issues such as the quality of paddlers' or tubers' experience navigating emergent vegetation while taking out or putting in at Trego Park Landing, how much use Trego Park Landing experiences from paddlers or tubers in privately-owned craft, etc.
    - Page 5-15, 5.3.2 Trego Lake District: The summary of Trego Lake District response does not adequately reflect material shown in Appendix 7, including Xcel partnership regarding vegetation management under the current license and concerns about access, AIS, vegetation management, and sedimentation.
    - Page 6-1, Conclusions, paragraph 2: The assessment of the condition of signage at the Hayward Canoe Portage may not be consistent with the documentation of the signage contained in Appendix 7.
    - Appendix 3, Recreation Inventory Photolog, PDF page 27: An index should be added to this section identifying photo number, topic, and location.

4. **Lake Hayward and Trego Lake Wood and Blanding's Turtle Nesting Habitat Study Report**
    - Our agency appreciates the completion of this study and does not have any questions or comments regarding the study report at this time.

5. **Water Quality Monitoring Study**
    - Can the licensee clarify why the water quality monitoring study excluded the parameters of cyanobacteria, methyl mercury, and sediment accumulation that were requested for inclusion by WDNR?

Outstanding Study Requests

Our agency requests that the Licensee reconsider the additional study requests outlined in our April 27, 2021 and subsequent letters, especially the Hydraulics, Sedimentation, and Channel Change study. As previously described, the proposed license will require a Section 7(a) evaluation by the NPS under the Wild and Scenic Rivers Act. These studies are necessary to the timely completion of our agency's review. They are also needed to satisfy Section 4(e) of the Federal Power Act, which directs FERC to "give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality." Equal consideration is not possible without adequate information on these important and relevant topics.

Thank you for your consideration of our agency's comments on the study reports. The NPS looks forward to continuing to consult with Xcel Energy and other stakeholders as the licensing process moves forward.

If you have any questions about our comments, please contact Lisa Yager at lisa_yager@nps.gov or 715-483-2290.

Sincerely,

CRAIG HANSEN

Digitally signed by CRAIG HANSEN
Date: 2023.04.21 13:53:42 -05'00'

Craig Hansen
Superintendent

TLD did not provide any comments on the ATIS Study Report

WDNR did not provide comments on any study reports

WDNR 2022 Fish Data

Darrin Johnson

From: Darrin Johnson
Sent: Wednesday, March 29, 2023 9:19 AM
To: Laatsch, Cheryl - DNR
Cc: Miller, Matthew J; Shawn Puzen; Darrin Johnson
Subject: Hayward 2022 Fish Data

Hi Cheryl,

We received a copy of the draft Lake Hayward Aquatic Plant Management Plan from the Lake Hayward Association. In the report it indicated that spring fyke netting surveys and June electrofishing surveys were conducted in 2022 within the lake. Can we get data from the 2022 fisheries surveys for inclusion in the Draft License Application?

We would like to request any recent fisheries data for surveys completed at the Trego Project as well. We have fisheries survey information for Trego up through 2019, so are just requesting any new survey data from 2020 to present if there is any.

Thank you.

Darrin Johnson
FERC Compliance and Licensing | Water
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
Mead&Hunt
LinkedIn | Twitter | Facebook | Instagram

Darrin Johnson

From: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>
Sent: Wednesday, March 29, 2023 12:26 PM
To: Laatsch, Cheryl - DNR; Roberts, Craig M - DNR
Cc: Darrin Johnson
Subject: RE: Hayward 2022 Fish Data

Hot off the press:
https://dnr.wisconsin.gov/sites/default/files/topic/Fishing/SawyerLakeHayward2022SpringSummary.pdf

Max H. Wolter
Fisheries Biologist
Hayward Service Center
Bureau of Fisheries Management
Wisconsin Department of Natural Resources
(☎) phone: (715) 634-7429
(☎) fax: (715) 634-9232
(✉) e-mail: Max.wolter@wisconsin.gov

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, March 29, 2023 12:16 PM
To: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>; Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: FW: Hayward 2022 Fish Data

Hi Max and Craig – See the info below. Please provide Darrin with any updated fishery information for these 2 projects. Thanks 😊

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
NEW (Work Cell) 920-382-9975
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Wednesday, March 29, 2023 9:19 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Miller, Matthew J <matthew.j.miller@xcelenergy.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: Hayward 2022 Fish Data

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Thank you.

Darrin Johnson
FERC Compliance and Licensing | Water
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
Mead&Hunt
LinkedIn | Twitter | Facebook | Instagram

Darrin Johnson

From: Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Sent: Wednesday, March 29, 2023 12:42 PM
To: Darrin Johnson; Wolter, Max H - DNR; Laatsch, Cheryl - DNR
Subject: RE: Hayward 2022 Fish Data

We haven't been back to survey Trego Lake since 2019. So there isnt any new data for the flowage itself.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Craig M. Roberts
Phone: (715) 416-0351
Craig.Roberts@Wisconsin.gov

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Wednesday, March 29, 2023 12:40 PM
To: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>; Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Subject: RE: Hayward 2022 Fish Data

Thanks Max.

Darrin Johnson
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
meadhunt.com | Experience Exceptional

From: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>
Sent: Wednesday, March 29, 2023 12:26 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: RE: Hayward 2022 Fish Data

Hot off the press:
https://dnr.wisconsin.gov/sites/default/files/topic/Fishing/SawyerLakeHayward2022SpringSummary.pdf

Max H. Wolter
Fisheries Biologist
Hayward Service Center
Bureau of Fisheries Management
Wisconsin Department of Natural Resources

(☎) phone: (715) 634-7429
(☎) fax: (715) 634-9232
(✉) e-mail: Max.wolter@wisconsin.gov

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Sent: Wednesday, March 29, 2023 12:16 PM
To: Wolter, Max H - DNR <Max.Wolter@wisconsin.gov>; Roberts, Craig M - DNR <Craig.Roberts@wisconsin.gov>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: FW: Hayward 2022 Fish Data

Hi Max and Craig – See the info below. Please provide Darrin with any updated fishery information for these 2 projects. Thanks 😊

Cheryl Laatsch
Statewide FERC Coordinator
Bureau of Environmental Analysis and Sustainability
Wisconsin Dept of Natural Resources
N7725 Hwy 28
Horicon WI 53032
NEW (Work Cell) 920-382-9975
Cheryl.laatsch@wisconsin.gov


dnr.wi.gov

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

From: Darrin Johnson <Darrin.Johnson@meadhunt.com>
Sent: Wednesday, March 29, 2023 9:19 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Miller, Matthew J <matthew.j.miller@xcelenergy.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>
Subject: Hayward 2022 Fish Data

Hi Cheryl,

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We would like to request any recent fisheries data for surveys completed at the Trego Project as well. We have fisheries survey information for Trego up through 2019, so are just requesting any new survey data from 2020 to present if there is any.

Thank you.

Darrin Johnson
FERC Compliance and Licensing | Water
Direct: 608-443-0313 | Cell: 715-697-3130 | Transfer Files
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LinkedIn | Twitter | Facebook | Instagram

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Section 106 Consultation

Darrin Johnson

From: WHPD <compliance@wisconsinhistory.org>
Sent: Tuesday, January 24, 2023 3:44 PM
To: shawn.puzen@meadhunt.com; tyler.howe@wisconsinhistory.org
Subject: Compliance Submittal Accepted

Hayward Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2417 (MH 1853) has been accepted by the State Historic Preservation Office as project 23-0139.

Darrin Johnson

From: WHPD <compliance@wisconsinhistory.org>
Sent: Wednesday, February 1, 2023 3:38 PM
To: shawn.puzen@meadhunt.com; tyler.howe@wisconsinhistory.org
Subject: Compliance Submittal Accepted

Categories: Filed by Newforma

Trego Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2711 (MH 1853) has been accepted by the State Historic Preservation Office as project 23-0196.

Darrin Johnson

From: Shawn Puzen
Sent: Tuesday, March 28, 2023 9:42 AM
To: TYLER B HOWE
Cc: Darrin Johnson
Subject: Status of Section 106 Reviews in my Account

Good Morning Tyler,
I want to make sure that three filing I made for Section 106 in my account have not fallen through the cracks.

I have not received any word from you on the following reviews in my account:

1) Hayward 2417-submitted January 24, 2023.
2) Trego 2711-submitted February 1, 2023.

I cannot locate a response for either of these review requests. Can you please let me know if they have been completed?

Thanks,

Shawn Puzen
FERC Hydropower Licensing and Compliance | Water
Direct: 920-593-6865 | Cell: 920-639-2480 | Transfer Files
Mead&Hunt
LinkedIn | Twitter | Facebook | Instagram | My LinkedIn

Darrin Johnson

From: tyler.howe@wisconsinhistory.org
Sent: Tuesday, March 28, 2023 11:56 AM
To: matthew.j.miller@xcelenergy.com
Cc: shawn.puzen@meadhunt.com
Subject: 23-0139/SY - MH 1853 - Hayward Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2417

Categories: Filed by Newforma

Good morning, Matt and Shawn:

We are in receipt of the 2023 shoreline survey of the Haywood hydro project (FERC No. 2417). We accept this report in fulfillment of the requirements of the HRMP and the PA. We concur with the following observations:

1). 47SY29: We recognize that the " shoreline was inspected on foot. Surface collection along the river bank yielded no artifacts." We also understand that the site does not appear to be currently impacted by facility operations.

2). 47SY54: Again, we recognize that the "shoreline was inspected on foot. Surface collection along the river bank yielded no artifacts." We also understand that the site does not appear to be currently impacted by facility operations.

3). 47SY121: We recognize that the "shoreline where the pilings had intersected previously, was inspected on foot. Surface collection along the river bank did not yield artifacts." Like other shoreline sites, this site appears to be not currently impacted by facility operations.

4). 47SY158 / BSY-0044: The SHPO understands the "shoreline at the location where the mound was reported was inspected on foot. Surface collection along the river bank did not yield artifacts." We further understand this site does not appear to be currently impacted by facility operations.

As such, the WI SHPO accepts the 2023 shoreline survey of the Hayward hydro project (FERC No. 2417) in fulfillment of the requirements of the HRMP and the PA. We look forward to our continued consultation partnership.

All the best,

Tyler

Tyler B. Howe, PhD
Compliance Section Manager
State Historic Preservation Office

Wisconsin Historical Society
816 State Street, Madison, WI 53706

tyler.howe@wisconsinhistory.org

Wisconsin Historical Society
Collecting, Preserving, and Sharing Stories Since 1846

Darrin Johnson

From: TYLER B HOWE <tyler.howe@wisconsinhistory.org>
Sent: Tuesday, March 28, 2023 11:57 AM
To: matthew.j.miller@xcelenergy.com
Cc: shawn.puzen@meadhunt.com
Subject: Re: 23-0139/SY - MH 1853 - Hayward Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2417

Categories: Filed by Newforma

Sorry, but I meant Hayward hydro, not Haywood hydro. I must have NC on the mind.

Cheers,

Tyler

Tyler B. Howe, PhD
Compliance Section Manager
State Historic Preservation Office

Wisconsin Historical Society
816 State Street, Madison, WI 53706

tyler.howe@wisconsinhistory.org

Wisconsin Historical Society
Collecting, Preserving, and Sharing Stories Since 1846

From: tyler.howe@wisconsinhistory.org <tyler.howe@wisconsinhistory.org>
Sent: Tuesday, March 28, 2023 11:55 AM
To: matthew.j.miller@xcelenergy.com <matthew.j.miller@xcelenergy.com>
Cc: shawn.puzen@meadhunt.com <shawn.puzen@meadhunt.com>
Subject: 23-0139/SY - MH 1853 - Hayward Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2417

Good morning, Matt and Shawn:

We are in receipt of the 2023 shoreline survey of the Haywood hydro project (FERC No. 2417). We accept this report in fulfillment of the requirements of the HRMP and the PA. We concur with the following observations:

1). 47SY29: We recognize that the " shoreline was inspected on foot. Surface collection along the river bank yielded no artifacts." We also understand that the site does not appear to be currently impacted by facility operations.

2). 47SY54: Again, we recognize that the "shoreline was inspected on foot. Surface collection along the river bank yielded no artifacts." We also understand that the site does not appear to be currently impacted by facility operations.

3). 47SY121: We recognize that the "shoreline where the pilings had intersected previously, was inspected on foot.

Surface collection along the river bank did not yield artifacts." Like other shoreline sites, this site appears to be not currently impacted by facility operations.

4). 47SY158 / BSY-0044: The SHPO understands the "shoreline at the location where the mound was reported was inspected on foot. Surface collection along the river bank did not yield artifacts." We further understand this site does not appear to be currently impacted by facility operations.

As such, the WI SHPO accepts the 2023 shoreline survey of the Hayward hydro project (FERC No. 2417) in fulfillment of the requirements of the HRMP and the PA. We look forward to our continued consultation partnership.

All the best,

Tyler

Tyler B. Howe, PhD
Compliance Section Manager
State Historic Preservation Office

Wisconsin Historical Society
816 State Street, Madison, WI 53706

tyler.howe@wisconsinhistory.org

Wisconsin Historical Society
Collecting, Preserving, and Sharing Stories Since 1846

Darrin Johnson

From: tyler.howe@wisconsinhistory.org
Sent: Tuesday, March 28, 2023 1:51 PM
To: matthew.j.miller@xcelenergy.com
Cc: shawn.puzen@meadhunt.com
Subject: 23-0196/WB - MH 1853 - Trego Hydroelectric Project Relicensing Shoreline Survey Report FERC Project No. 2711

Categories: Filed by Newforma

Good afternoon, Matt and Shawn:

We are in receipt of the 2022 shoreline survey report for the Trego hydro project (FERC No. 2711). We accept this report in fulfillment of the requirements of the HRMP and the PA. We offer the following comments:

1). 47WB39: The WI SHPO recognizes this site was surveyed on foot, and no artifacts were encountered during the survey. We also understand this site does not appear to be impacted by facility operations.

2). 47WB105: The WI SHPO recognizes that the " shoreline was inspected on foot with access to the site provided by boat. Surface collection along the riverbank yielded no artifacts." We also understand the site does not appear to be impacted by facility operations.

3). 47WB106: The WI SHPO recognizes this site was mapped, and accessed by boat, and that no artifacts were recovered during shoreline inspection. We also understand the site does not appear to be impacted by facility operations.

4). 47WB107: We understand the shoreline was physically inspected, and no artifacts were discovered during the survey. We also understand the site does not appear to be impacted by facility operations.

5). 47WB108: We understand access to this site was blocked, and the site boundaries may not extend to the water line. As such, I suggest we discuss the usefulness of including this site in future shoreline surveys.

6). 47WB109: We understand this site was physically surveyed, and no artifacts were encountered during the survey. We also understand this site does not appear to be impacted by facility operations.

7). 47WB110: The WI SHPO recognizes this site was inspected on foot, and no artifacts were encountered during the survey. We also understand this site does not appear to be impacted by facility operations.

The WI SHPO concurs with the professional archaeologist's determination that "there is no mention in the report of erosion at any of the sites; thus, no mention of artifacts being found at the bank." As such, the WI SHPO accepts the 2022 shoreline survey of the Trego hydro project (FERC No. 2711) in fulfillment of the HRMP and the PA. We look forward to our continued consultations.

Take care,

Tyler

Tyler B. Howe, PhD
Compliance Section Manager
State Historic Preservation Office

Wisconsin Historical Society
816 State Street, Madison, WI 53706

tyler.howe@wisconsinhistory.org

Wisconsin Historical Society
Collecting, Preserving, and Sharing Stories Since 1846

CZMA Correspondence

Darrin Johnson

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Wednesday, May 24, 2023 3:20 PM
To: kathleen.angel@wisconsin.gov
Cc: Shawn Puzen; Darrin Johnson
Subject: Request for Determination - Hayward and Trego Hydroelectric Projects
Attachments: Hayward CZMA Letter signed.pdf; Trego CZMA Letter signed.pdf

Hello Ms. Angel,

Attached you will find two letters from Xcel Energy each requesting a written determination of consistency with Wisconsin's Coastal Management Program regarding the federal relicensing of the Hayward and Trego hydroelectric projects located in Sawyer County and Washburn County, respectively. Should you have any questions, you may reach me directly at 715-737-1353.

Kind Regards,

Matthew Miller
Xcel Energy
Environmental Analyst
1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702
P: 715.737-1353 **F**: 715.737.1077
E: matthew.j.miller@xcelenergy.com

XCELENERGY.COM

Xcel Energy®
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1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

May 24, 2023

VIA Electronic Mail

Ms. Kathleen Angel
Wisconsin Coastal Management Program Department of Administration
101 E. Wilson Street, 9th Floor
P.O. Box 894
Madison, WI 53708-8944

Re: **Request for Determination of Compliance**
Hayward (P-2417) Hydroelectric Project

Dear Ms. Angel:

Northern States Power Company – Wisconsin (NSPW) is the licensee for the Hayward Hydroelectric Project (Project). The Project is licensed by the Federal Energy Regulatory Commission (FERC) as Project No. 2417. The current FERC license for the Project expires on November 30, 2025.

A Preliminary Application Document providing a description of the Project and its proposed operation was submitted to your office in November 2020 and is available for review at hydrorelicensing.com/hayward/. It is anticipated that the Draft Application for New License and the Final Application for New License will be submitted in June 2023 and November 2023, respectively.

As part of the federal relicensing process for the Project, NSPW must provide the FERC documentation that a determination has been made that the proposed relicensing complies with the policies of Wisconsin's approved Coastal Management Plan, and that any activities associated with the licensing will be conducted in a manner that is consistent with such policies. This letter constitutes a formal request on behalf of NSPW for a written determination of consistency with Wisconsin's Coastal Management Program.

If you are unable to submit a letter, please provide your determination to me via e-mail so that I may incorporate your comments into FERC's licensing record. My email address is matthew.j.miller@xcelenergy.com. Should you have any questions, you may contact me at 715-737-1353.

Sincerely,

Matthew J. Miller

Digitally signed by Matthew J. Miller
Date: 2023.05.24 15:08:52 -05'00'

Matthew J. Miller
Environmental Analyst

CC: Shawn Puzen, Darrin Johnson – Mead & Hunt (via e-mail)
Scott Crotty – Xcel Energy (via e-mail)

Xcel Energy®
RESPONSIBLE BY NATURE®

1414 West Hamilton Avenue
PO Box 8
Eau Claire, WI 54702-0008

May 24, 2023

VIA Electronic Mail

Ms. Kathleen Angel
Wisconsin Coastal Management Program Department of Administration
101 E. Wilson Street, 9th Floor
P.O. Box 8944
Madison, WI 53708-8944

Re: **Request for Determination of Compliance**
Trego (P-2711) Hydroelectric Project

Dear Ms. Angel:

Northern States Power Company - Wisconsin (NSPW) is the licensee for the Trego Hydroelectric Project (Project). The Project is licensed by the Federal Energy Regulatory Commission (FERC) as Project No. 2711. The current FERC license for the Project expires on November 30, 2025.

A Preliminary Application Document providing a description of the Project and its proposed operation was submitted to your office in November 2020 and is available for review at hydrorelicensing.com/trego/. It is anticipated that the Draft Application for New License and the Final Application for New License will be submitted in June 2023 and November 2023, respectively.

As part of the federal relicensing process for the Project, NSPW must provide the FERC documentation that a determination has been made that the proposed relicensing complies with the policies of Wisconsin's approved Coastal Management Plan, and that any activities associated with the licensing will be conducted in a manner that is consistent with such policies. This letter constitutes a formal request on behalf of NSPW for a written determination of consistency with Wisconsin's Coastal Management Program.

If you are unable to submit a letter, please provide your determination to me via e-mail so that I may incorporate your comments into FERC's licensing record. My email address is matthew.j.miller@xcelenergy.com. Should you have any questions, you may contact me at 715-737-1353.

Sincerely,

Matthew J. Miller Digitally signed by Matthew J. Miller
Date: 2023.05.24 15:10:15 -05'00'

Matthew J. Miller
Environmental Analyst

CC: Shawn Puzen, Darrin Johnson – Mead & Hunt (via e-mail)
Scott Crotty – Xcel Energy (via e-mail)