White River Hydroelectric Project
FERC Project No. 2444

Application for a Subsequent License for a Minor Water Power Project
Less than 1.5 Megawatts

Prepared for

Northern States Power Company
a Wisconsin Corporation

Prepared by

Mead & Hunt
meadhunt.com

Volume 3 of 4
Appendices

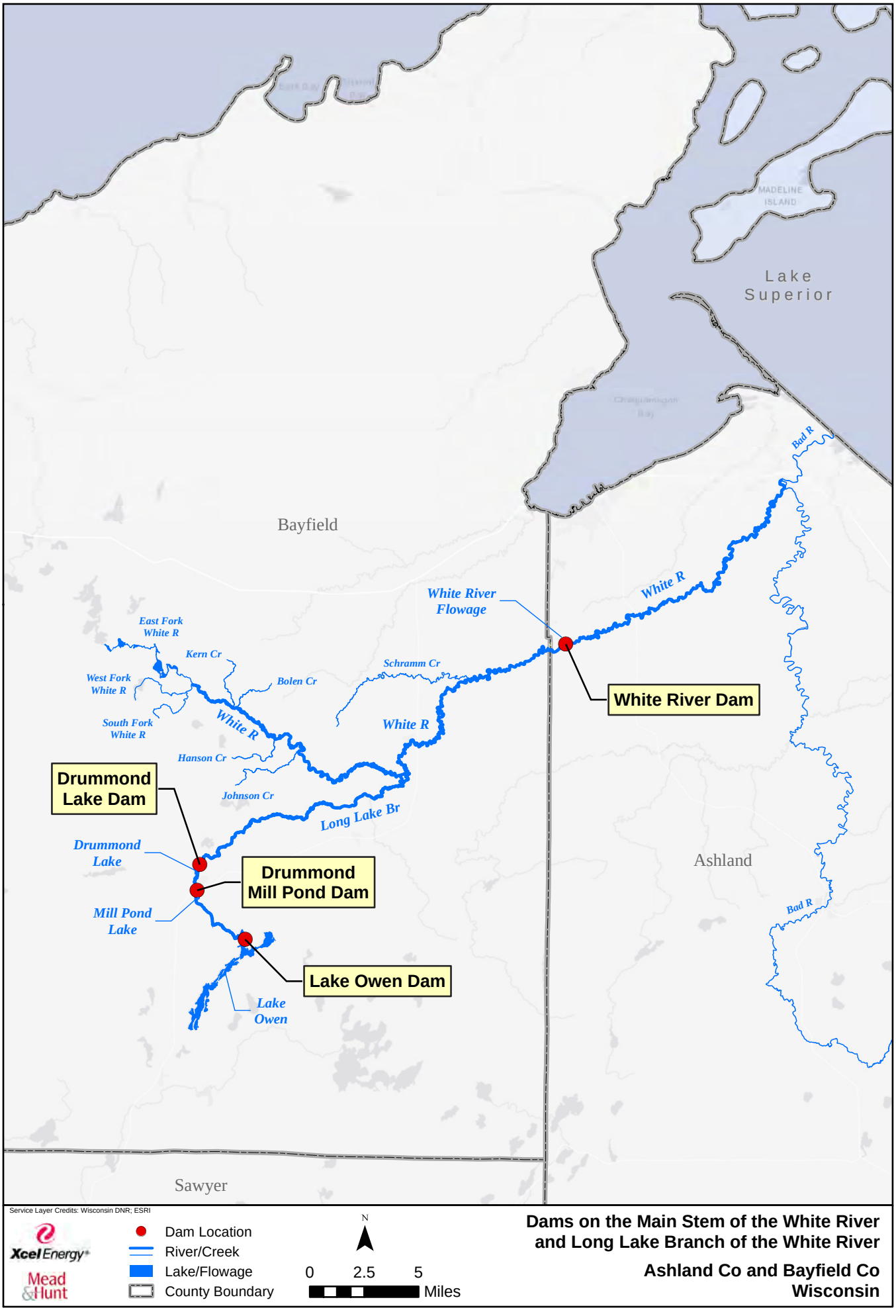
July 2023

Volume 3 of 4
Appendices

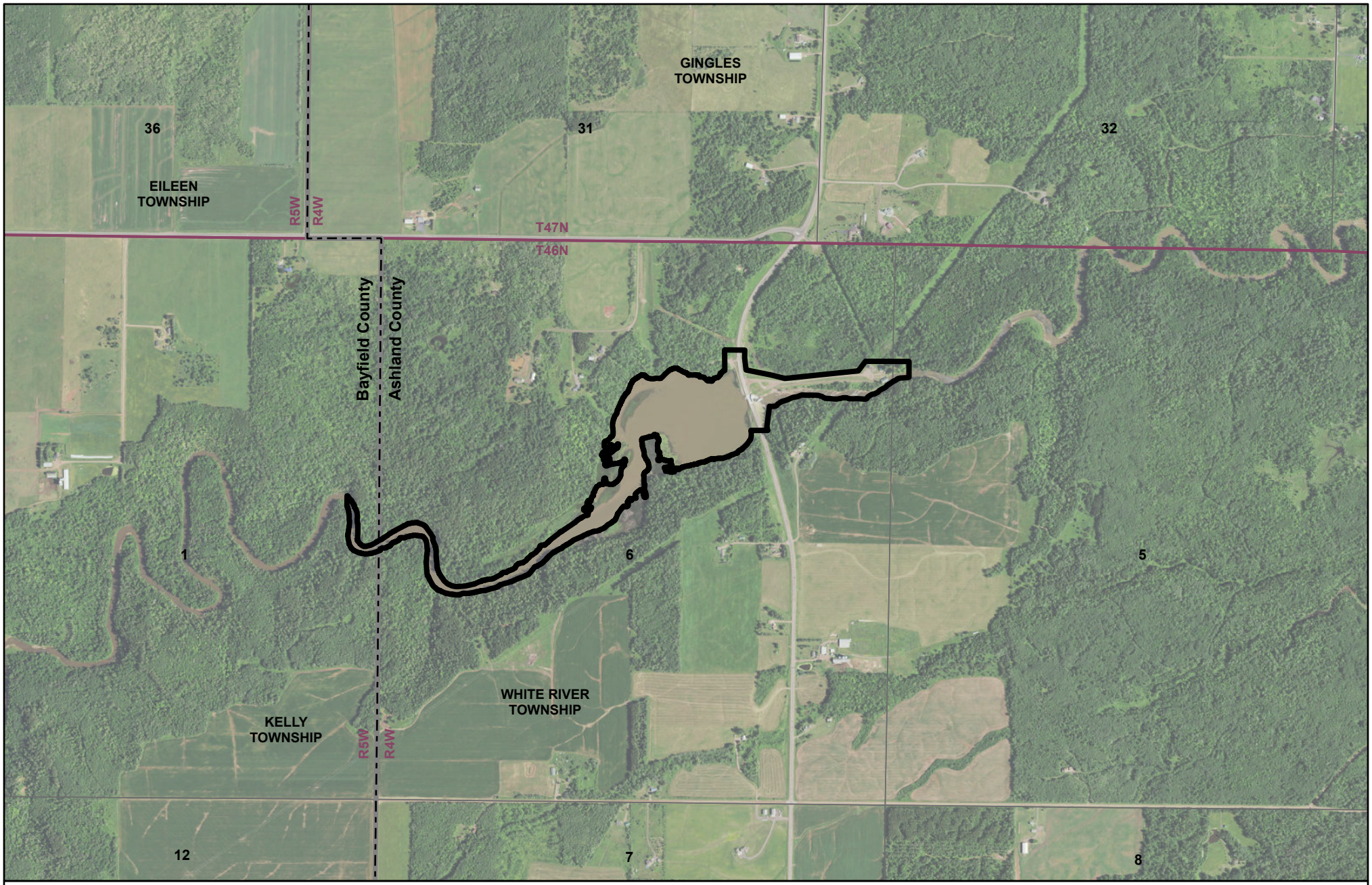
Appendix

Appendices (cont'd):

APPENDIX E-1 Dams on the White River and Long Lake Branch of the White River


Lake Superior
MADELINE ISLAND
Bayfield
Ashland
Sawyer
Bad R
White R
White River Flowage
White River Dam
East Fork White R
Kern Cr
West Fork White R
Bolen Cr
Schramm Cr
South Fork White R
White R
Hanson Cr
Drummond Lake Dam
Johnson Cr
Long Lake Br
Drummond Lake
Drummond Mill Pond Dam
Mill Pond Lake
Lake Owen Dam
Lake Owen
Bad R
Service Layer Credits: Wisconsin DNR; ESRI
Xcel Energy
Mead & Hunt
Dam Location
River/Creek
Lake/Flowage
County Boundary
N
0
2.5
5
Miles
Dams on the Main Stem of the White River and Long Lake Branch of the White River
Ashland Co and Bayfield Co
Wisconsin

APPENDIX E-2 Orthophotographic Map of White River Project Area



Proposed Project Boundary
County Boundary
Township Range
Section

N

0 1,000 2,000 Feet

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

Source Layer: WI 2022 NAIP (natural color, 0.6-meter resolution)

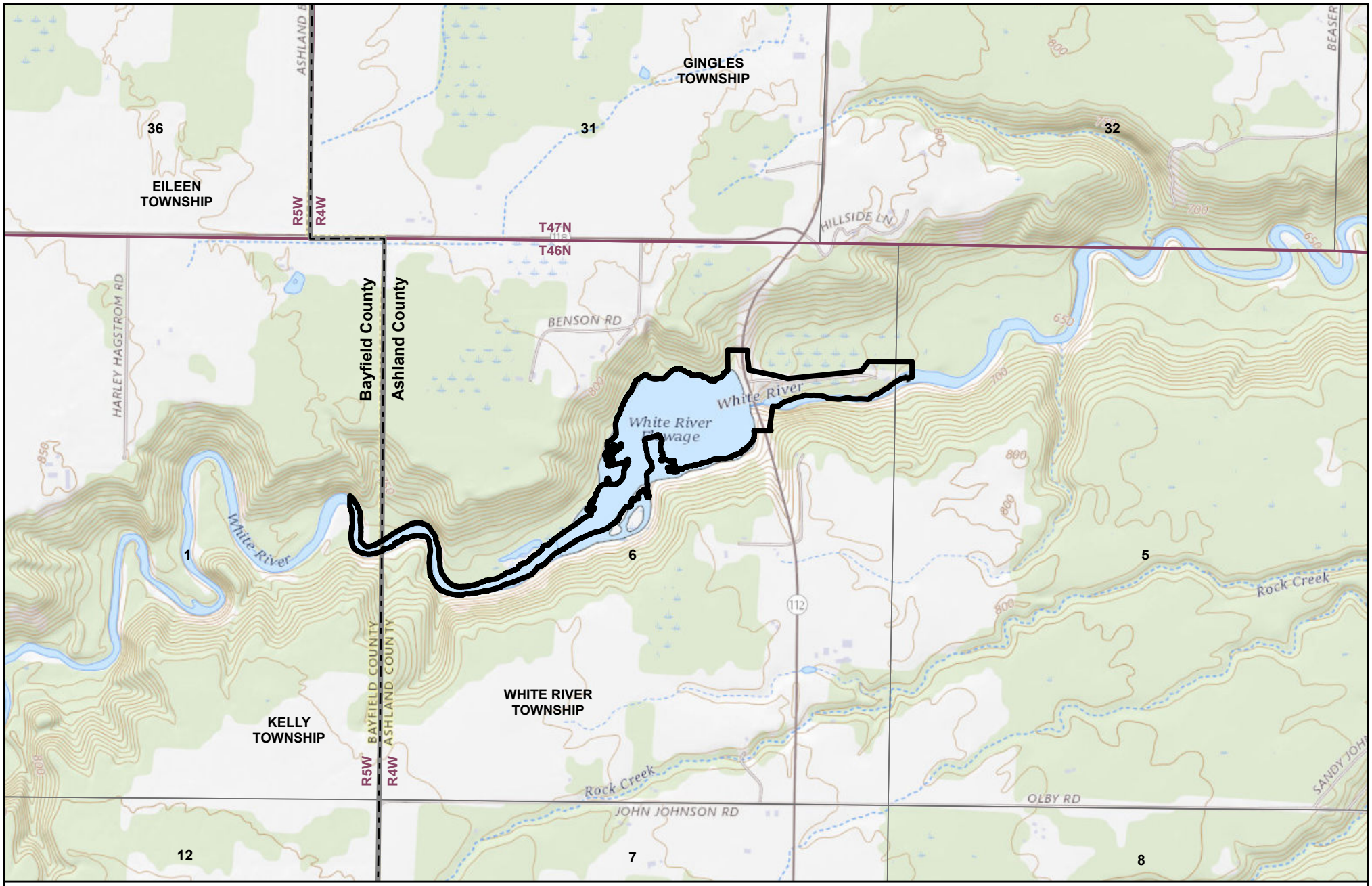
Xcel Energy®
Mead & Hunt

White River Hydroelectric Project
Orthophotographic Map

FERC No. 2444

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLAWhiteRiver_DLA.aprx

APPENDIX E-3 Topographic Map of White River Project Area



Proposed Project Boundary
County Boundary
Township Range
Section

N

0 1,000 2,000 Feet

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

Source Layer: USGS The National Map

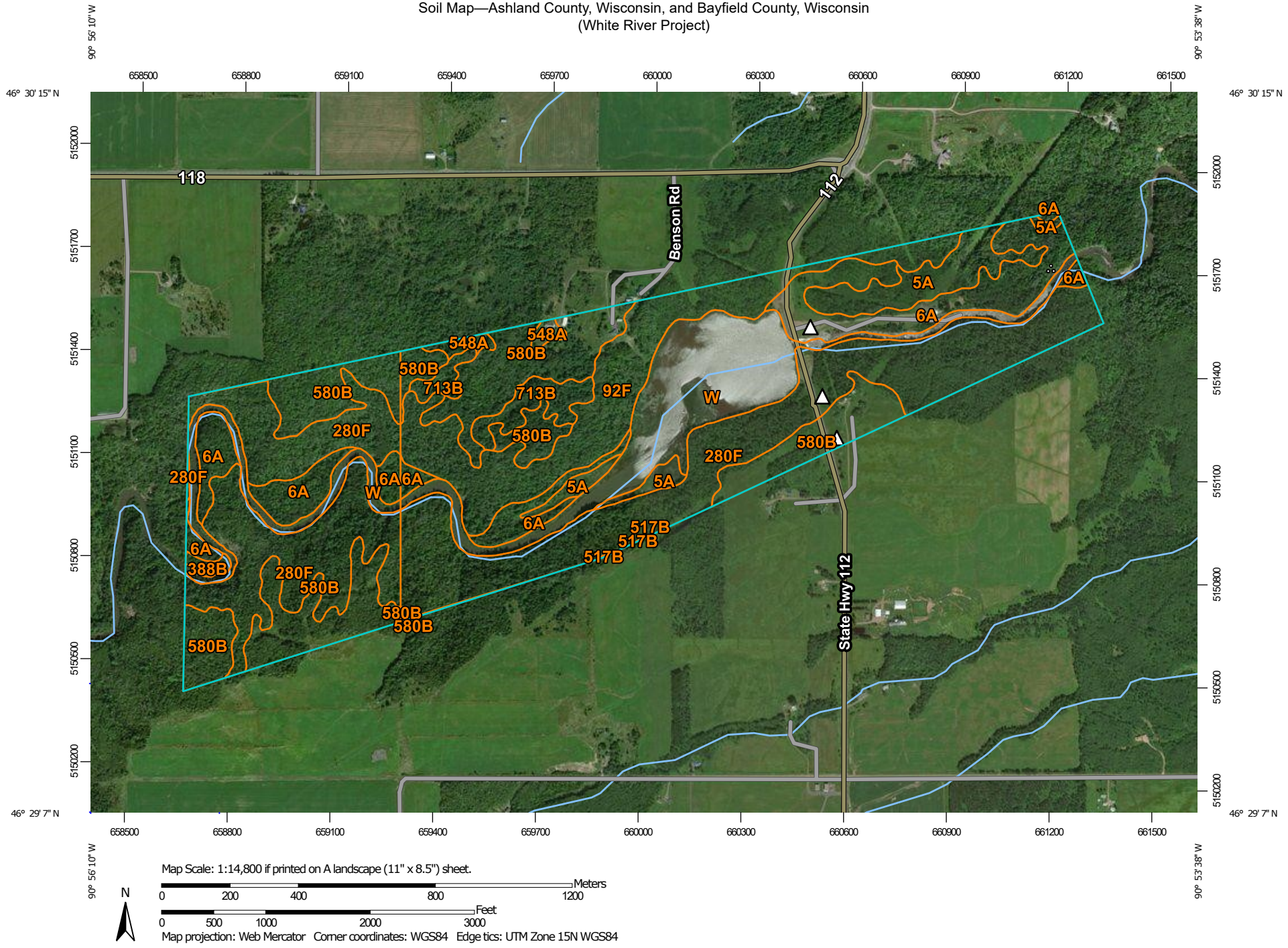
White River Hydroelectric Project
Topographic Map

FERC No. 2444

X:\24001001\192923.011\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLAWhiteRiver_DLA.aprx

APPENDIX E-4 White River Soils Report

Soil Map—Ashland County, Wisconsin, and Bayfield County, Wisconsin
(White River Project)



Map Scale: 1:14,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ashland County, Wisconsin
Survey Area Data: Version 18, Sep 10, 2019

Soil Survey Area: Bayfield County, Wisconsin
Survey Area Data: Version 21, Sep 10, 2019

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 12, 2010—Jul 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5A	Arnheim mucky silt loam, 0 to 1 percent slopes, frequently flooded	21.0	4.9%
6A	Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded	36.5	8.5%
92F	Udorthents, ravines and escarpments, 25 to 60 percent slopes	51.2	11.9%
280F	Odanah silt loam, 25 to 60 percent slopes	82.6	19.3%
517B	Annalake fine sandy loam, lake terrace, 2 to 6 percent slopes	0.0	0.0%
548A	Pickford-Badriver complex, 0 to 3 percent slopes	3.1	0.7%
580B	Sanborg-Badriver complex, 0 to 6 percent slopes	45.8	10.7%
713B	Kellogg-Allendale-Ashwabay complex, 2 to 6 percent slopes	10.6	2.5%
W	Water	50.1	11.7%
Subtotals for Soil Survey Area		**301.0**	**70.2%**
Totals for Area of Interest		**428.6**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded	16.5	3.8%
280F	Odanah silt loam, 25 to 60 percent slopes	60.9	14.2%
388B	Pelkie, occasionally flooded-Dechamps, frequently flooded, complex, 0 to 4 percent slopes	1.4	0.3%
580B	Sanborg-Badriver complex, 0 to 6 percent slopes	38.6	9.0%
W	Water	10.3	2.4%
Subtotals for Soil Survey Area		**127.7**	**29.8%**
Totals for Area of Interest		**428.6**	**100.0%**

View Soil Information By Use: All Uses

Printable Version | Add to Shopping Cart

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Search

Soil Reports

Open All | Close All

- AOI Inventory
- Building Site Development
- Construction Materials
- Disaster Recovery Planning
- Land Classifications
- Land Management
- Recreational Development
- Sanitary Facilities
- **Soil Chemical Properties**
  - Chemical Soil Properties
- **Soil Erosion**
  - Conservation Planning
  - RUSLE2 Related Attributes

View Description | View Soil Report

Options

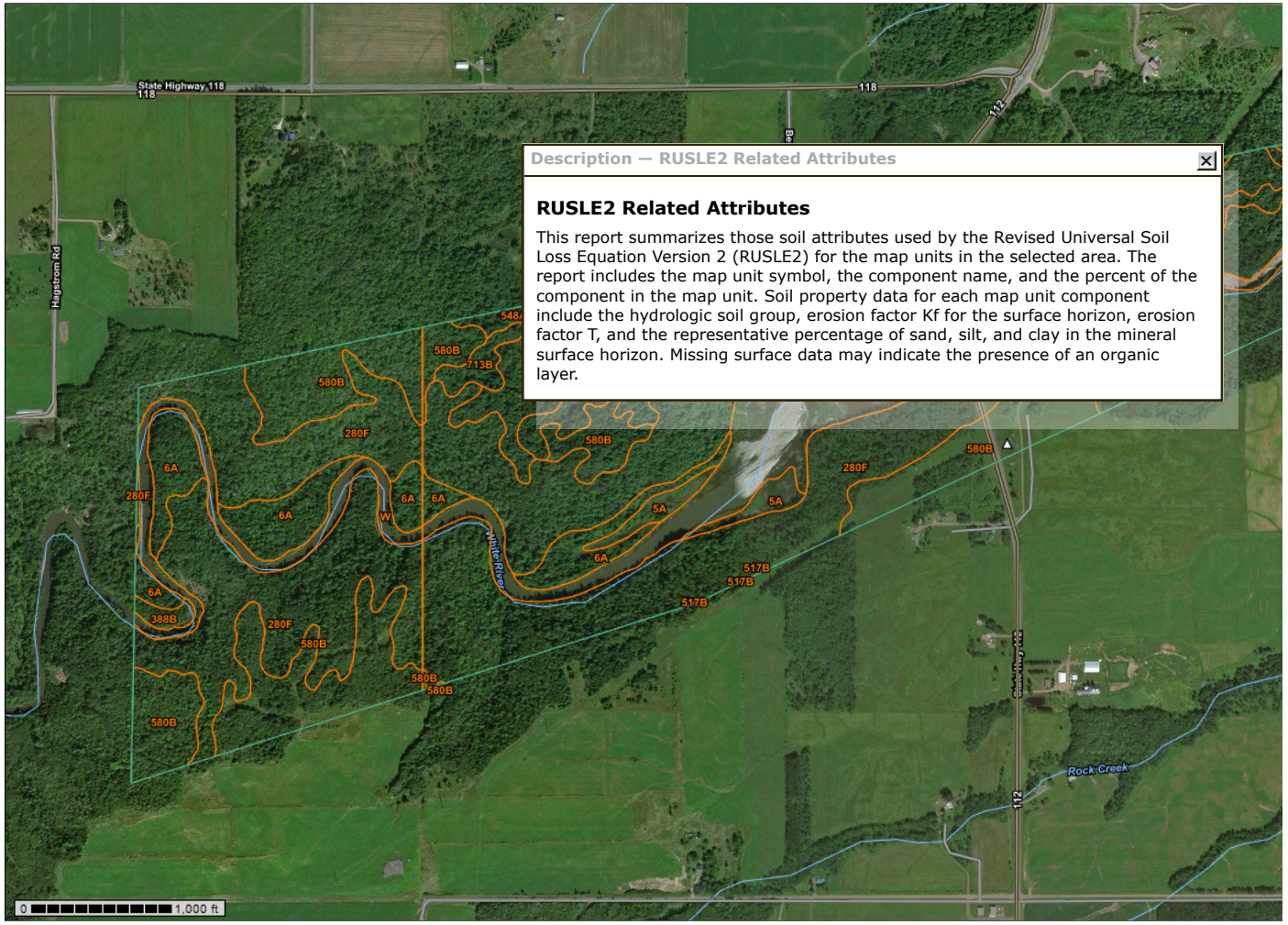
Include minor soils?

View Description | View Soil Report

  - Windbreaks and Environmental Plantings
- Soil Health
- Soil Physical Properties
- Soil Qualities and Features
- Vegetative Productivity
- Waste Management
- Water Features
- Water Management
- Wildlife Management

Soil Map

Scale (not to scale)



Description — RUSLE2 Related Attributes

RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factor Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic layer.

Report — RUSLE2 Related Attributes

Soil properties and interpretations for erosion runoff calculations. The surface mineral horizon properties are displayed or the first mineral horizon below an organic surface horizon. Organic horizons are not displayed.

Ashland County, Wisconsin

Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
5A—Arnheim mucky silt loam, 0 to 1 percent slopes, frequently flooded								
Arnheim	85	249	B/D	.32	5	30.1	54.9	15.0
6A—Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded								
Moquah	85	249	C	.15	5	70.9	16.6	12.5
280F—Odanah silt loam, 25 to 60 percent slopes								
Odanah	95	59	C/D	.37	5	28.7	51.3	20.0
517B—Annalake fine sandy loam, lake terrace, 2 to 6 percent slopes								
Annalake	85	200	C	.28	5	68.5	21.5	10.0
548A—Pickford-Badriver complex, 0 to 3 percent slopes								
Pickford	50	249	D	.28	5	16.9	48.1	35.0
Badriver	35	249	C/D	.17	5	34.2	32.3	33.5
580B—Sanborg-Badriver complex, 0 to 6 percent slopes								
Sanborg	50	200	C/D	.55	5	30.1	54.9	15.0
Badriver	30	249	C/D	.17	5	34.2	32.3	33.5
713B—Kellogg-Allendale-Ashwabay complex, 2 to 6 percent slopes								
Kellogg	35	200	C/D	.02	4	93.6	1.4	5.0
Allendale	25	200	D	.20	4	78.6	16.4	5.0
Ashwabay	20	200	A	.05	4	84.9	9.1	6.0

Bayfield County, Wisconsin

Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
6A—Moquah fine sandy loam, 0 to 3 percent slopes, frequently flooded								
Moquah	85	249	C	.15	5	70.9	16.6	12.5

Bayfield County, Wisconsin								
280F—Odanah silt loam, 25 to 60 percent slopes								
Odanah	95	59	C/D	.37	5	28.7	51.3	20.0
388B—Pelkie, occasionally flooded-Dechamps, frequently flooded, complex, 0 to 4 percent slopes								
Pelkie	50	249	A	.37	5	83.0	9.0	8.0
Dechamps	30	249	A/D	.17	5	71.3	17.7	11.0
580B—Sanborg-Badriver complex, 0 to 6 percent slopes								
Sanborg	50	200	C/D	.55	5	30.1	54.9	15.0
Badriver	30	249	C/D	.17	5	34.2	32.3	33.5

Description — RUSLE2 Related Attributes

RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factor Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic layer.

APPENDIX E-5 White River Archaeological Survey Report

6737 West Washington St.
Ste. 2100
West Allis, WI 53214

T 262.879.1212
TRCcompanies.com

December 1, 2022

Mr. Matt Miller
Hydro Licensing Specialist
Xcel Energy
1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

Re: *Archaeological Shoreline Monitoring at the White River Hydroelectric Project (FERC #2444)*
TRC WIARC No. 282
TRC Project No. 482550

Dear Mr. Miller:

This letter reports the results of an archaeological shoreline monitoring survey at the White River Hydroelectric Project (Project) in Ashland County, Wisconsin. The Project is in the N½ of section 6, T46N, R4W. Archaeological monitoring of the shoreline was conducted by a TRC archaeologist on July 12, 2022, with assistance from the hydro operator, a boat operator, and a boat provided by Xcel Energy. The survey was conducted as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the facility. Figure 1 is the map depicting the hydroelectric project boundary; the map was provided by Xcel Energy.

LITERATURE AND ARCHIVES RESEARCH

The Project had been surveyed twice; once in 1989 (Harrison 1991), and again in 2013 (Van Dyke 2013). The 2013 AVD survey report contained a review of the 1991 survey report (Harrison 1991) and noted that the 1991 survey developed a detailed area history during the initial shoreline erosion assessment conducted as part of the FERC relicensing process. That survey did not discover any archaeological sites eroding from the shoreline. The background research presented in the 1991 report suggested that evidence of an 1823 sawmill was either heavily compromised or destroyed during construction of the existing dam and penstock systems (Harrison 1991). That survey also reported on the location of a dam tender's house which would not likely be eligible for inclusion on the State or National Register of Historic Places (NRHP) but could be a contributing feature for a nomination of the entire hydroelectric facility should it ever warrant nomination.

The Project site was visited by AVD Archaeological Services, Inc. archaeologists on October 7, 2013, following a drawdown. At that time, the reservoir shoreline at the recently receded waterline was stable and well-vegetated to the bank top. Small flood plain terraces of the original pre-flowage river channel were exposed by the recent drawdown. The terraces were examined for areas of exposed soil and, where found, were crisscrossed by surface survey transects. No artifacts or cultural features were noted during the 2013 surface survey.

There were no archaeological sites eroding from the bank within the reservoir, nor were there any previously recorded archaeological sites along the reservoir. The archaeologists concluded that that operation of the hydro did not affect any archaeological sites. The archaeological report recommended that shoreline monitoring continue at five-year intervals.

2022 WHITE RIVER HYDROELECTRIC PROJECT ARCHAEOLOGICAL SHORELINE MONITORING

TRC checked the Wisconsin Historic Preservation Database (WHPD) prior to fieldwork to establish that no new archaeological sites had been reported within the vicinity of the reservoir: there were none. Figure 2 is a copy of the Wisconsin Historic Preservation Database (WHPD) map with the hydroelectric project shoreline outlined.

The Project was visited by a TRC archaeologist on July 12, 2022, who met with the hydro operator and a boat operator at 8:30 a.m. The archaeologist inspected the shoreline of the White River Flowage for archaeological sites (none had been reported for the hydro), and locations where bank exposures could be viewed for artifacts. Photographs were taken along the shoreline, including areas of bank exposure, using a tablet and a geode with sub-meter accuracy. The archaeologist was accompanied by both Xcel Energy employees.

The shoreline on the west side of the reservoir was surveyed using a boat to expedite the survey process. Many photographs were taken of the shoreline, 66 in total, showing the variety of natural settings. Eleven photographs that most typify the shoreline are included in this report. Table 1 includes the photographs by number, along with the lat./long. and a brief description for each location. The locations are keyed to the aerial photo map (Figure 3) by those numbers.

The boat was beached at each location where there was exposed surface to look for artifacts: none were found. The reservoir shoreline was, for the most part, buffered by emergent vegetation of cattails and marsh grasses. Nearer the far west end of the project boundary, woody shrubs and wooded lots dominated the shoreline.

Downstream of the dam, the survey was conducted on foot because the shallow and rapids-dominated water would not accommodate a boat, nor would it have made sense to use a boat under existing conditions. The shoreline environment was either exposed bedrock, or it was heavily wooded. The far east end of the project boundary, just beyond the power plant and gauging station, was covered by woody shrubs, trees, and grasses. No artifacts or cultural features were noted during this survey. No archaeological sites were encountered during the 2022 survey.

TRC recommends that Xcel Energy continue to follow the Project's current HRMP guidelines, including 10-year shoreline inspections as it relates to cultural resources. If you have any questions about the survey, please contact me by phone or by email.

Sincerely,

TRC Environmental Corporation

Allen P. Van Dyke
Principal Archaeologist – Midwest

Attachments: 3 Figures ,11 Photos, and HPR-ARI Form

Table 1
2022 White River Hydroelectric Project Photo Location – Sites

Photo #	Latitude	Longitude	Comments
1	46.493618	-90.924206	Gravel and rock channel and shore
2	46.492895	-90.922067	Bedrock river channel
3	46.492191	-90.921886	Typical marsh
4	46.492170	-90.921471	Marsh backed by coniferous forest
5	46.492654	-90.918750	Shrub-carr at waterline backed by coniferous forest
6	46.495975	-90.913789	Marsh backed by coniferous forest
7	46.495923	-90.911673	Bedrock and gravel shoreline
8	46.498262	-90.911914	Exposed tree roots above stony waterline, new vegetation established
9	46.497976	-90.906511	Downstream of dam
10	46.497964	-90.904907	Downstream of dam
11	46.498385	-90.903749	Downstream of dam

REFERENCES CITED

Harrison, C.
1991 *Report on Cultural Resource Investigation Along the White River Reservoir Shoreline, Ashland County, Wisconsin*. Prepared for Northern States Power Company. Burnett County Historical Society, Siren, Wisconsin.

Van Dyke, A,P.
2013 Archaeological Monitoring at the White River Hydroelectric Project (FERC #2444). AVD Archaeological Services, Inc.

FIGURES

Figure 3.2.2-1: White River Project Boundary

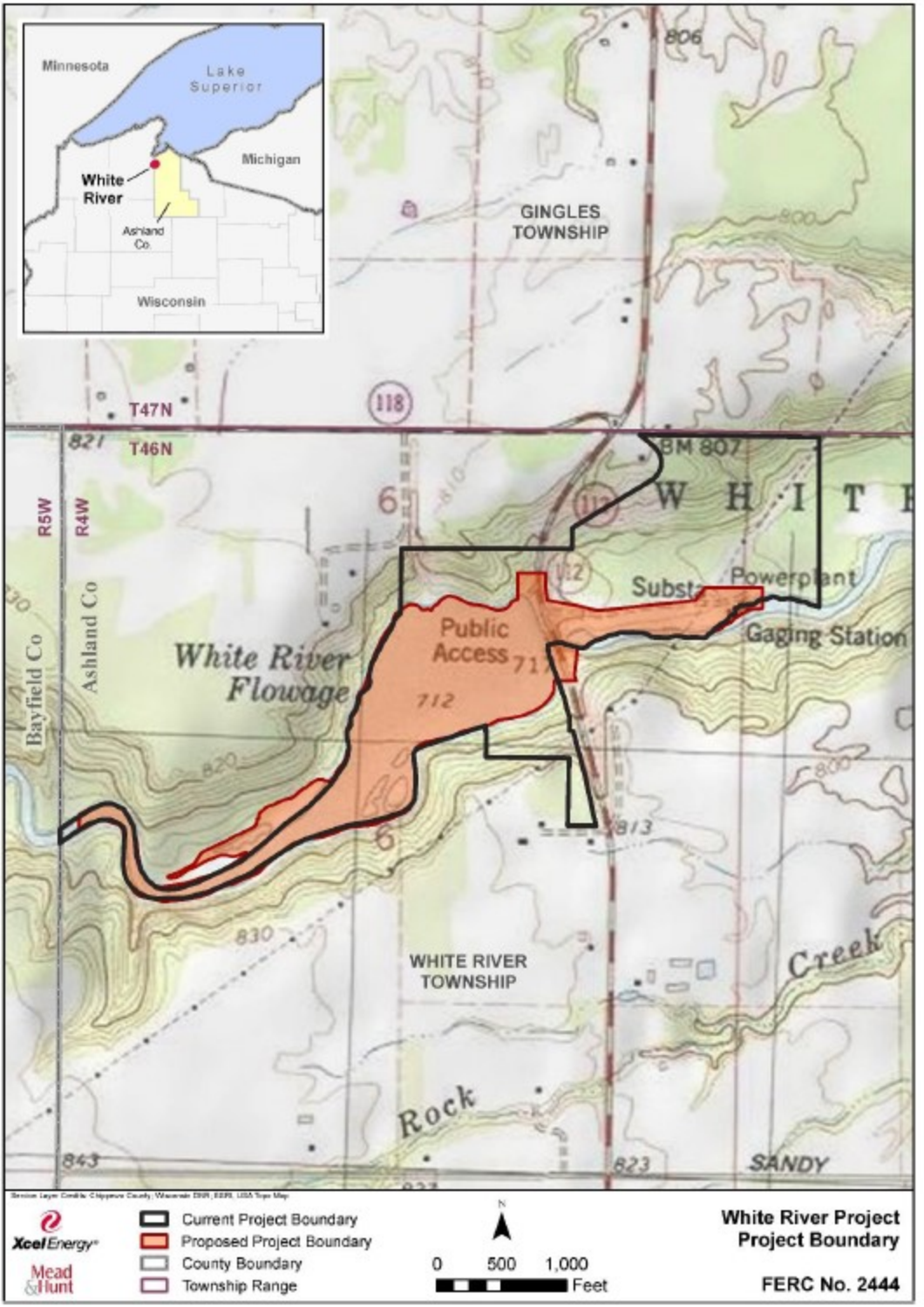
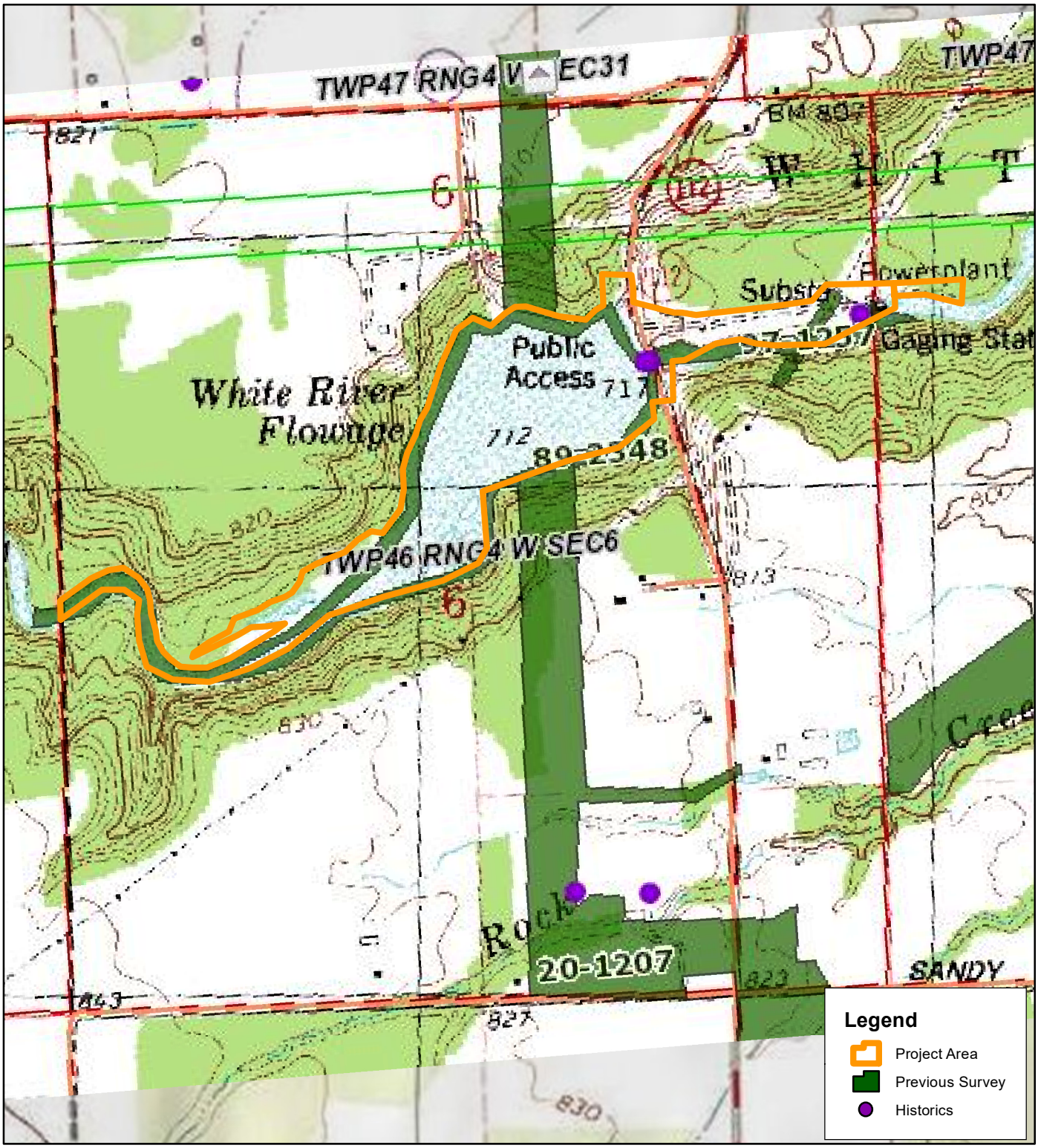


Figure 1



BASE IMAGERY FROM WHPD, (2022)

1 " = 917 '
1:11,000

0 2,000 4,000 FEET

TRC
6737 W WASHINGTON STREET
SUITE 2100
WEST ALLIS, WI 53214
PHONE: 262.879.1212
TRC - GIS

PROJECT:
XCEL/Mead & Hunt
White River Hydro
Ashland County, WI

TITLE:
WHPD Map

DRAWN BY:	A. MCMAHON
CHECKED BY:	R.KLABACKA-WILLIAMS
APPROVED BY:	A.VAN DYKE
DATE:	JULY 2022
PROJ. NO.:	482550
FILE:	[rpt]_Figx_[whiteriver]_Template_8x11.mxd

FIGURE 2

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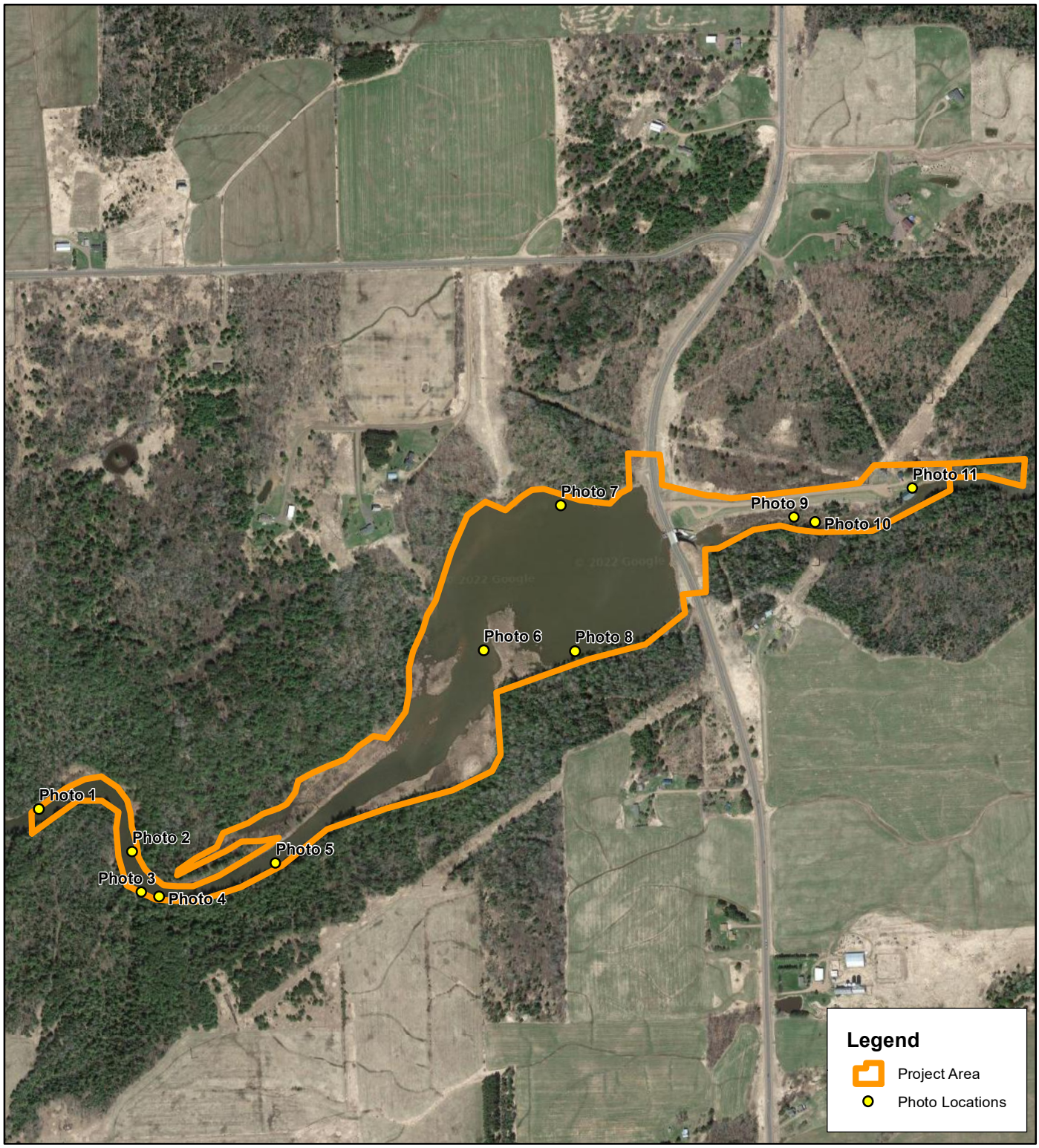

BASE IMAGERY FROM GOOGLE EARTH PRO & PARTNERS, (2018)

1 " = 833 '
1:10,000

0 2,000 4,000 FEET

TRC
6737 W WASHINGTON STREET
SUITE 2100
WEST ALLIS, WI 53214
PHONE: 262.879.1212
TRC - GIS

PROJECT:
XCEL/Mead & Hunt
White River Hydro
Ashland County, WI

TITLE:
Photo Location Map

DRAWN BY:	A. MCMAHON
CHECKED BY:	R.KLABACKA-WILLIAMS
APPROVED BY:	A.VAN DYKE
DATE:	JULY 2022
PROJ. NO.:	482550
FILE:	[rpt]_Figx_[whiteriver]_Template_8x11.mxd

FIGURE 3

P:\ARCHAEOLOGY\TRC\Project by Client\Mead & Hunt\2022\White River Hydro\Whiteriver GIS\[rpt]_Figx_[whiteriver]_Template_8x11.mxd -- Saved By: <ACP>AMcMahon </ACP>on 7/18/2022, 12:03:57 PM

PHOTOS

Photo 1: Shoreline riparian vegetation. View to north.

Photo 2: Coniferous forest shoreline vegetation, bedrock river channel. View to east.

Photo 3: Shallow marsh. View to south.

Photo 4: Shallow marsh – foreground; coniferous forest – background. View to south.

Photo 5: Mixed shrub-carr, coniferous forest background. View to southeast.

Photo 6: Shallow marsh – foreground; coniferous forest – background. View to east.

Photo 7: Coniferous forest with some grasses on shoreline. View to north.

Photo 8: Coniferous forest upslope; washed out tree roots with vegetation forming at the toe. View to south.

Photo 9: Coniferous forest upload of undercut bank. View to south.

Photo 10: Coniferous forest with forbes along shoreline. View to south.

Photo 11: Emergent wetland vegetation along shoreline, coniferous forest upslope from emergent vegetation. View to south.

HPR-API FORM

ARCHAEOLOGICAL REPORTS INVENTORY FORM

WHS PROJECT # none COUNTY Ashland

AUTHORS: A. Van Dyke and A. McMahon

REPORT TITLE: Archaeological Shoreline Monitoring at the White River Hydroelectric Project (FERC ~~#244~~4)

DATE OF REPORT (MONTH AND YEAR): August 2022

SERIES/NUMBER: WIARC # 282

PLACE OF PUBLICATION: West Allis, WI

LOCATIONAL INFORMATION [LEGAL DESCRIPTION OF SURVEY AREA (T-R-S)]
N½ of section 6, T46N, R4W

U.S.G.S. QUAD MAP(S): Sanborn?

SITE(S) INVESTIGATED: none

ACRES INVESTIGATED: N/A AGENCY # ____

INVESTIGATION TECHNIQUES COMPLETED (Check all that apply.)

■ Historical Research	■ Surface Survey	☐ Geomorphology
■ Interview/Informant	☐ Soil Core	☐ Underwater
■ Records/Background	■ Walk Over/Visual Inspection	☐ Avocational Survey
■ Literature Background Research	☐ Mechanical Stripping	☐ Chance Encounter
☐ Traditional Knowledge	☐ Test Excavation/Phase II	☐ Osteological Analysis
■ Monitoring	☐ Major Excavation/Phase III	☐ Faunal Analysis
☐ Shovel Testing/Probing	☐ Remote Sensing	☐ Floral Analysis

ABSTRACT: ■ Included in report ☐ Written in space below

APPENDIX E-6 White River Aquatic and Terrestrial Invasive Species Study Report

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Aquatic and Terrestrial Invasive Species Study Report

Northern States Power Company
White River Hydroelectric Project
White River, Wisconsin
GAI Project Number: R220323.02
| FERC No. 2444
November 2022

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

Aquatic and Terrestrial Invasive Species Study Report

Northern States Power Company
White River Hydroelectric Project
White River, Wisconsin

GAI Project Number: R220323.02
FERC #: 2444

November 2022

Prepared for:
Mead & Hunt
1702 Lawrence Drive
De Pere, WI 54115

Prepared by:
GAI Consultants, Inc.
3313 S Packerland Drive, Suite E
De Pere, Wisconsin 54115

Report Authors:

Laura Sass

Digitally signed by Laura Sass
DN: cn=Laura Sass, o=GAI Consultants, Inc., ou=Oil & Gas MW SW, email=l.sass@gaiconsultants.com, c=US
Date: 2022.11.22 13:01:30 -06'00'

Laura Sass
Senior Project Environmental Specialist

Mary Rohde

Digitally signed by Mary Rohde
DN: cn=Mary Rohde, o, ou, email=m.rohde@gaiconsultants.com, c=US
Date: 2022.11.29 19:13:14 -06'00'

Mary Rohde
Senior Environmental Manager / Associate

Table of Contents

1.0 Project Overview

The White River Hydroelectric Project (Project), Federal Energy Regulatory Commission Project No. 2444, is located on the White River in Ashland County, Wisconsin (Figure 1). The Project is owned, operated, and maintained by Northern States Power Company – Wisconsin (Licensee). The Licensee is seeking to secure a new license for the Project as the current one expires July 31, 2025. The Wisconsin Department of Natural Resources (WDNR) and the Bad River Tribe requested the Licensee complete an invasive species study as part of the relicensing process. On behalf of Mead & Hunt, GAI is pleased to submit the results of an Aquatic and Terrestrial Invasive Species Study (Study) conducted June 29 and July 18-19, 2022, to fulfill this request. This Study report provides baseline data on native species and aquatic and terrestrial invasive species and includes the following:

- Aquatic plant surveys – two sampling events; conducted in June and July,
- Water tow samples – collected during the July survey,
- Sediment samples – collected during the June survey, and
- Terrestrial upland survey – conducted during the July survey.

2.0 Introduction

The White River is located in Bayfield and Ashland Counties. The river empties into the Bad River before flowing north into Lake Superior.

This Study was conducted to assess the presence of known aquatic and terrestrial invasive species and identify any new invasive species in the Project area. The Study encompassed the White River Flowage within the Project's existing and proposed boundaries and included aquatic and terrestrial plants and select aquatic invertebrates. The study area also included the reservoir shoreline and upland shoreline owned by the Licensee. This report summarizes the results of the 2022 aquatic and terrestrial plant surveys, water samples, and sediment samples.

3.0 Methodology

Prior to performing the field work, GAI reviewed the known and historic status of invasive species at the Project. Limited information was available regarding invasive species within the Project boundary prior to this study. The WDNR indicated that reed canary grass (*Phalaris arundinacea*) is known to exist within the Project boundary, and the Ashland County Land and Water Conservation Department identified narrow-leaf cattail (*Typha angustifolia*) within the reservoir in 2019.

3.1 Upstream and Downstream Inundated Areas

3.1.1 Aquatic Plant Survey

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: one on June 29 and one on July 19, 2022. The WDNR provided a grid of sample points for White River Flowage to implement during the study (Figure 2). The grid was comprised of 212 sample points distributed evenly throughout the flowage. 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 (due to plant density, shallow water, or safety),
- Terrestrial (point located in an upland area), or
- Too Deep (i.e., over 15 feet deep in June; over greatest depth of plant growth in July)

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 3 and 4, Attachments A and B). Plant density was measured by rake fullness (Figure 5). 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 C.

Additional information on bed substrates and depths was collected in June at points with water depths less than 15 feet. 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 lake bottom was also noted. Locations with coarse woody habitat greater than 4 inches in diameter and five feet in length that were observed in the water at or below the ordinary high-water mark (OHWM) were mapped. In July, the maximum depth of colonization (MDC) was determined by the data collected in June and confirmed in the field by three empty rake retrievals in different areas with the same depth. Once the MDC was determined, sample points where the water depth was greater than the MDC 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 was collected in the reservoir and one was collected in the tailwater (Figure 1) using a 64-micron mesh zooplankton net. To monitor for the presence of spiny water flea (*Bythotrephes longimanus*) and fishhook water flea (*Cercopagis pengoi*), two water flea samples were collected, one from the reservoir and one from the tailwater (Figure 1) 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, 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 was not touching 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 lack of a boat landing at the tailwater location 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 positioned in the current so 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 four 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. The 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 delivered to the Wisconsin State Laboratory of Hygiene in Madison, Wisconsin on August 11, 2022, to be analyzed, as requested by the WDNR invasive species coordinator.

3.1.3 Sediment Samples

To monitor for invasive macroinvertebrates, a sediment sample was collected at the public boat landing off of Hwy 112 near the dam (Figure 1). A shovel was used to scoop approximately six inches of sediment into a 10-inch Tetra Pond Planter Basket, with a 1/32nd inch mesh (Figure 6). 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 around these access sites were also visually examined for live snails, clams, crayfish, and shells.

3.2 Terrestrial Upland Areas

The upland shoreline adjacent to the reservoir and upland areas owned by the Licensee that included Project facilities and/or Licensee-owned formal recreation sites, were surveyed in mid-July using the two methods described below.

3.2.1 Upland Shorelines

Upland shoreline areas were studied by GAI on July 18, 2022 (Attachment D). The upland shoreline was surveyed by boat or on foot where the use of a boat was not feasible. While the boat motored slowly 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 survey upstream of the dam was divided into 2 segments (Figure 7a) to collect vegetation data along the north and south shores, respectively. 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
95-100	6

3.2.2 Upland Terrestrial Areas

Upland areas owned by the Licensee within the Project boundary and shorelines where boat access was not feasible were studied using a meander survey on July 19, 2022 (Figure 7b). The route traveled during the meander survey was recorded using a Garmin Forerunner 55 Watch. An overall characterization of the terrestrial plant community 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 Aquatic Plant Survey

4.1.1 June Survey

In June, all points with a water depth of 15 feet or less were sampled. A total of 163 of the 212 points provided were sampled during the point-intercept survey on June 29, 2022 (Figure 3, Attachment A). Most of the points that were not sampled were either non-navigable due to plant density or had a depth greater than 15 feet. In addition, four of the points could not be sampled because of navigability issues due to being too shallow, and three points were terrestrial. Among the points sampled, 49 were shallower than the maximum depth of rooting plants (4.0 feet) and only 19 points (39% of the littoral points) exhibited vegetation. Fifteen species were found during the survey (Table 2), two of which, common arrowhead (*Sagittaria latifolia*) and sago pondweed (*Stuckenia pectinata*), were observed visually but not present on the rake. Overall, predominant species were coontail (*Ceratophyllum demersum),* leafy pondweed (*Potamogeton foliosus*), common waterweed (*Elodea canadensis*), and grass-leaved arrowhead (*Sagittaria graminea*). Figure 8 depicts 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 (Figure 3). Only one invasive species was located on the rake during the point-intercept survey: narrow-leaf cattail, which is already known in the Flowage. One additional invasive species, aquatic forget-me-not (*Myosotis scorpioides*), was observed growing along the shoreline in one area in June and was hand pulled. The WDNR Incident Report form is available in Attachment E. This species will be discussed further in Section 4.4.

4.1.2 Late-July Survey

The late-season survey on White River Flowage was completed on July 19, 2022. All sample points that were within the plant rooting depth range (having a depth of 4.0 feet or less), which was established in June, were re-sampled in July. A total of 74 points were visited during the July survey (Figure 4, Attachment B). The maximum depth of plant growth in July was 3.8 feet. Of the points visited, 46 were found to be within the littoral zone. Twenty-two (48% littoral frequency of occurrence) of these sample sites contained vegetation. Seventeen species were found on the rake during the late-season survey (Table 2). The predominant species were the same four as in June, but with a change in rank, ordering: leafy pondweed, grass-leaved arrowhead, common waterweed, and coontail. Figure 9 depicts the predominant species for each rake sample in July. The average total rake fullness where plants were present was 1.8. No aquatic invasive species were located on the rake during the July point-intercept survey, although narrow-leaf cattail was again observed in the reservoir. A few new locations of aquatic forget-me-not were located in July and were hand pulled.

Some interesting species were observed. Marsh milkweed (*Asclepias incarnata*), a native wetland plant used by Monarch butterflies, was visually observed growing in some areas near the shoreline. One point-intercept sampling location contained a special concern species: Vasey's pondweed (*Potamogeton vaseyi*).

Occurrences of wild rice (*Zizania* sp.) were mapped during the July survey as well and can be found in Figure 4. The findings consisted of two contiguous areas and one smaller point-based occurrence toward the northeast end of the flowage. Populations of wild rice are dynamic, depending on a variety of factors and can look quite different from year to year.

Table 2

Aquatic Plant Species Abundance in White River Flowage

Scientific Name	Common Name	Littoral Frequency of Occurrence[a]		Relative Frequency of Occurrence[b]	
		June	July	June	July
Ceratophyllum demersum	Coontail	20.4	10.9	20.0	8.8
Chara sp.	Muskgrasses	*not observed*	8.7	*not observed*	7.0
Elodea canadensis	Common waterweed	12.2	15.2	12.0	12.3
Heteranthera dubia	Water stargrass	8.2	6.5	8.0	5.3
Lemna minor	Small duckweed	*not observed*	2.2	*not observed*	1.8
Nymphaea odorata	White water lily	2.0	2.2	2.0	1.8
Potamogeton epihydrus	Ribbon-leaf pondweed	2.0	4.4	2.0	3.5
Potamogeton foliosus	Leafy pondweed	16.3	26.1	16.0	21.1
Potamogeton natans	Floating-leaf pondweed	8.2	4.4	8.0	3.5
Potamogeton praelongus	White-stem pondweed	*not observed*	2.2	*not observed*	1.8
Potamogeton richardsonii	Clasping-leaf pondweed	2.0	2.2	2.0	1.8
Potamogeton vaseyi	Vasey's pondweed	*not observed*	2.2	*not observed*	1.8
Potamogeton zosteriformis	Flat-stem pondweed	*10.2*	4.4	10.0	3.5
Sagittaria graminea	Grass-leaved arrowhead	12.2	15.2	12.0	12.3
Sagittaria latifolia	Common arrowhead	Visual	6.5	Visual	5.3
Sparganium eurycarpum	Common bur-reed	2.0	2.2	2.0	1.8
Stuckenia pectinata	Sago pondweed	Visual	*not observed*	Visual	*not observed*
Typha angustifolia	Narrow-leaf cattail	2.0	Visual	2.0	Visual
Zizania sp.	Wild rice	4.0	8.7	4.0	7.0

[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).

4.1.3 Overall Aquatic Plant Survey Analysis and Observations

In June, species richness (on the rake; excludes visual-only occurrences) was 13 and the mean conservatism value was 5.5, resulting in a Floristic Quality Index (FQI) of 19.7. In July, species richness was 17 and the mean conservatism value was 6.0, calculating to a 24.7 FQI (Table 3). In June, 7 of the 13 species located on the rake had C-values over 5; in July, 10 of the 17 species had C-values over 5. 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. Conservatism values for species in the White River Flowage suggest neither quality nor degraded conditions.

Overall littoral frequency of occurrence of plants in June was 38.8% and in July was 47.8%. A higher littoral frequency of occurrence is expected during a late-season survey compared to an early-season survey as the later survey is expected to account for species that start growing later in the growing season and are undetectable earlier in the year. The maximum depth of growing plants being 4 feet deep is quite low when compared to other Wisconsin lakes; although, a lower MDC is common with impoundments/flowages which frequently have higher turbidity compared to drainage lakes. As mentioned in the introduction, the water in the Flowage is stained a darker color and turbidity is highly variable; likely contributing to the lower MDC. A relatively steep underwater slope in some of the navigable areas of the flowage restricts submergent aquatic plant growth to near shore areas. Figure 10 shows a bathymetric map which illustrates the depths recorded during the June 2022 point-intercept survey.

Substrate type also directly affects the species type and abundance of plants that can be supported in a waterbody. Most of the White River Flowage has a relatively firm bottom dominated by clay. The majority of substrate samples collected in June (63%), at points having depths of less than 15 feet, were classified as clay (Figure 11). The remaining locations were classified as silt, sand, gravel, and cobble, in decreasing order. As the flowage becomes more riverine upstream, the substrates change from mostly clay and silt, to sandy and rocky. When comparing the substrate map to either of the point-intercept maps, these riverine portions support lower abundances of submergent plants. The predominantly firm substrate types, in conjunction with the transition to less organic substrates likely play a role in the distribution of aquatic plants in the Flowage.

Woody debris was mapped within the flowage and along the lakeshores. During the June point-intercept survey, 14 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 July point-intercept survey (Figure 12). One hundred six pieces of CWH were located in near-shore areas all around the Flowage.

Table 3

Overall White River Flowage Submergent Plants Summary

Statistic	June 2022	Late-July 2022
Littoral Frequency of Occurrence	38.8	47.8
Maximum Depth of Plants	4.0 feet	3.8 feet
Species Richness	13	17
FQI	19.7	24.7

4.2 Water Samples

The water samples for zebra mussel veligers and water fleas were analyzed by the Wisconsin State Lab of Hygiene. Samples were dropped off at the Lab on August 11, 2022, and results were received October 19, 2022. All water samples were negative for the presence of zebra mussel veligers and water fleas (Attachment F).

4.3 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 people shore-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. Sediment samples collected at the public access site near the dam did not detect any invasive macroinvertebrates. A small number of native snails were visually observed at the boat launch area while collecting sediment samples.

4.4 Terrestrial Upland Areas

Terrestrial invasive species surveys were conducted along the shoreline and upland areas included within the study area. The shoreline was inspected by boat where possible, or by walking where navigability was limited. A terrestrial invasive meander survey was conducted in areas east of the flowage that are owned by the Licensee. These areas contained sizeable populations of invasive species.

4.4.1 Upland Shoreline Survey – White River Shoreline

The survey of the upland shoreline accessible by boat was separated into two segments to collect vegetation data along the north and south shores, respectively (Figure 7a). The shoreline is almost exclusively undeveloped and densely wooded, with the exceptions of the dam and boat landing, and would be classified as Northern Mesic Forest (Table 4), per the WDNR community classification system.

Table 4

Terrestrial Shoreline Community Types Summary

Terrestrial Shoreline Community	Mileage of Meander	Percentage of Meander
Northern Mesic Forest (Segment 1)	1.13	49.78%
Northern Mesic Forest (Segment 2)	1.14	50.22%
Total	2.27	100%

The following list summarizes the most commonly encountered herbaceous and woody vegetation species observed within the Northern Mesic Forest terrestrial shoreline community, which was similar for Segments 1 and 2 (vegetation characteristics for areas between the flowage and State Highway 112 were captured during the terrestrial meander survey):

- Northern Mesic Forest
  - Overstory: sugar maple (*Acer saccharum*), eastern white pine (*Pinus strobus*), balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), eastern hemlock (*Tsuga canadensis*), eastern white cedar (*Thuja occidentalis*)
  - Understory: fern species (polypodiophytes)

Invasive species comprised 0.97 miles of shoreline during the terrestrial survey and were limited to narrow-leaf cattail and aquatic forget-me-not (Table 5). Narrow-leaf cattail was the most predominant species observed, while only small populations of aquatic forget-me-not were identified.

Table 5

Shoreline and Terrestrial Invasive Species Summary

Species	Common Name	Mileage of Meander	Percentage of Meander
Typha angustifolia	Narrow-leaf cattail	0.96	42.29%
Myosotis scorpioides	Aquatic forget-me-not	0.006	0.26%

4.4.2 Upland Terrestrial Area – Meander Survey

The areas owned by the Licensee were broken up into 4 parts for the purpose of the upland terrestrial meander survey (Figure 7b):

1. The **northwest** portion of the survey included areas between the flowage and Highway 112 and north of the dam, including the boat landing. This area was characterized by a mixture of maintained turfgrass, road-ROW, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Canada thistle (*Cirsium arvense*)
    b. Crown vetch (*Coronilla varia*)
    c. Tansy (*Tanacetum vulgare*)
2. The **southwest** portion of the survey included areas between the flowage and Highway 112 and south of the dam. This area was characterized by a mixture of maintained turfgrass, road-ROW, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Canada thistle
    b. Crown vetch
    c. Narrow-leaf cattail
    d. Spotted knapweed (*Centaurea stoebe*)
    e. Wild parsnip (*Pastinaca sativa*)
3. The **southeast** portion of the survey included areas east of Highway 112 and south of the river and dam. This area was characterized by a mixture of maintained turfgrass, road-ROW, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:
    a. Canada thistle
    b. Crown vetch
    c. Spotted knapweed
4. The **northeast** portion of the survey included areas east of Highway 112 and north of the river and dam. The area also includes the Licensee's control houses, access roads, and

canoe portage put-in site. This area was characterized by a mixture of maintained turfgrass, road right of way, and natural herbaceous and woody vegetation. Invasive plant species observed within this area included:

a. Canada thistle
b. Crown vetch
c. Tansy
d. Spotted knapweed
e. Narrow-leaf cattail
f. Wild parsnip
g. Common buckthorn (*Rhamnus cathartica*)
h. Eurasian honeysuckle (*Lonicera* spp.)

4.4.3 Overall Upland Shoreline and Terrestrial Survey Observations

Overall, shoreline and terrestrial invasive species were observed at moderate to high densities and frequencies throughout the Project area. Several large, high-density infestations of narrow-leaf cattail were observed and documented along the flowage's shoreline, while aquatic forget-me-not was less dense or widespread. The invasive species identified in the terrestrial meander surveys are well-established in Wisconsin and the relatively high frequency and density of populations were unsurprising, considering the site is adjacent to a highway and has a public boat launch.

5.0 Conclusion

Not much information on the condition of White River Flowage exists. The WDNR water detail site for the Flowage lists its general condition as *suspected poor*. An inquiry was made to the WDNR's Ashland County Water Resources Management Specialist as to why this may be. The conclusion was that not enough information is available to give a definitive condition and that it was suspected poor based on satellite-derived data which read out as being poor based on the turbidity of the system.

Based on the surveys that GAI conducted in 2022, the White River Flowage does not appear to be in poor shape. It supports a healthy population of species known to be sensitive to environmental degradation including an NHI special concern species (Vasey's pondweed). Beds of wild rice exist here which provide food and habitat for wildlife, help maintain water quality, and are of cultural significance. Additionally, a high incidence of coarse woody habitat is present, which also supports a variety of fish and wildlife. No submergent aquatic invasive species were discovered.

6.0 References

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FIGURE 1
Project Location and Overview Map

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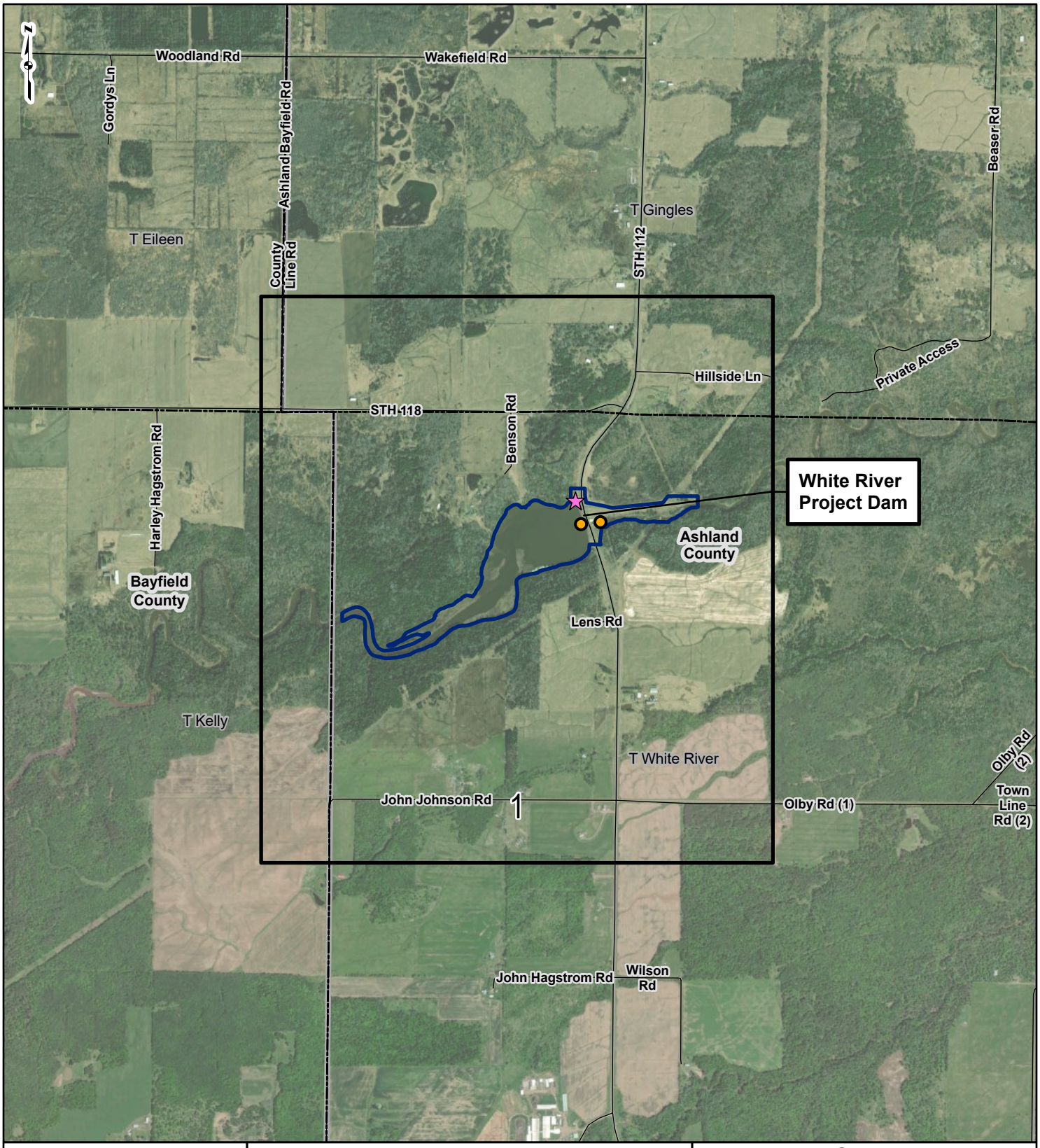
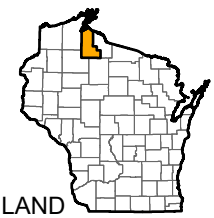


PROJECT LOCATION



ASHLAND 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
PROJECT LOCATION AND OVERVIEW MAP

White River Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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DRAWN BY: EMW
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 9/26/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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FIGURE 2
Point-Intercept Grid Provided by the WDNR

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White River Flowage
Ashland County
WBIC 2894200
T46N R04W S06
41.5 acres / 16.8 ha
212 Sampling Points
28m between Points
Site1: Lat. 46.49223667
Long. -90.92168536

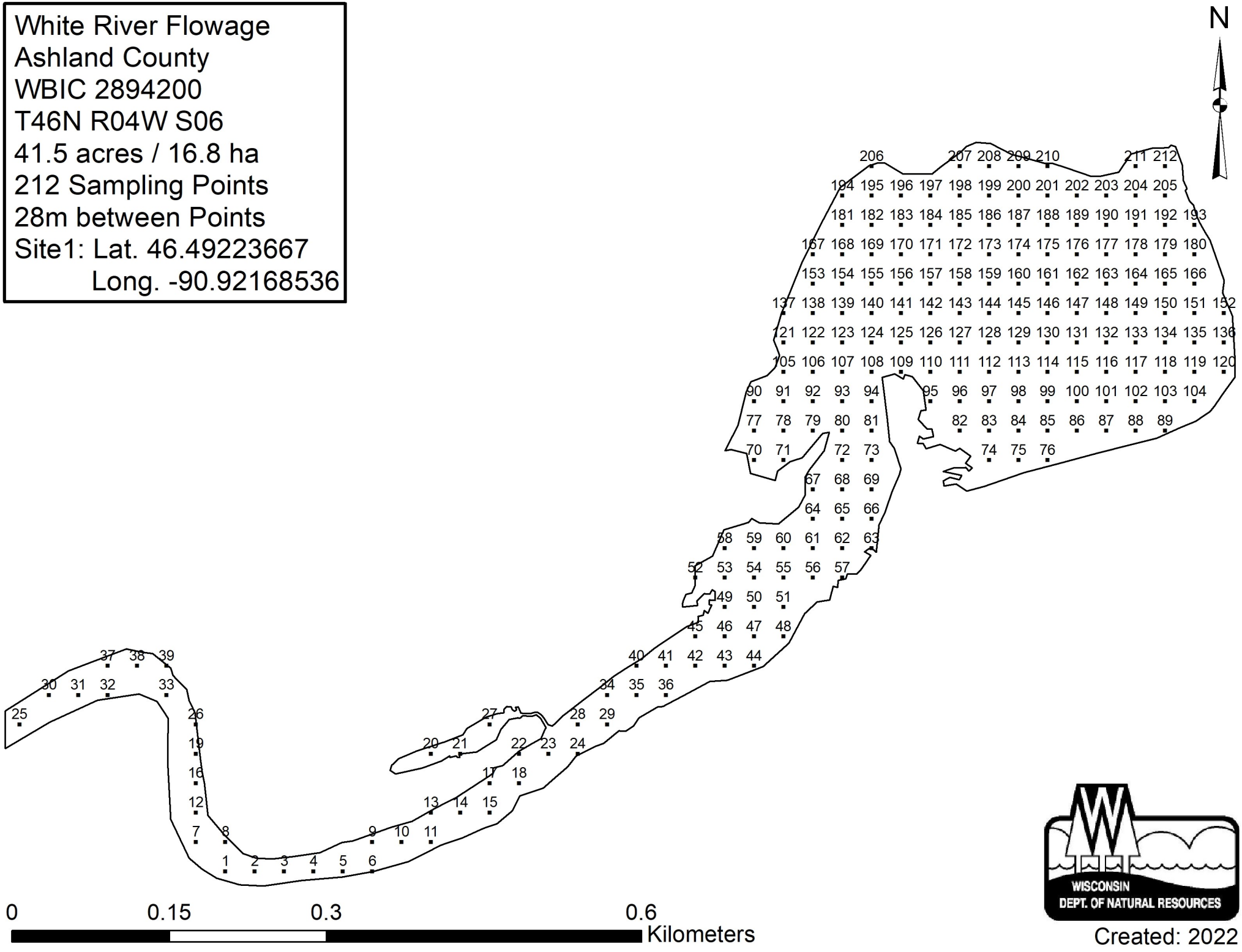

FIGURE 3
June Point-Intercept Survey

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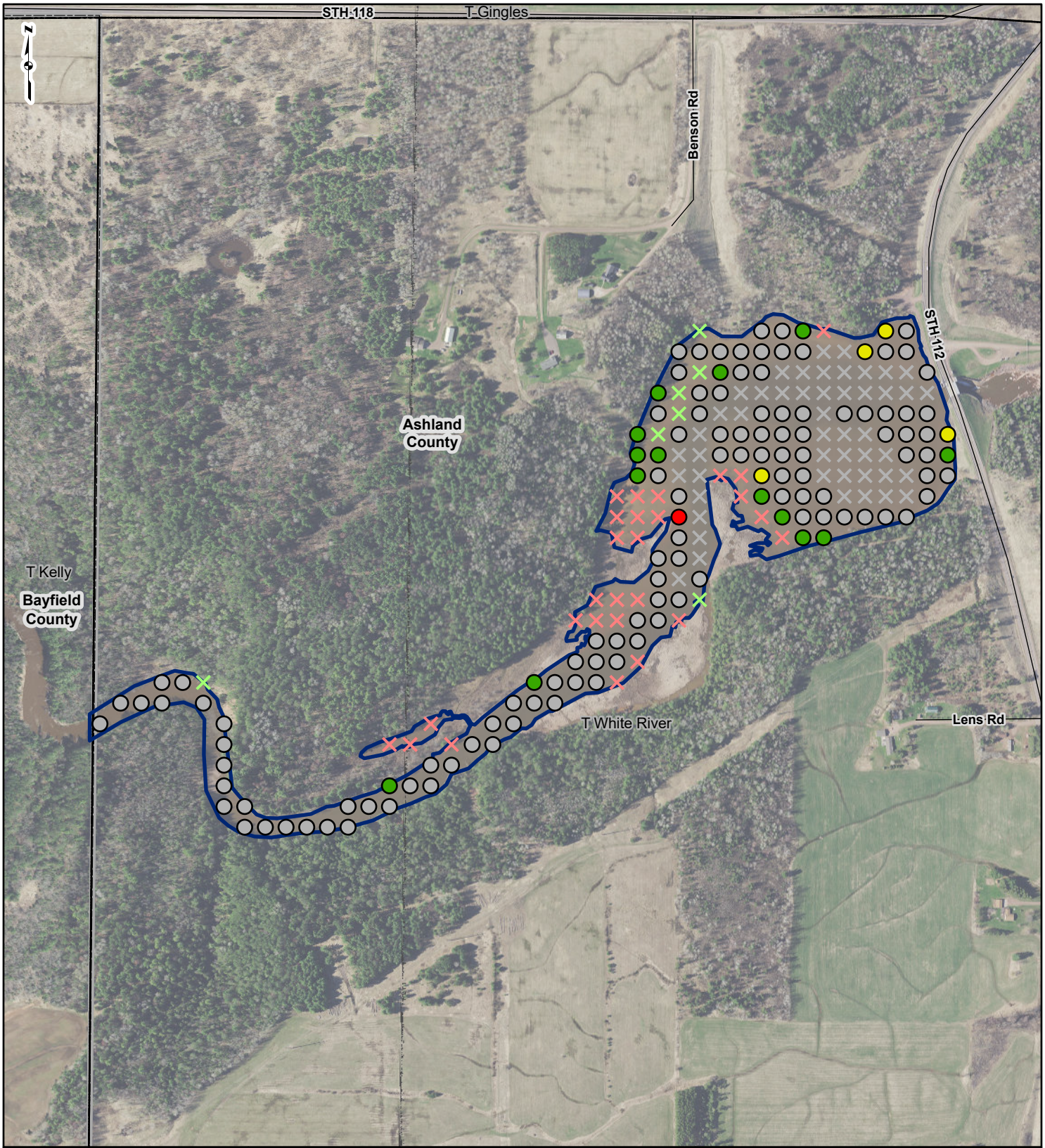
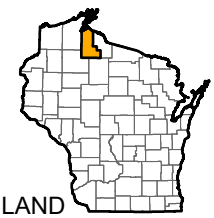


PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/Shallow

Rake Fullness

- 0
- 1
- 2
- 3

- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

Figure 3
June Point
Intercept Survey

White River Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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DRAWN BY: EMW DATE: 9/26/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 9/26/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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FIGURE 4
July Point-Intercept Survey

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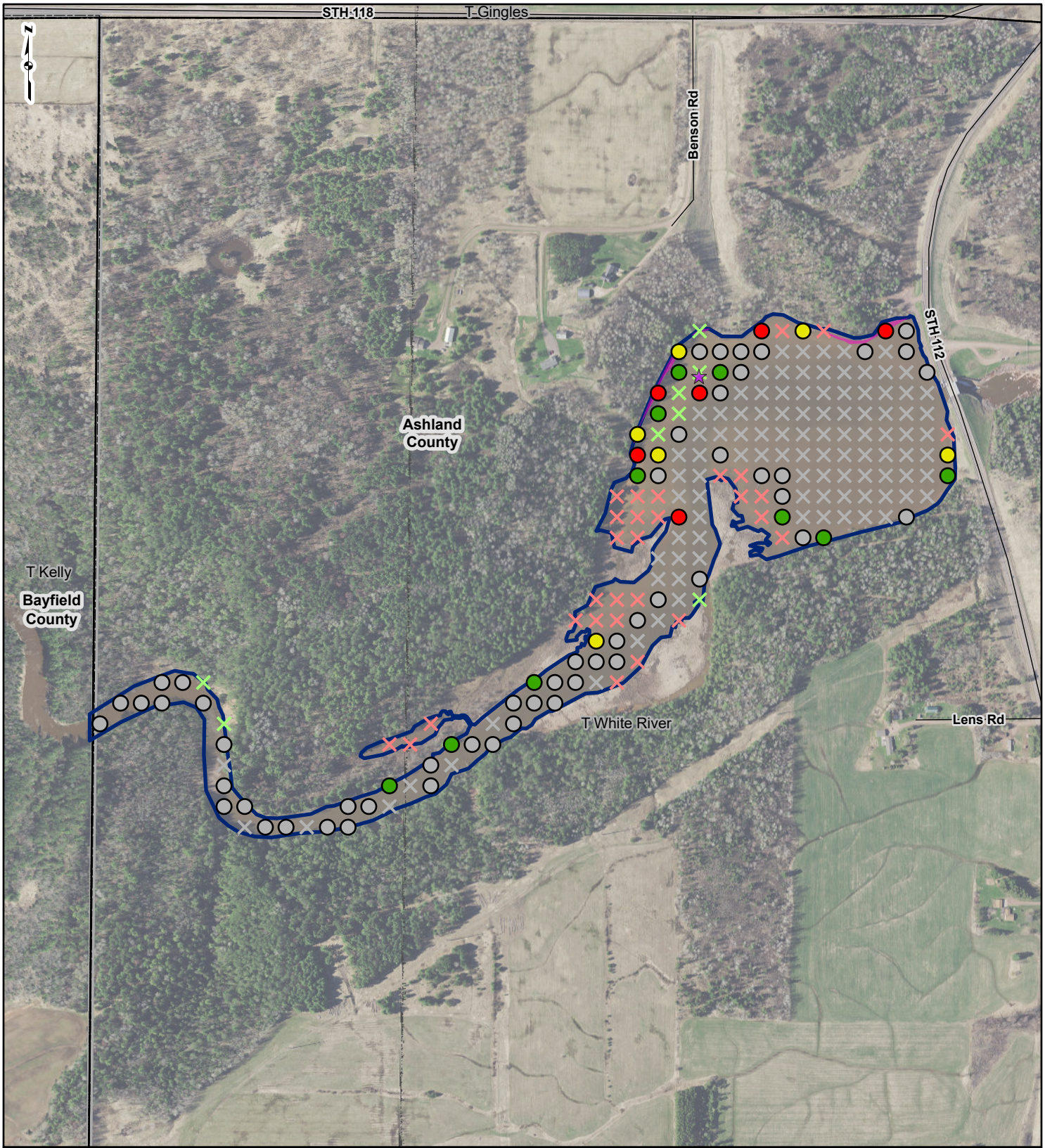
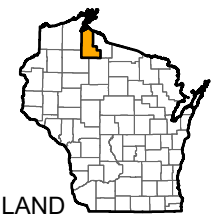


PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

- Deeper than Plant Growth
- Non-Navigable Vegetation
- Non-Navigable Terrestrial/ Shallow
- Wild Rice Location

Rake Fullness
- 0
- 1
- 2
- 3

- Wild Rice Area
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

Figure 4
July Point
Intercept Survey

White River Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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DRAWN BY: EMW DATE: 10/12/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/12/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

FIGURE 5
Rake Fullness per WDNR Protocol

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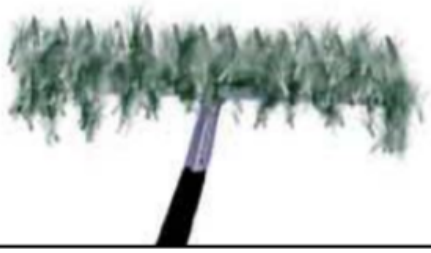
Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

Figure 5. 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 6
Sediment Basket

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Figure 6. Sediment basket.

Using a 10-inch Tetra Pond Planter Basket, with a 1/32nd inch mesh, a sample is being rinsed for examination.

FIGURE 7A
Shoreline Terrestrial and Invasive Species

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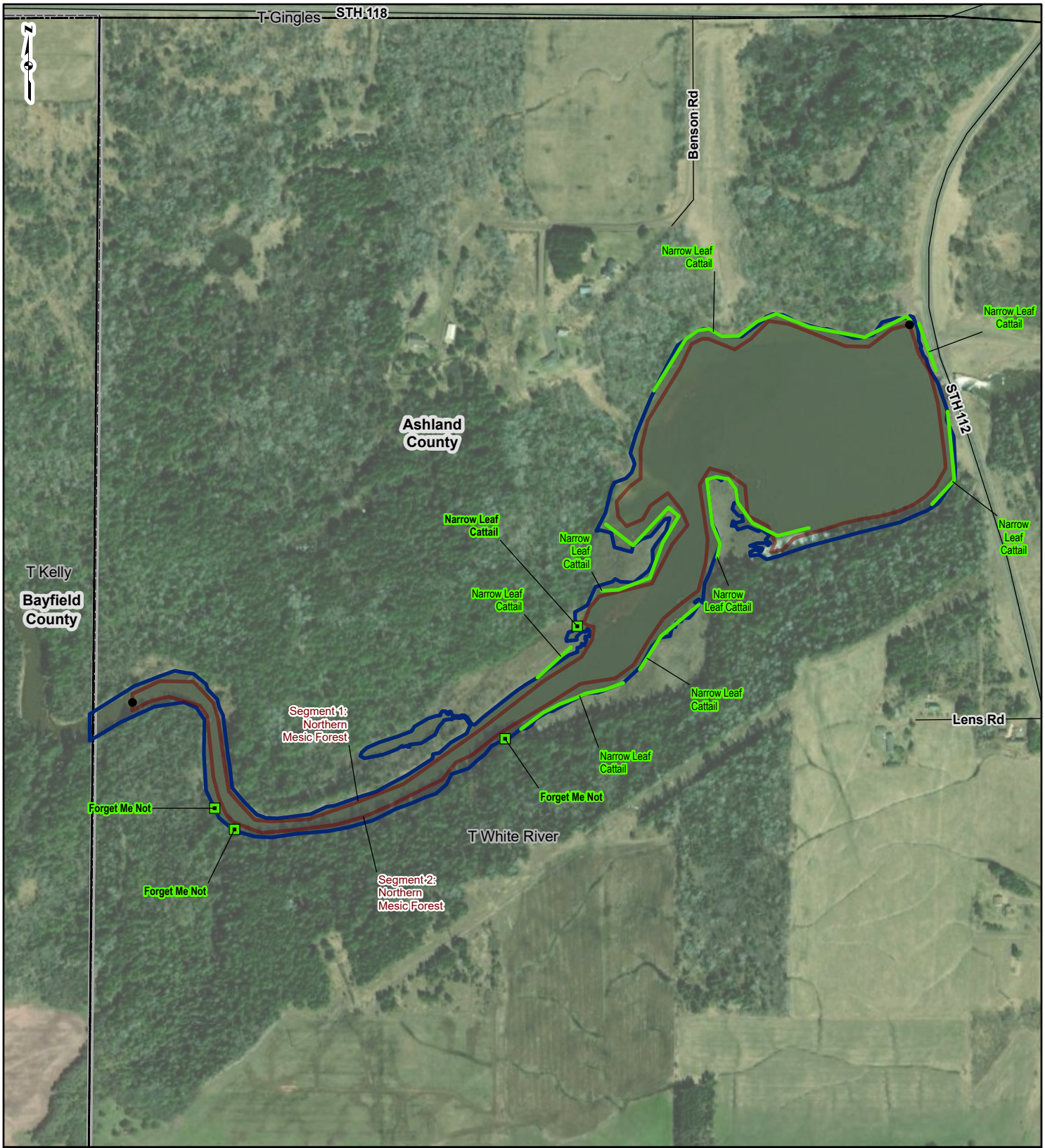

PROJECT LOCATION

ASHLAND COUNTY, WISCONSIN

LEGEND

- Start/Stop Locations
- Invasive Point
- Invasive Line
- Meander Segments
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

Figure 7A
Shoreline Terrestrial and Invasive Species

White River Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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DRAWN BY: EMW
CHECKED: TDB
DATE: 10/24/2022
APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/24/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

FIGURE 7B
Upland Terrestrial Meanders and Invasive Species

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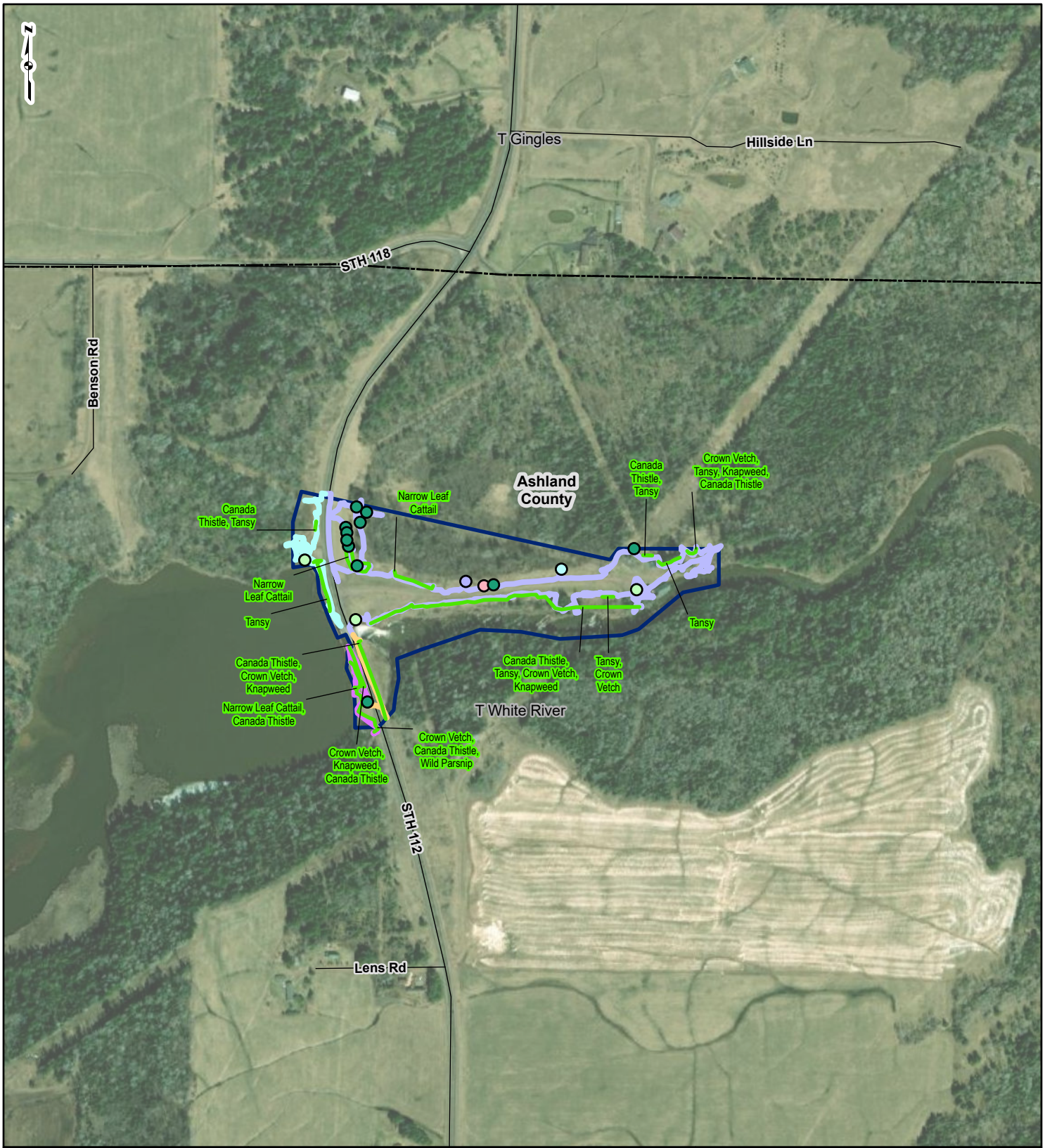
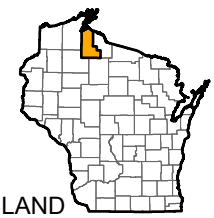


PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Common Name
- Canada Thistle
- Common Buckthorn
- Honeysuckle
- Parsnip
- Tansy

- Invasive Line
- East HWY 112 North of Dam
- East HWY 112 South of Dam
- West HWY 112 North of Dam
- West HWY 112 South of Dam
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

Figure 7B
Upland Terrestrial Meanders and Invasive Species

White River Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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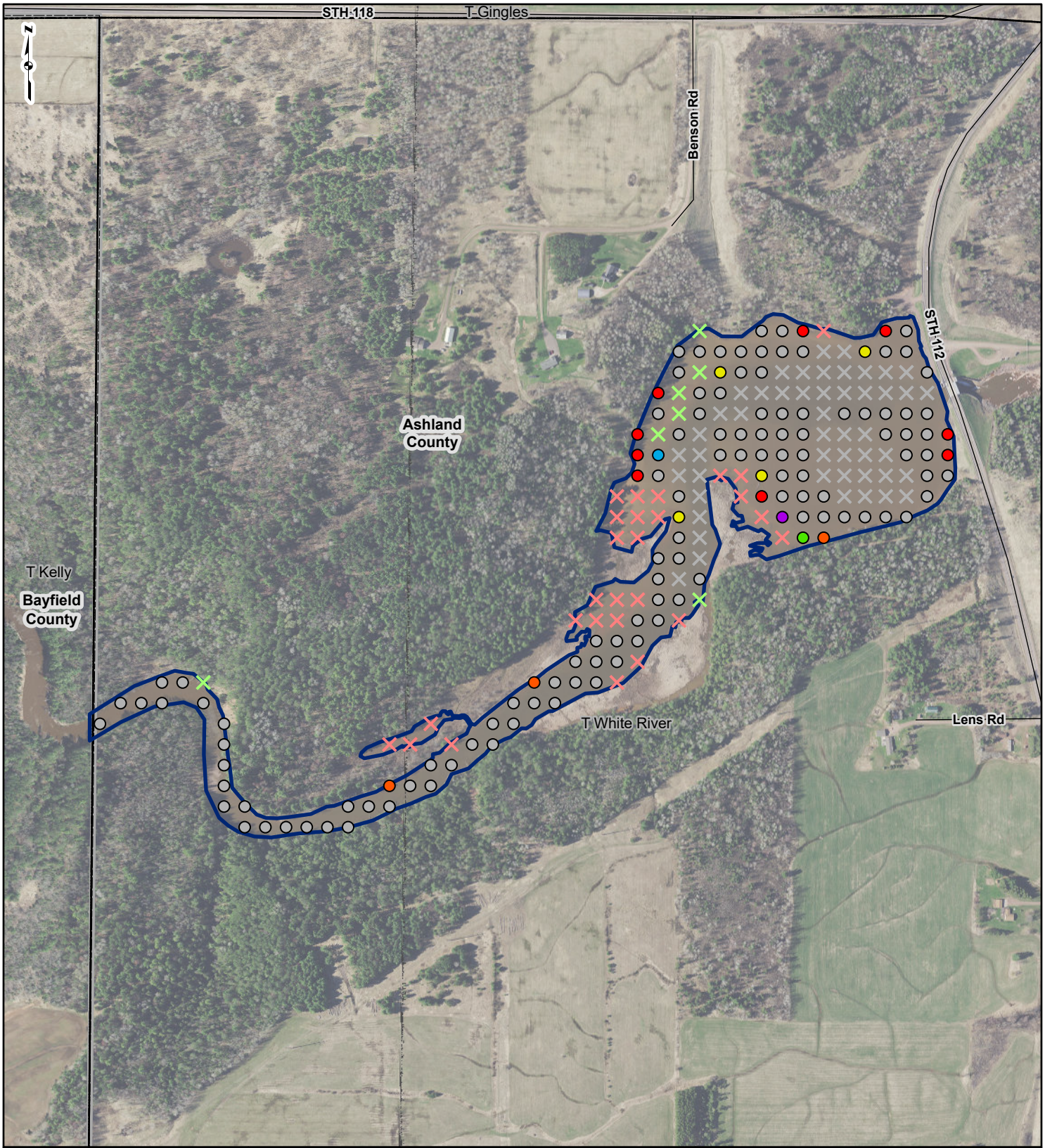
Mead & Hunt

DRAWN BY: EMW
CHECKED: TDB
DATE: 10/24/2022
APPROVED: LLS

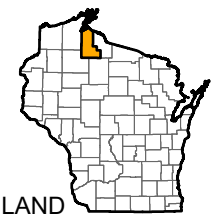
REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/24/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

FIGURE 8
June Predominant Species



PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow

Predominant Species
None
Coontail
Grass-leaved arrowhead
Leafy pondweed
Narrow-leaf cattail
Water stargrass
White water lily

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 300 600 1,200 Feet

Figure 8
June Predominant Species

White River Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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DRAWN BY: EMW DATE: 9/26/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 9/26/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

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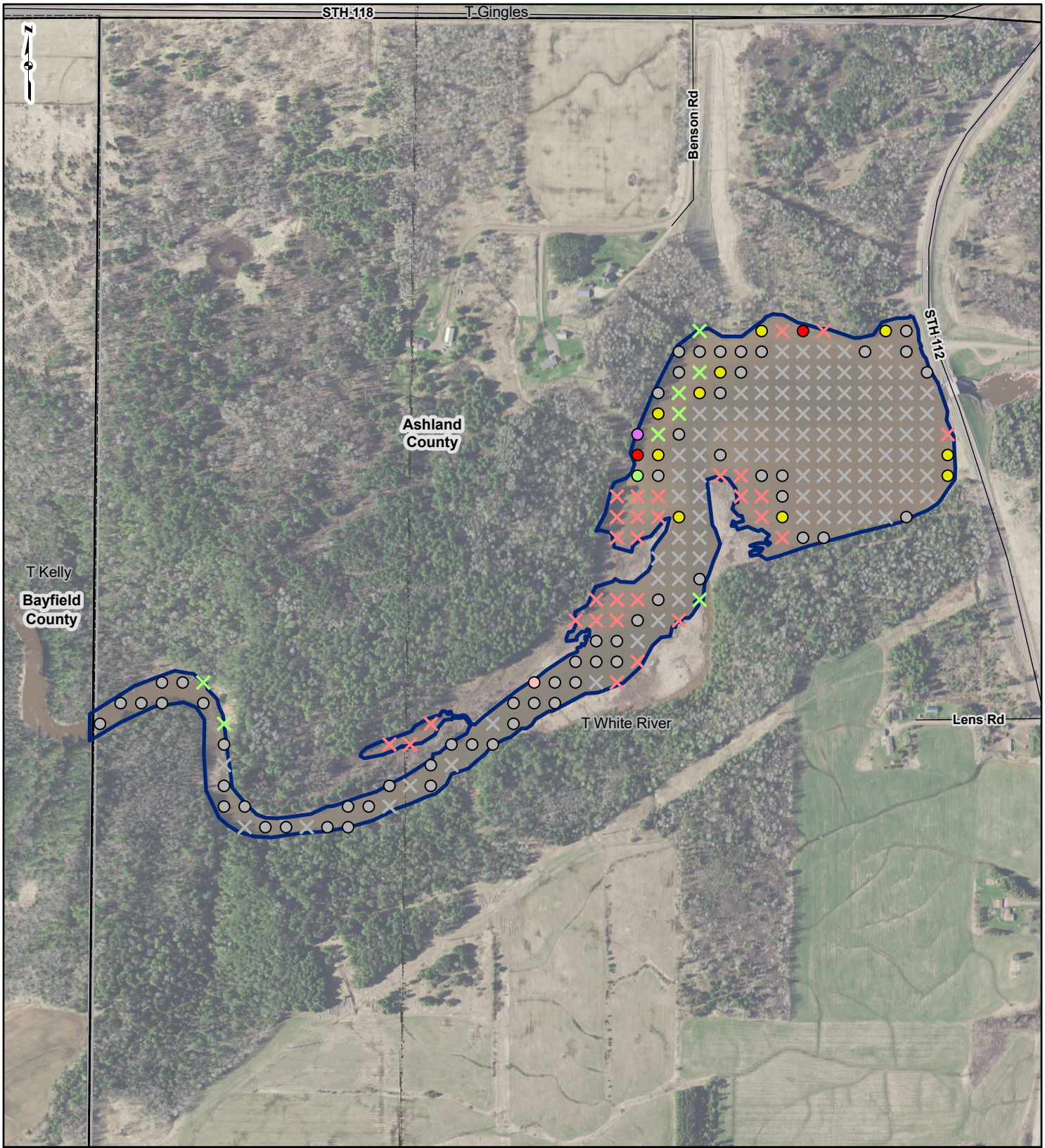
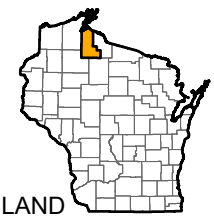
FIGURE 9
July Predominant Species



PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Deeper than Plant Growth
Non-Navigable Vegetation
Non-Navigable Terrestrial

Predominant Species
None
Common arrowhead
Coontail
Leafy pondweed
White-stem pondweed
Wild rice

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 300 600 1,200 Feet

Figure 9
July Predominant Species

White River Hydroelectric Project
Aquatic and Terrestrial Invasive Species Study

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DRAWN BY: EMW DATE: 9/27/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 9/27/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

FIGURE 10
Bathymetric Map

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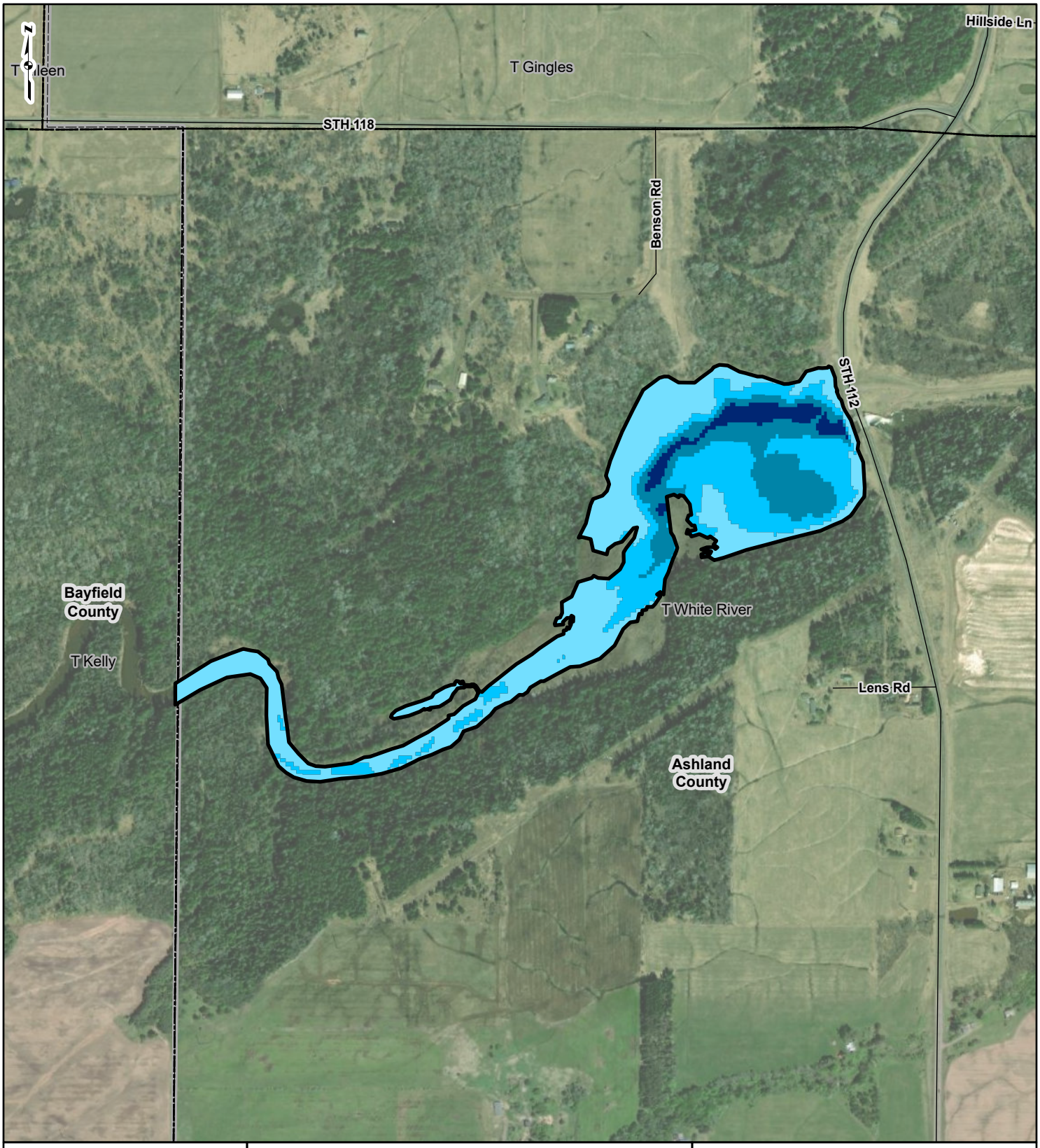
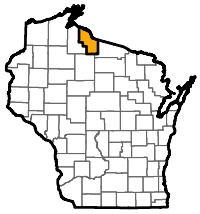


PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Depth
- 0- 5 ft
- 5 - 10 ft
- 10 - 15 ft
- >15 ft

- Road Centerline
- Community Boundary
- County Boundary
- Project Boundary

0 375 750 1,500 Feet

FIGURE 10
BATHYMETRIC MAP

WHITE RIVER FLOWAGE
BATHYMETRIC SURVEY
2022 SURVEY

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DRAWN BY: EMW
CHECKED: TDB
DATE: 10/17/22
APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/17/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Depth_Mapping\R220323_00_White_River_Depth_Mapping\R220323_00_White_River_Depth_Mapping.aprx

FIGURE 11
Substrate Types

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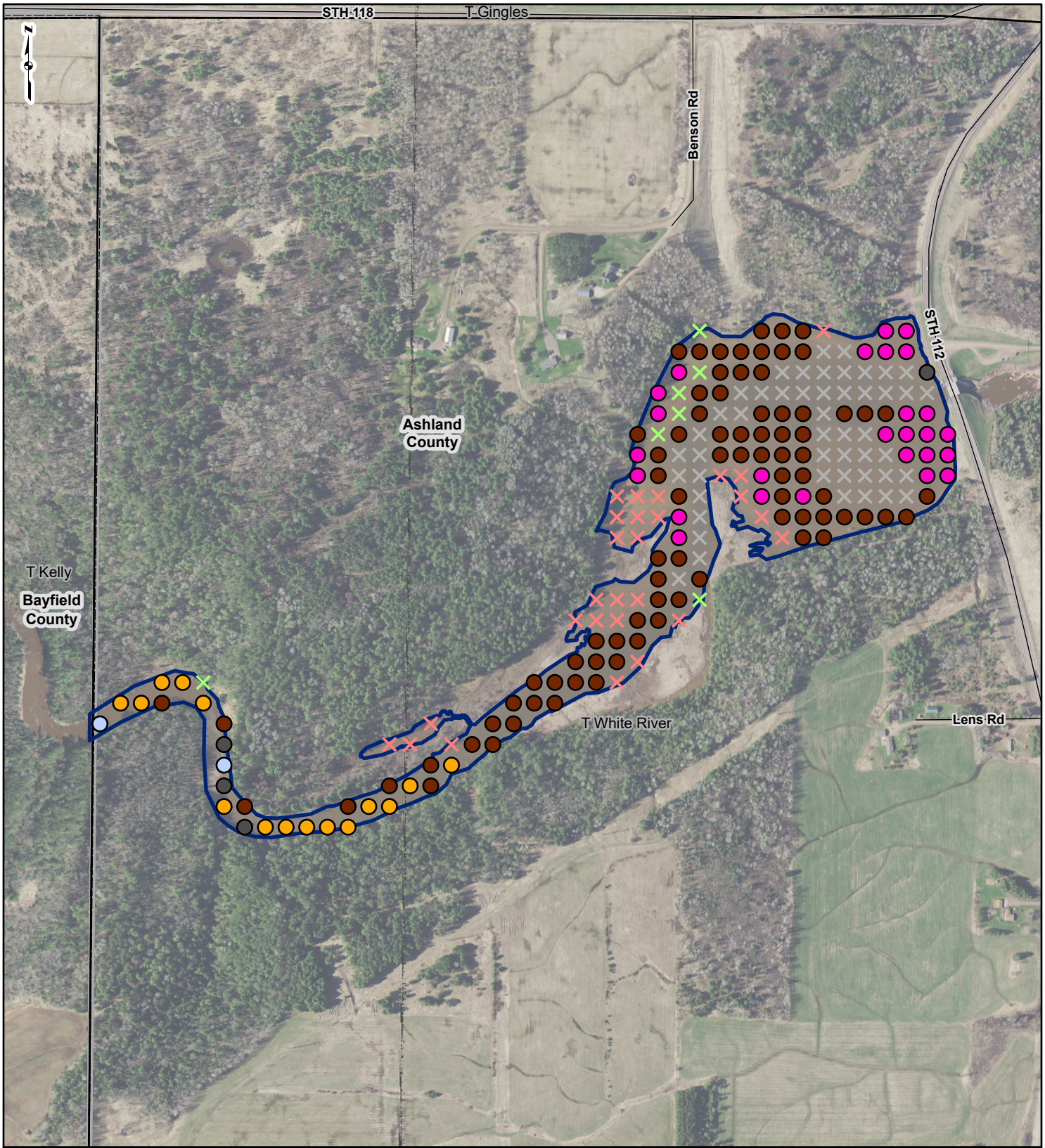
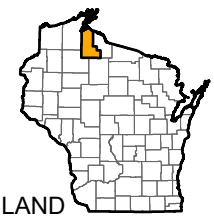


PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Over 15 ft Deep
Non-Navigable Vegetation
Non-Navigable Terrestrial/Shallow

Dominant Substrate
Cobble
Gravel
Sand
Silt
Clay

Project Boundary
Road Centerline
Community Boundary
County Boundary

0 300 600 1,200 Feet

Figure 11
Substrate Types

White River Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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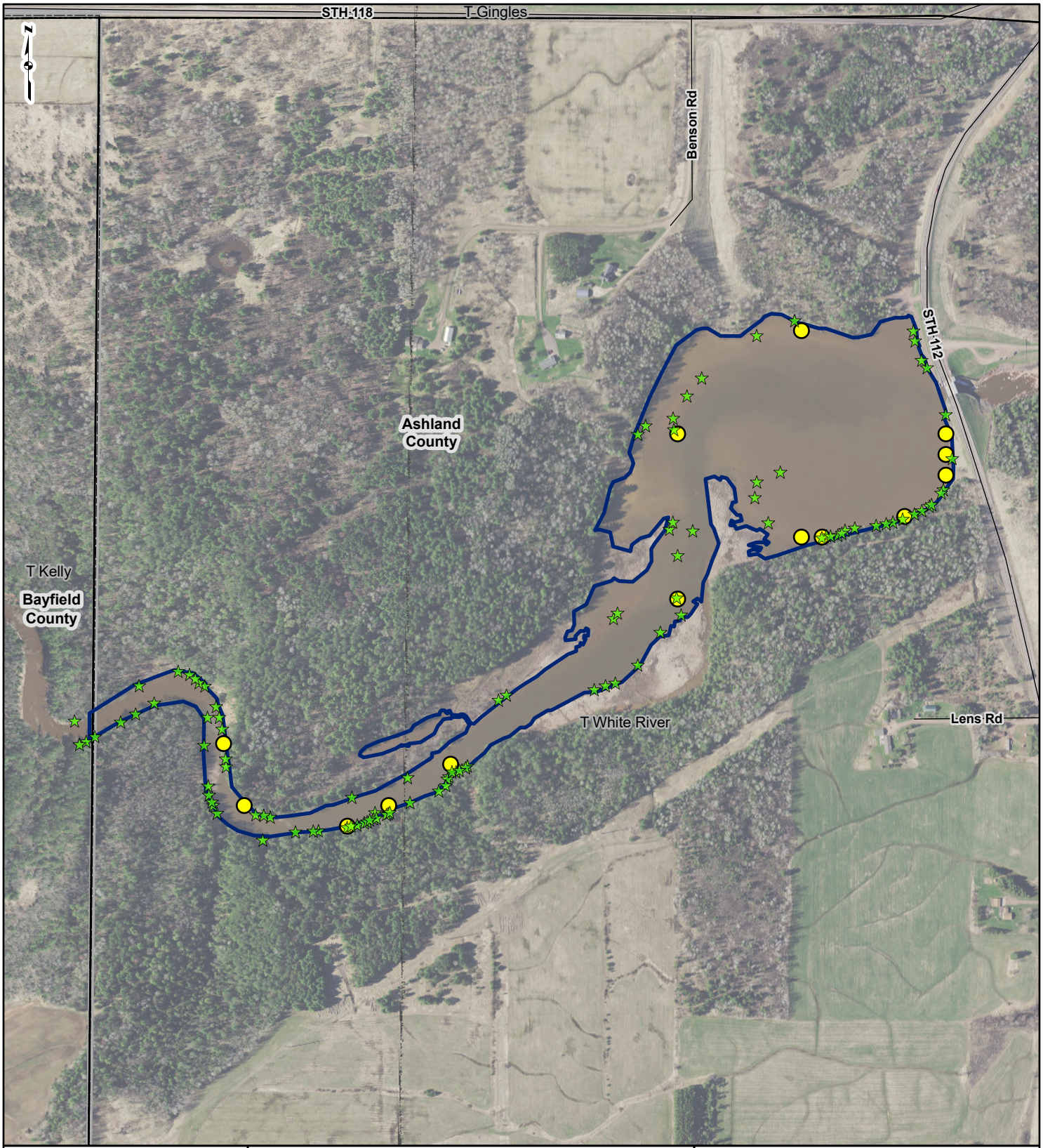
DRAWN BY: EMW DATE: 9/26/2022
CHECKED: TDB APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 9/26/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

FIGURE 12
Coarse Woody Debris



PROJECT LOCATION

ASHLAND COUNTY, WISCONSIN

LEGEND

- Coarse Woody Habitat
- Coarse Woody Debris Present
- Project Boundary
- Road Centerline
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

Figure 12
Coarse Woody Debris

White River Hydroelectric Project
Aquatic and Terrestrial
Invasive Species Study

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REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/17/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Invasive_Mapping\White_River\R220323_00_White_River_ATIS_Mapping\R220323_00_White_River_ATIS_Mapping.aprx

ATTACHMENT A
Aquatic Invasive Species Survey
Field Data Sheets – June

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Waterbody/Project: White River Date: 6-29-22
Crew: Laura Sass, Heather Lutzow

Turbid water
Very Little visability
No wind today

Heard
green frogs
E. gem tree frog

Sampling Point	Depth (ft)	CWD?	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	Potamogeton Richardsonii	Potamogeton zosteriformis	Ceratophyllum demersum	Myriophyllum sibiricum	Potamogeton natans	Stuckenia pectinata	Elodea canadensis	Heteranthera dubia	Sagittaria spp.	Potamogeton amplifolius	Potamogeton epihydrus
212	4.5 N	M	P	silt	Ø												
211	2.0 N	M	P	silt	Ø		1	2	1	1	1						
205	4.0 N	M	P	silt	Ø												
193	1.6 N	R	P	gravel	Ø												
180	22.3 -	-	-	-	-												
166	7.4 N	M	P	silt	Ø												
151	8.0 N	M	P	silt	Ø												
152	1.5 Y	M	P	silt	2		1	2	1	1	1	1					
136	1.8 Y	M	P	silt	1		1	1		1	1						
120	5.0 Y	M	P	silt	Ø												
104	7.6 N	M	P	clay	Ø		Sagittaria latifolia on shore										
89	2.5 Y	M	P	clay	Ø												
103	12.9 N	M	P	silt	Ø												
118	11.0 N	M	P	silt	Ø												
119	9.0 N	M	P	silt	Ø												
135	9.0 N	M	P	silt	Ø												
134	9.7 N	M	P	silt	Ø												
150	7.0 N	M	P	silt	Ø												
165	7.0 N	M	P	silt	Ø												
179	19.5 -	-	-	-	-												
192	14.8 N	M	P	silt	Ø												
204	8.1 N	M	P	silt	Ø												
191	20.5 -	-	-	-	-												
178	12.8 N	M	P	silt	Ø												
164	6.4 N	M	P	clay	Ø												
149	7.6 N	M	P	silt	Ø												
133	11.3 N	M	P	silt	Ø												
117	11.6 N	M	P	silt	Ø												

Sampling Point	Depth (ft)	CWD Y/N	Dom Substrate	Additional Info	Total Rake Fullness	Potamogeton Richardsonii	Elodea Canadensis	Ceratophyllum demersum	Potamogeton natans	Stuckenia pectinata
185	4.3	N	M	clay	Ø					
171	15.9	-	-	-	-					
158	9.7	N	M	clay	Ø					
143	8.7	N	M	clay	Ø					
111	3.0	N	M	silt	2	2	1			
82	Non Nav - plants									
96	2.5	N	M	silt	1		1	1	1	Y
95	Non nav - cattail mat -									
110	Non nav - cattail mat -									
126	7.5	N	M	clay	Ø					
142	7.2	N	M	clay	Ø					
157	15.4	-	-	-	-					
171	12.8	N	M	clay	Ø					
184	3.0	N	M	clay	Ø					
197	5.0	N	M	clay	Ø					
96	3.4	N	M	clay	Ø					
83	1.8	N	M	clay	1	1				
170	3.8	N	M	clay	Ø					
156	16.6	-	-	-	-					
141	9.3	N	M	clay	Ø					
125	5.0	N	M	clay	Ø					
109	Non Nav - cattails									
108	11.9	N	M	clay	Ø					
124	16.4	-	-	-	-					
140	19.0	-	-	-	-					
155	6.7	N	M	clay	Ø					
169	2.0	N	M	clay	Ø					
195	4.0	N	M	clay	Ø					

White water crawdad - incidental near point #111

Entered 7/12/2022 - BL

Waterbody/Project: White River Date: 6/29/2022

Crew: Laura Sass, Heather Lutrow

Sampling Point	Depth (ft)	CWD?	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	Potamogeton foliosus	Sagittaria graminea	Ceratophyllum demersum	Elodea canadensis	Potamogeton zosteriformis	Heteranthera dubia	Nymphaea odorata	Potamogeton Richardsonii												
102	11.8 N	M	P	Silt	Ø																					
88	5.4 N	M	P	Clay	Ø																					
87	9.3 N	M	P	Clay	Ø																					
101	11.3 N	M	P	Silt	Ø																					
116	12.2 N	M	P	Silt	Ø																					
182	11.9 N	M	P	Silt	Ø																					
148	11.4 N	M	P	Silt	Ø																					
163	8.5 N	M	P	Clay	Ø																					
177	13.2 N	M	P	Clay	Ø																					
190	18.5 -	-	-	-	-																					
203	3.0 N	M	P	Silt	2	2																				
202	10.1 N	M	P	Clay	Ø																					
189	19.6 -	-	-	-	-																					
176	10.8 N	M	P	Clay	Ø																					
162	9.1 N	M	P	Clay	Ø																					
147	11.0 N	M	P	Silt	Ø																					
131	11.4 N	M	P	Clay	Ø																					
115	10.7 N	M	P	Clay	Ø																					
100	10.7 N	M	P	Clay	Ø																					
86	7.0 N	M	P	Clay	Ø																					
76	1.0 Y	M	P	Clay	1	1																				
85	7.6 N	M	P	Clay	Ø																					
99	9.1 N	M	P	Clay	Ø																					
114	10.1 N	M	P	Clay	Ø																					
130	10.4 N	M	P	Silt	Ø																					
146	10.2 N	M	P	Clay	Ø																					
209	1.0 Y	M	P	Clay	1	1	1	1	1	1	V	V														
173	13.6 N	M	P	Clay	Ø																					

Sampling Point	Depth (ft)	CWD (Y/N)	Dominant Substrate	Additional Info	Total Rake Fullness	Typha angustifolia	Typha x glauca			
161	10.8	N	M	Clay	Ø					
175	14.1	N	M	Clay	Ø					
188	19.7	-	-	-	-					
201	10.1	N	M	Clay	Ø					
210	terrestrial		-	-	-					
200	7.0	N	M	Clay	Ø					
187	17.9	-	-	-	-					
174	13.4	N	M	Clay	Ø					
160	9.6	N	M	Clay	Ø					
145	9.3	N	M	Clay	Ø					
129	9.7	N	M	Clay	Ø					
113	8.9	N	M	Clay	Ø					
98	8.2	N	M	Silt	Ø					
84	5.2	N	M	Clay	Ø					
75	1.5	N	M	Clay	1	1				
74	Non Nav - Plants				Lots of P. natans	1				
83	4.0	N	M	Clay	1					
97	5.0	N	M	Clay	Ø					
112	5.8	N	M	Clay	Ø					
127	6.7	N	M	Clay	Ø					
128	8.9	N	M	Clay	Ø					
144	9.2	N	M	Clay	Ø					
159	9.6	N	M	Clay	Ø					
186	20.3	-	-	-	-					
199	5.8	N	M	Clay	Ø					
208	6.5	N	M	Clay	Ø					
207	4.3	N	M	Clay	Ø					
198	4.8	N	M	Clay	Ø					

Entered 7/12/2022

Waterbody/Project: White River Date: 6/29/2022

Crew: Laura Sass + Heather Lutrow

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	Potamogeton Richardsonii	Ceratophyllum demersum	Elodea canadensis	Sparganium eurycarpum	Potamogeton zosteriformis	Heteranthera dubia
206	Non Nav -		terrestrial			—						
182	Non Nav -		too shallow			—						
194	4.3 N	M	P		clay	0						
181	3.8 N	M	P		silt	0						
167	3.4 N	M	P		silt	1	1	1				
168	Non Nav -		shallow			—						
153	3.1 N	M	P		silt	0						
154	Non Nav - shallow					—						
137	1.5 N	M	P		clay	1	1	1	1	1	1	
121	2.4 N	M	P		silt	1	1			1		
122	1.5 N	M	P		clay	1				1		
139	2.4 Y	M	P		clay	0						
138	Non nav - plants/shallow					-						
123	4.2 N	M	P		clay	0						
107	15.2 -	-	-		-	—						
106	2.7 N	M	P		clay	0						
105	2.0 N	M	P		silt	1	1			1	1	1
20	1.8 N	M	P		silt	3	1					
12	4.0 N	R	P		gravel	0						
16	5.5 N	R	P		cobble	0						
19	3.5 Y	R	P		gravel	0						
26	2.0 N	M	P		clay	0						
33	3.3 N	S	P		sand	0						
37	2.5 N	S	P		sand	0						
31	3.8 N	S	P		sand	0						
20	3.5 N	R	P		cobble	0						
30	2.8 N	S	P		sand	0						
32	0.5 N	M	P		clay	0						

Sampling Point	Depth	CWD (Y/N)	Dominant Substrate	Additional Info	Total Rake Fullness	Non Nav	why
93	7.8	N	M	clay	0		90	plants
94	17.8	-	-	-	-		91	plants
81	10.8	N	M	clay	0		92	plants
73	15.0	N	M	clay	0		77	plants/terr
69	12.2	N	M	clay	0		78	plants/terr
66	5.3	N	M	clay	0		79	
62	6.6	Y	M	clay	0		70	
56	8.7	N	M	clay	0		71	
51	5.8	N	M	clay	0		63	terrest
47	4.2	N	M	clay	0		57	cattails
43	4.3	N	M	clay	0		48	cattails
42	5.2	N	M	clay	0		44	cattails
36	4.5	N	M	clay	0		39	terrest
35	4.0	N	M	clay	0			
29	4.9	N	M	clay	0			
24	4.0	N	M	clay	0			
23	4.9	N	M	clay	0			
18	6.8	Y	S	sand	0			
15	4.0	N	M	clay	0			
11	5.8	Y	S	sand	0			
6	4.8	Y	S	sand	0			
5	5.5	N	S	sand	0			
4	6.0	N	S	sand	0			
3	5.0	N	S	sand	0			
2	5.5	N	S	sand	0			
1	6.5	N	R	gravel	0			
7	4.8	N	S	sand	0			
38	2.8	N	S	sand	0			

Entered 7/12/2022 -BL

Waterbody/Project: White River Date: 6-29-22

Crew: Laura Sass, Heather Lutzow

Sampling Point	Depth (ft)	CWD?	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	Sagittaria graminea				PH #	Depth	CWD?	Dom. Sed.	Pole	Substrate	TRF						
8	2.5	Y	M	P	clay	Ø																	
9	4.3	N	M	P	clay	Ø																	
10	5	N	S	P	sand	Ø																	
13	0.5	N	M	P	clay	1																	
14	5.3	N	S	P	sand	Ø																	
17	3.5	N	M	P	clay	Ø																	
22	Non-	nav	: plants																				
20	"				"																		
21	"				"																		
27	"				"																		
28	5.5	N	M	P	clay	Ø																	
34	4.5	N	M	P	clay	Ø																	
40	1.5	N	M	P	clay	1	1																
41	4.2	N	M	P	clay	Ø																	
45	3	N	M	P	Clay	Ø																	
46	4.5	N	M	P	Clay	Ø																	
49	2.6	N	M	P	clay	Ø																	
50	3.5	N	M	P	Clay	Ø																	
55	3.3	N	M	P	clay	Ø																	
52	Non-n	av:	plants/shallow																				
53	"				"																		
54	"				"																		
58	"				"																		
59	"				"																		
60	"				"																		
61	5.4	N	M	P	clay	Ø																	
65	10.5	N	M	P	clay	Ø																	
64	9.3	N	M	P	clay	Ø																	
67	7	N	M	P	clay	Ø																	
68	6.5	N	M	P	clay	Ø																	
72	7.5	N	M	P	silt	Ø																	

Entered 7/12/2022 - BL

ATTACHMENT B
Aquatic Invasive Species Survey
Field Data Sheets – July

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Waterbody/Project: White River page 1 of 3 Date: 7/19/2022

Crew: Laura Sass, Heather Lutrow

Substrate = mix of organic/clay/silt

Sampling Point	Depth (ft) CWD?	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 Chara spp	Elodea canadensis	~~Glyceria borealis~~ Zizania spp	Heteranthera dubia	Myriophyllum sibiricum Lemna trinor	Nymphaea odorata	Potamogeton epihydrus Potamogeton vaseyi	Potamogeton ~~friesii~~ foliosus	Potamogeton natans	Potamogeton richardsonii	Potamogeton zosteriformis	Sagittaria graminea	Sparganium eurycarpum	Stuckenia pectinata Potamogeton Rad longus	Typha angustifolia		
212	4.5 N	M	P	Silt	0																
211	2.3 N	M	P	org	3	1	1	1	1					2		2					
209	1.5 N	M	P	org	2	2			1	1				1				1			
207	3.8 N	M	P	Silt	3									3							
198	4.0 N	M	P	clay	0																
184	3.1 N	M	P	clay	0																
197	4.2 N	M	P	clay	0																
196	3.8 N	M	P	clay	0																
195	3.6 N	M	P	Silt	0																
194	1.8 N	M	P	clay	2	1		2		1						1	1				
121	2.3 N	M	P	Silt	3	2	1	1	1				1	2							
137	1.8 N	M	P	clay	2		1	2		V							V	V			
153	2.8 N	M	P	clay	1	1							1								
1167	1.4 N	M	P	clay	3			1									2				
181	2.8 N	M	P	clay	1	1															
183	1.5 N	M	P	clay	1								1								
170	4.7 N	M	P	clay	0																
169	1.5 N	M	P	Silt	3							1	3								
139	4.5 N	M	P	clay	0																
122	1.8 N	M	P	clay	2		1						2								
106	2.8 N	M	P	clay	0																
105	3.2 N	M	P	Silt	1														1		1
80	1.6 N	M	P	Silt	3								3								
101	3.8 N	M	P	clay	0																
55	3.0 N	M	P	clay	0																
50	3.2 N	M	P	clay	0																
49	1.0 N	M	P	Silt	2												2				

Waterbody/Project: White River Page 2 of 3 Date: 7/19/2022

Crew: Laura Sass Heather Lutzow

Sampling Point	Depth (ft) CWD?	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	Elodea canadensis	Glyceria borealis	Heteranthera dubia	Myriophyllum sibiricum	Nymphaea odorata	Potamogeton epihydrus	Potamogeton friesii	Potamogeton natans	Potamogeton richardsonii	Potamogeton zosteriformis	Sagittaria graminea ssp. Latifolia	Sparganium eurycarpum	Stuckenia pectinata	Typha angustifolia	.	.
46	3.9 N	M	P	clay	0																	
45	3.5 N	M	P	silt	0																	
41	4.1 N	S	P	sand	0																	
40	2.1 N	M	P	clay	1										1							
34	4.2 N	S	P	sand	0																	
29	4.7 N	S	P	sand	0																	
24	3.0 N	M	P	clay	0										V							
23	4.6 N	S	P	sand	0																	
22	0.5 N	M	P	clay	1										1 1	1						
17	2.0 N	M	P	clay	0						V											
13	0.5 N	M	P	clay	1										1 1							
10	4.7 N	S	P	sand	0																	
9	4.0 N	M	P	silt	0																	
3	3.5 N	S	P	Sand	0																	
2	4.7 N	S	P	sand	0																	
8	2.5 N	S	P	sand	0																	
7	4.3 N	S	P	Sand	0																	
12	3.9 N	S	P	Sand	0																	
19	3.9 N	S	P	Sand	0																	
26	Terrestrial																					
33	2.4 Y	S	P	Sand	0																	
38	2.6 N	S	P	Sand	0																	
37	2.1 N	S	P	Sand	0																	
31	3.8 N	S	P	Sand	0																	
30	2.1 N	M	P	clay	0																	
25	4.7 N	R	P	gravel	0																	
32	2.4 N	M	P	Clay	0																	

Waterbody/Project: White River Page 3 of 3 Date: 7/19/2022

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	Ceratophyllum demersum	Elodea canadensis	Glyceria borealis	Heteranthera dubia	Myriophyllum sibiricum	Nymphaea odorata	Potamogeton epihydrus	Potamogeton friesii	Potamogeton natans	Potamogeton richardsonii	Potamogeton zosteriformis	Sagittaria graminea	Sparganium eurycarpum	Stuckenia pectinata	Typha angustifolia		
5	5.1 N	R	P	cobble	0																	
6	4.6 N	S	P	sand	0																	
15	4.1 N	M	P	clay	0																	
35	3.6 N	S	P	sand	0																	
36	4.5 N	S	P	sand	0																	
42	5.6 N	S	P	sand	0																	
47	4.2 N	M	P	clay	0																	
66	3.6 N	M	P	clay	0																	
125	5.6 N	M	P	clay	0																	
111	3.6 N	M	P	clay	0																	
112	5.6 N	M	P	clay	0																	
97	4.6 N	M	P	clay	0																	
96	NN -	Plants		-	-																	
83	3.0 N	M	P	silt	1	1	1						1									
75	3.0 Y	M	P	silt	0																	
76	1.4 Y	M	P	clay	1						1					1						
89	0.5 Y	M	P	clay	0																	
120	3.1 Y	M	P	clay	1	1	1				1	1			1							
136	2.5 N	M	P	silt	2	1	1					1	1									
152	NN -	Plants																				
193	3.5	R	P	cobble	0																	
205	(100K vp)	M	P	org	0																	
203	5.6	M	P	silt	0																	

ATTACHMENT C
Photo Log

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White River Flowage ATIS
Study Report Photo Log

	
Aquatic forget-me-not (*Myosotis scorpioides*) 46.493219, -90.917095 June 29, 2022	Vasey's pondweed (*Potamogeton vaseyi*) 46.498279, -90.911575 July 19, 2022
	
Native snails near the White River Flowage public boat launch, 46.498521, -90.910176 July 29, 2022	Tansy (*Tanacetum vulgare*) densely mixed with other plants, facing northwest, 46.498091, -90.909720, July 19, 2022

Narrow-leaf cattail along the shoreline by Hwy 112, upstream of the dam, facing north, 46.497970, -90.910005, July 18, 2022

Canada thistle and narrow-leaf cattail near upstream dam, facing south, 46.497369, -90.909321, July 19, 2022

White River Flowage, facing southwest, 46.4937527, -90.92252, July 19, 2022

Water sampling in the tailwater, below dam, 46.497552, -90.90836, July 19, 2022

ATTACHMENT D
Terrestrial Survey Field Data

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		Site #	Landcover Classification	Starting latitude	Starting longitude	Abundance = Daubenmire Scale; Length = ft.	Common buckthorn	Eurasian honeysuckle	Spotted knapweed	Narrow-leaf cattail	Canada thistle	Tansy	Aquatic forget-me-not	Crown vetch	Wild parsnip
Project	White River					Relative Abundance				4					
County	Ashland	1	Northern Mesic Forest	46.49846204	-90.91006423	Length of Shoreline				2540					
Date	07/18/22					Relative Abundance				4			1		
Field Crew	Kellen Black	2	Northern Mesic Forest	46.49374862	-90.92369694	Length of Shoreline				2526			30		
	Laura Sass					Relative Abundance					1	1		1	
			NW Terrestrial Meander Survey	46.49861952	-90.90999643	Length of Shoreline					41	46		15	
						Relative Abundance			2	2	4			4	3
			SW Terrestrial Meander Survey	46.49705636	-90.90908284	Length of Shoreline			228	146	653			507	279
						Relative Abundance			4		4			4	
			SE Terrestrial Meander Survey	46.49720825	-90.90898365	Length of Shoreline			376		376			376	
						Relative Abundance	1	1	2	2	2	2		2	1
			NE Terrestrial Meander Survey	46.49838313	-90.90630409	Length of Shoreline	5	5	1320	570	1412	1427		1370	5
						Relative Abundance									
						Length of Shoreline									
						Relative Abundance									
						Length of Shoreline									
						Relative Abundance									
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						Length of Shoreline									
						Relative Abundance									
						Length of Shoreline									

ATTACHMENT E
WDNR Incident Report Form

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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
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.

ATTACHMENT F
WI State Lab 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: 636482005

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 #: WHITE RIVER-TAIL,ZM
Project No:
Collection End: 7/19/2022 2:45:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10020884
Sample Location: WHITE RIVER AT STH 112
Sample Description: POOL BELOW DAM
Sample Type: SU-SURFACE WATER
Waterbody: 2892500
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 2

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: 636482005

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: 636482006

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 #: WHITE RIVER-RES,ZM
Project No:

Collection End: 7/19/2022 3:30:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10056727
Sample Location: WHITE RIVER FLOWAGE - DEEP HOLE
Sample Description: NEAR DEEP HOLE/CHANNEL
Sample Type: SU-SURFACE WATER
Waterbody: 2894200
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 2

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: 636482006

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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Results relate only to the items tested.

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Responsible Party

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Organics: Erin Mani, Supervisor 608-224-6269
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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: 637981005

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 #: White River - Tail, WF
Project No:
Collection End: 7/19/2022 2:30:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10020884
Sample Location: WHITE RIVER AT STH 112
Sample Description: POOL BELOW DAM
Sample Type: SU-SURFACE WATER
Waterbody: 2892500
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 2

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: 637981005

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
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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: 637981006

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 #: White River - Res, WF
Project No:

Collection End: 7/19/2022 3:20:00 PM
Collection Start:
Collected By: LAURA SASS
Date Received: 8/11/2022
Date Reported: 10/19/2022
Sample Reason:

ID#: 10056727
Sample Location: WHITE RIVER FLOWAGE - DEEP HOLE
Sample Description: NEAR DEEP HOLE/CHANNEL
Sample Type: SU-SURFACE WATER
Waterbody: 2894200
Point or Outfall:
Sample Depth:
Program Code:
Region Code:
County: 2

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
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Laboratory Report

Environmental Health Division

WSLH Sample: 637981006

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

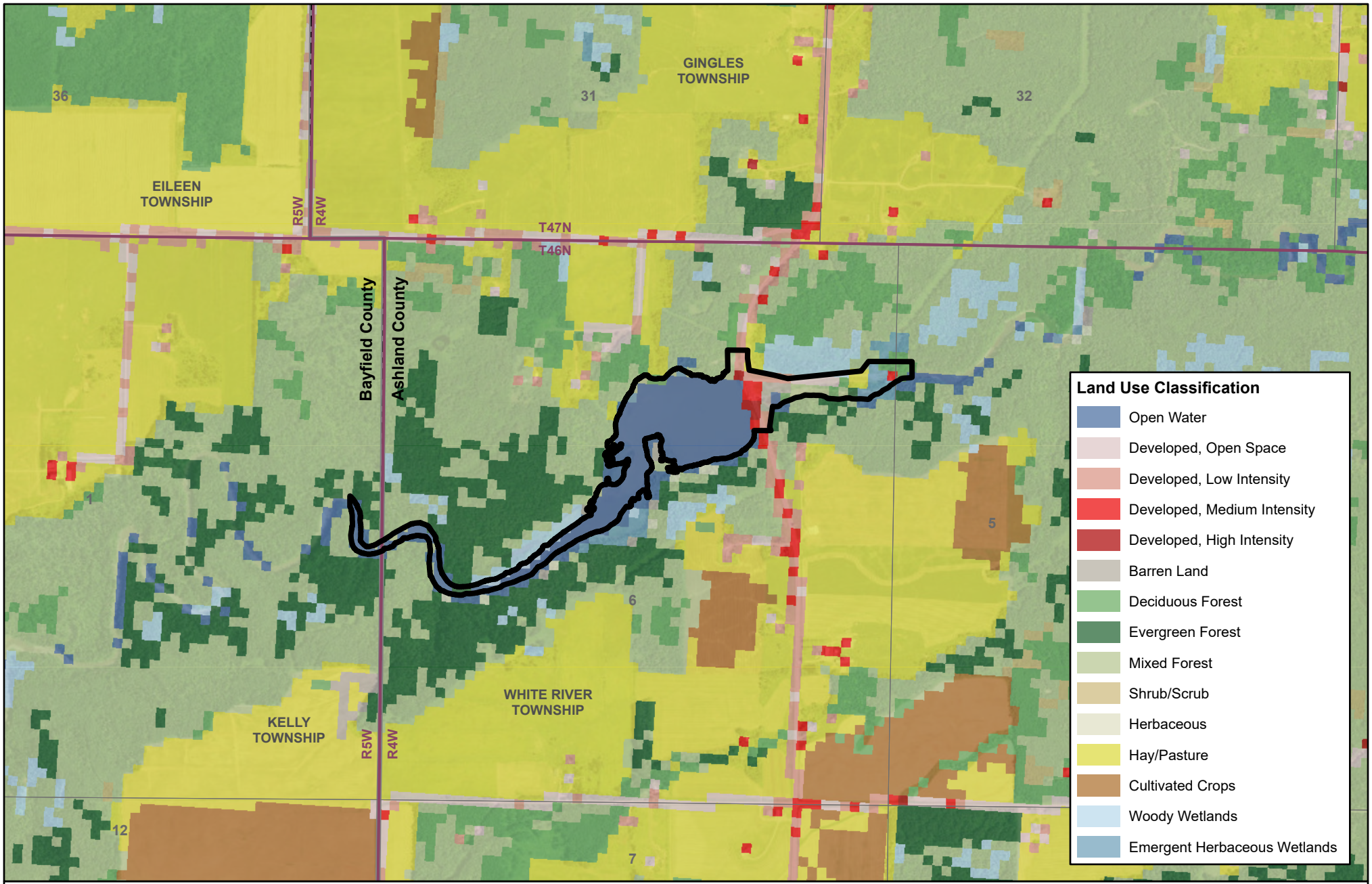
Test results for NELAP accredited tests are certified to meet the requirements of the NELAC standards. For a list of accredited analytes
see http://www.slh.wisc.edu/about/compliance/nelac-laboratory-accreditation
Results, LOD and LOQ values have been adjusted for analytical dilutions and percent moisture 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

APPENDIX E-7 Major Land Uses in the White River Project Vicinity



Xcel Energy®
Mead & Hunt

Proposed Project Boundary
County Boundary
Township Range
Section

N

0 1,000 2,000 Feet

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

White River Hydroelectric Project
Major Land Use in Vicinity of Project

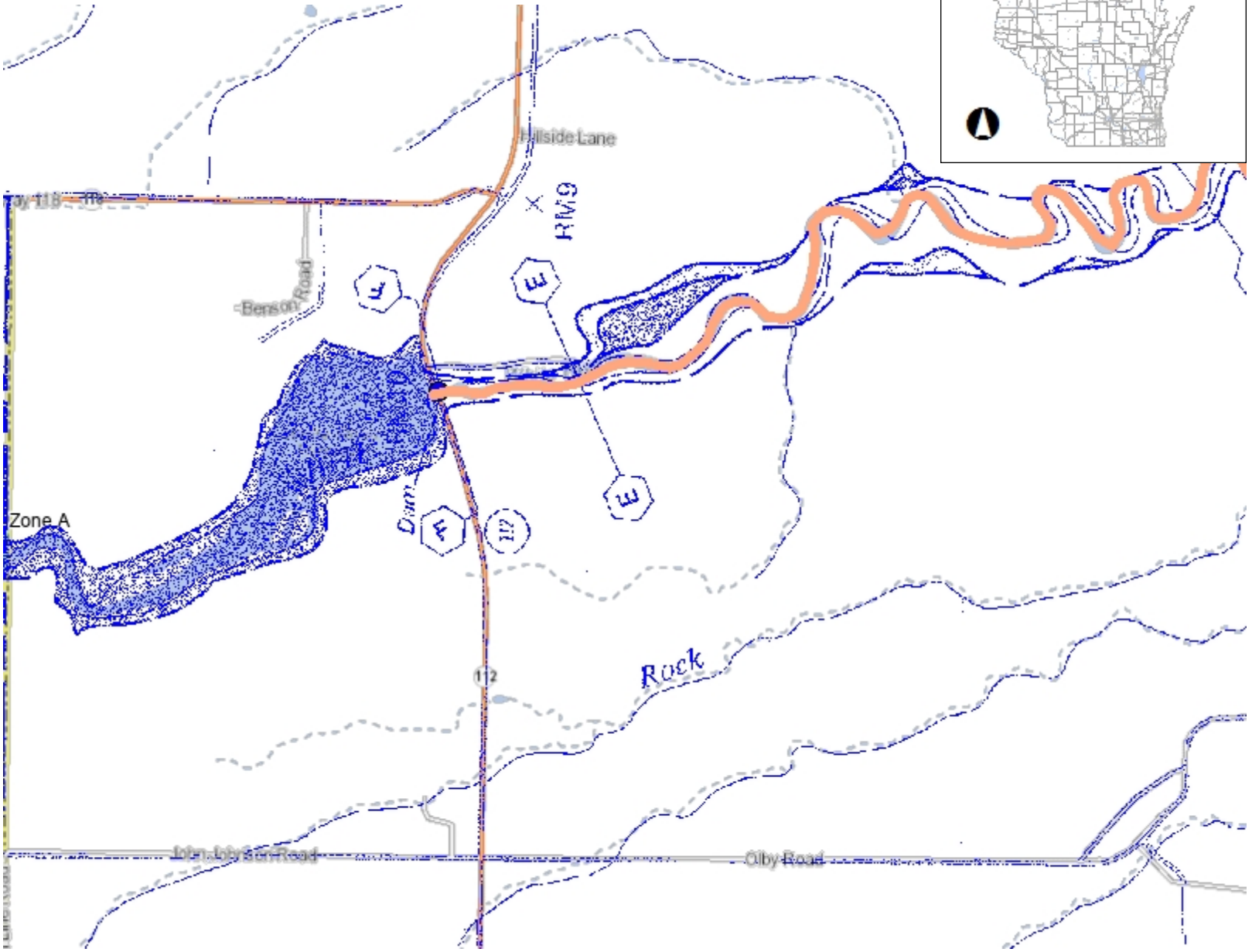
FERC No. 2444

Source Layer: National Land Cover Database 2019, WI 2022 NAIP (natural color, 0.6-meter resolution)

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA.aprx

APPENDIX E-8 Flood Zone Maps

Floodplain Map-Ashland County



Legend

2D Water Surface Elevation Grid
- High : 937.629
- Low : 853.184

Record Flood Levels

Analysis Lines
- Other
- Flood Insurance Study
- Letter of Map Revision
- Case By Case Analysis
- Bridge

Analysis Points
- Other
- Flood Insurance Study
- Letter of Map Revision
- Case By Case Analysis
- Bridge

Analysis Catchments

Floodplain Storage

Cross Sections

Floodplains
- Flood Fringe
- Floodway

DOT Bridges

Statewide Paper FIRM Index

Cross-Sections

Flood Hazard Boundaries
- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones
- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway

Notes

0.5 0 0.25 0.5 Miles

NAD_1983_HARN_Wisconsin_TM

1: 15,840

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by Bayfield County. The aerial photography was acquired in the spring of 2005 to create 1"-2,000' scale digital orthophotos with 12-inch ground resolution and resampled to a 24-inch ground resolution.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 46 NORTH, RANGE 6 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line

23 — 23 Transect line

Culvert

Bridge

45° 52' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

2100000 FT 5000-foot ticks: Wisconsin State Plane North Zone (FIPS Zone 4802), Lambert Conformal Conic projection

1000-meter Universal Transverse Mercator grid values, zone 15

5455000 mN

DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
December 16, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0760D

FIRM

FLOOD INSURANCE RATE MAP

BAYFIELD COUNTY, WISCONSIN AND INCORPORATED AREAS

PANEL 760 OF 1070

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BAYFIELD COUNTY	550530	0760	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55007C0760D

EFFECTIVE DATE
DECEMBER 16, 2011

Federal Emergency Management Agency

APPENDIX E-9 NR 102 – Water Quality Standards

Chapter NR 102

WATER QUALITY STANDARDS FOR WISCONSIN SURFACE WATERS

History: Chapter NR 102 as it existed on September 30, 1973 was repealed and a new chapter NR 102 was created, effective October 1, 1973. Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.

NR 102.01 Purpose. (1) The purpose of this chapter is to establish, in conjunction with chs. NR 103 to 105, water quality standards for surface waters of the state pursuant to s. 281.15 (2) (b), Stats. This chapter describes the designated use categories for such waters and the water quality criteria necessary to support these uses. This chapter and chs. NR 103 to 105 constitute the water quality standards for the surface waters of Wisconsin.

(2) Water quality standards shall protect the public interest, which includes the protection of public health and welfare and the present and prospective uses of all waters of the state for public and private water supplies, propagation of fish and other aquatic life and wild and domestic animals, domestic and recreational purposes, and agricultural, commercial, industrial, and other legitimate uses. In all cases where the potential uses are in conflict, water quality standards shall protect the general public interest.

(3) Water quality standards serve as a basis for developing and implementing control strategies to achieve legislative policies and goals. Water quality standards are the basis for deriving water quality based effluent limitations. Water quality standards also serve as a basis for decisions in other regulatory, permitting or funding activities that impact water quality.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.02 Applicability. The provisions of this chapter are applicable to surface waters of Wisconsin.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.03 Definitions. (1) "Mixing zone" means a region in which a discharge of different characteristics than the receiving water is in transit and progressively diluted from the source to the receiving system.

(2) "Natural conditions" means the normal daily and seasonal variations in climatic and atmospheric conditions, and the existing physical and chemical characteristics of a water or the course in which it flows.

(3) "Natural temperature" means the normal existing temperature of a surface water including daily and seasonal changes outside the zone of influence of any artificial inputs.

(4) "Resource management" means the application of control techniques to enhance or preserve a surface water in accordance with statutory provisions and in the general public interest.

(5) "Sanitary survey" means a thorough investigation and evaluation of a surface water including bacteriological sampling to determine the extent and cause of any bacterial contamination.

(6) "Surface waters" means all natural and artificial named and unnamed lakes and all naturally flowing streams within the boundaries of the state, but not including cooling lakes, farm ponds and facilities constructed for the treatment of wastewaters (the term waters as used in this chapter means surface waters).

(7) "Unauthorized concentrations of substances" means pollutants or other chemicals introduced into surface waters without prior permit or knowledge of the department, but not including accidental or unintentional spills.

(8) "Best practicable control technology" means that level of treatment established by the department under s. 283.13 (2) (a), Stats., for categories and classes of point sources to be achieved by not later than July 1, 1977.

(9) "Best available control technology" means that level of treatment established by the department under s. 283.13 (2) (b) 1., Stats., for categories and classes of point sources to be achieved by not later than July 1, 1983.

(10) Class I and Class II trout waters are as defined in s. NR 1.02 (7).

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; r. (1), renum. from NR 102.01, Register, February, 1989, No. 398, eff. 3−1−89; cr. (10), Register, May, 1993, No. 449, eff. 6−1−93.

NR 102.04 Categories of standards. (1) GENERAL. To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions:

(a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

(c) 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.

(d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

(2) REVISED STANDARDS. It should be recognized that these standards will be revised as new information or advancing technology indicate that revisions are in the public interest. Water used for hydropower and commercial shipping depends mainly on quantity, depth and elevation; consequently, no specific quality standards for these uses have been prepared.

(3) FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a) to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in the federal water pollution control act amendments of 1972, P.L. 92−500; 33 USC 1251 et seq.

(a) *Cold water communities.* This subcategory includes surface waters capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species. This subcategory includes, but is not restricted to, surface waters identified as trout water by the department of natural resources (Wisconsin Trout Streams, publication 6−3600 (80)).

(b) *Warm water sport fish communities.* This subcategory includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.

(c) *Warm water forage fish communities.* This subcategory includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

(d) *Limited forage fish communities.* (Intermediate surface waters). This subcategory includes surface waters of limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of forage fish and other aquatic life.

(e) *Limited aquatic life.* (Marginal surface waters). This subcategory includes surface waters of severely limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of aquatic life.

(4) STANDARDS FOR FISH AND AQUATIC LIFE. Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

(a) *Dissolved oxygen.* Except as provided in par. (e) and s. NR 104.02 (3), the dissolved oxygen content in surface waters may not be lowered to less than 5 mg/L at any time.

(b) *Temperature.* 1. There shall be no temperature changes that may adversely affect aquatic life.

2. Natural daily and seasonal temperature fluctuations shall be maintained.

3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5º F for streams and 3º F for lakes.

4. The temperature shall not exceed 89º F for warm water fish.

(c) *pH.* 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.

(d) *Other substances.* Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. Surface waters shall meet the acute and chronic criteria as set forth in or developed pursuant to ss. NR 105.05 and 105.06. Surface waters shall meet the criteria which correspond to the appropriate fish and aquatic life subcategory for the surface water, except as provided in s. NR 104.02 (3).

(e) *Temperature and dissolved oxygen for cold waters.* Streams classified as trout waters by the department of natural resources (Wisconsin Trout Streams, publication 6−3600 (80)) or as great lakes or cold water communities may not be altered from natural background temperature and dissolved oxygen levels to such an extent that trout populations are adversely affected.

1. There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

2. Dissolved oxygen in classified trout streams shall not be artificially lowered to less than 6.0 mg/L at any time, nor shall the dissolved oxygen be lowered to less 7.0 mg/L during the spawning season.

3. The dissolved oxygen in great lakes tributaries used by stocked salmonids for spawning runs shall not be lowered below natural background during the period of habitation.

(5) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use.

(a) *Bacteriological guidelines.* The membrane filter fecal coliform count may not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(b) *Exceptions.* Whenever the department determines, in accordance with the procedures specified in s. NR 210.06, that wastewater disinfection is not required to protect recreational uses, the recreational use criteria and classifications as established in this subsection and in chs. NR 103 and 104 do not apply.

(6) STANDARDS FOR PUBLIC HEALTH AND WELFARE. All surface waters shall meet the human threshold and human cancer criteria specified in or developed pursuant to ss. NR 105.08 and 105.09, respectively. The applicable criteria vary depending on whether the surface water is used for public drinking water supplies and vary with the type of fish and other aquatic life subcategory. All surface waters providing public drinking water supplies or classified as cold water or warm water sport fish communities as described in sub. (3) shall meet the taste and odor criteria specified in or developed pursuant to s. NR 102.14.

(7) STANDARDS FOR WILDLIFE. All surface waters shall be classified for wildlife uses and meet the wildlife criteria specified in or developed pursuant to s. NR 105.07.

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; am. (3), Register, December, 1977, No. 264, eff. 1−1−78; renum. from NR 102.02, r. (3) (d) 1. to 3., and (5), renum. (3) (intro.) to (d) (intro.) and (e) and (4) to be (4) (intro.) to (e) and (5) and am. (4) (a), (d), (e) (intro.) and (5), cr. (6) and (7), Register, February, 1989, No. 398, eff. 3−1−89; am. (3) (intro.), (6), (7), r. (3) (a), renum. (3) (b) to (f) to be (3) (a) to (e) and am. (3) (a), Register, August, 1997, No. 500, eff. 9−1−97.

NR 102.05 Application of standards. (1) ANTIDEGRADATION. (a) No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

(b) *Classification system.* For the purposes of this subsection, all surface waters of the state, or portions thereof, shall be classified as one of the following:

1. Outstanding resource waters as listed in s. NR 102.10,
2. Exceptional resource waters as listed in s. NR 102.11,
3. Great Lakes system waters as listed in s. NR 102.12 (1),
4. Fish and aquatic life waters as described in s. NR 102.13, or
5. Waters listed in tables 3 through 8 in ss. NR 104.05 to 104.10.

(2) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature, or other water quality characteristics. The determination of water quality based effluent limitations or other management practices shall be based upon the following conditions except as provided in ch. NR 106 for toxic and organoleptic substances and whole effluent toxicity:

(a) The average minimum 7−day low streamflow which occurs once in 10 years (7−day Q_{10}); or,

(b) In the case of dissolved oxygen and wherever sufficient data on streamflow and temperature are available, by application of a 0.274% level of nonattainment. This is equivalent to an expected nonattainment of the dissolved oxygen criterion of one day per year.

(3) MIXING ZONES. Water quality standards shall be met at every point outside of a mixing zone. The size of the mixing zone cannot be uniformly prescribed, but shall be based on such factors as effluent quality and quantity, available dilution, temperature, current, type of outfall, channel configuration and restrictions to fish movement. For toxic and organoleptic substances with water quality criteria or secondary values specified in or developed pursuant to chs. NR 102 and 105, allowable dilution shall be determined as specified in ch. NR 106 in addition to the requirements

specified in this subsection. As a guide to the delineation of a mixing zone, the following shall be taken into consideration:

(a) Limiting mixing zones to as small an area as practicable, and conforming to the time exposure responses of aquatic life.

(b) Providing passageways in rivers for fish and other mobile aquatic organisms.

(c) Where possible, mixing zones being no larger than 25% of the cross−sectional area or volume of flow of the stream and not extending more than 50% of the width.

(d) Final acute criteria and secondary values specified in or developed pursuant to s. NR 105.05 for the fish and aquatic life subcategory for which the receiving water is classified not being exceeded at any point in the mixing zone.

(e) Mixing zones not exceeding 10% of a lake's total surface area.

(f) Mixing zones not interfering with spawning or nursery areas, migratory routes, nor mouths of tributary streams.

(g) Mixing zones not overlapping, but where they do, taking measures to prevent adverse synergistic effects.

(h) Restricting the pH to values greater than 4.0 s.u. and to values less than 11.0 s.u. at any point in the mixing zone for the protection of indigenous fish and fish food organisms.

(4) EXEMPTIONS. The thermal mixing zone provisions of this chapter are not applicable to municipal waste and water treatment plants, to vessels, or to discharges to enclosed harbors.

(5) RESOURCE MANAGEMENT EXEMPTIONS. Application of chemicals for water resource management purposes in accordance with statutory provisions is not subject to the requirements of the standards except in case of water used for public water supply.

(6) ANALYTICAL PROCEDURES. (a) The criteria in the Radiation Protection Code, s. HFS 157.44, shall apply to the disposal and permissible concentrations of radioactive substances.

(b) Methods used for analysis of samples shall be as set forth in ch. NR 219 unless alternative methods are specified by the department.

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; renum. (5) and (6) to be (6) and (7), cr. (5), Register, July, 1975, No. 235, eff. 8−1−75; r. and recr. (3), Register, August, 1981, No. 308, eff. 9−1−81; correction in (7) made under s. 13.93 (2m) (b) 7., Stats., cr. (4) (h), Register, September, 1984, No. 345, eff. 10−1−84; renum. from NR 102.03, r. (1), cr. (1) (b), renum. (2) to (7) to be (1) (a) to (6) and am. (2), (3) (intro.) and (d) and (6), Register, February, 1989, No. 398, eff. 3−1−89; am. (1) (b) 3., (3) (intro.) and (d), Register, August, 1997, No. 500, eff. 9−1−97; correction in (6) (a) made under s. 13.93 (2m) (b) 7., Stats. Register July 2006 No. 607, eff. 8−1−06.

NR 102.06 Phosphorus. In addition to the requirements established in ch. NR 217, any wastewater discharger, regardless of population, volume or type of waste discharge, or geographic location, may be required to remove excess amounts of phosphorus. Effluent limitations for total phosphorus based on surface water quality may be established where, in the best professional judgment of the department, such limitations will result in an improvement in water quality, or preserve the quality of surface waters where long−term discharges may result in impairment of water quality. Such limitations for phosphorus shall include an evaluation of the discharges from point sources, nonpoint sources, background sources, tributaries, and a consideration of a margin of safety.

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; am. Register, October, 1986, No. 370, eff. 11−1−86; renum. from NR 102.04, Register, February, 1989, No. 398, eff. 3−1−89; am. Register, November, 1992, No. 443, eff. 12−1−92.

NR 102.07 Lake Michigan and Lake Superior thermal standards. For Lake Michigan and Lake Superior the following thermal standards are established so as to minimize effects on the aquatic biota in the receiving waters.

(1) (a) Thermal discharges shall not raise the receiving water temperature more than 3ºF above the existing natural temperature at the boundary of mixing zones established in pars. (b) and (c).

(b) 1. The mixing zone for a shoreline thermal discharge shall be the area included within the perimeter of a rectangular figure extending 1,250 feet in both directions along the shoreline from the outfall and 1,250 feet into the lake.

2. The mixing zone for an offshore thermal discharge shall be the area within a 1,000−foot radius circle with its center at the point of discharge.

(c) The department may, upon request from the owner of a source of thermal discharge, adjust the boundaries of the mixing zone established in par. (b) for that source. In no case may any mixing zone so established include an area greater than 72 acres nor may it include more than 2,800 feet of shoreline.

(2) In addition to the limitation set forth in sub. (1), but excepting the Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River, thermal discharges to Lake Michigan shall not raise the temperature of the receiving waters at the boundary of the established mixing zone above the following limits:

January	45°F
February	45°
March	45°
April	55°
May	60°
June	70°
July	80°
August	80°
September	80°
October	65°
November	60°
December	50°

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; r. and recr. Register, July, 1975, No. 235, eff. 8−1−75; renum. from NR 102.05, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.08 Mississippi river thermal standards. In addition to the standards for fish and aquatic life, the monthly average of the maximum daily temperature in the Mississippi river outside the mixing zone shall not exceed the following limits:

January	40°F
February	40°
March	54°
April	65°
May	75°
June	84°
July	84°
August	84°
September	82°
October	73°
November	58°
December	48°

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; renum. from NR 102.06, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.09 Review of thermal standards. (1) Whenever the owner of any source of thermal discharges that existed on or before July 31, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(2) Any owner desiring a review pursuant to sub. (1) shall submit a demonstration to the department no later than June 30, 1976. The department shall reach a decision no later than December 31, 1976.

(3) In the event the owner fails to make a satisfactory demonstration pursuant to sub. (1), the department shall establish a compliance date for the thermal component to be achieved no later than July 1, 1979.

(4) Whenever the owner of any source of thermal discharges that commenced on or after August 1, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(5) In the event an owner fails to make a satisfactory demonstration pursuant to sub. (4), the discharge shall be in compliance with the thermal requirements of this chapter upon commencement of the discharge.

(6) The department may require the reduction of thermal discharges or the size and configuration of a mixing zone if it finds that environmental damage is imminent or existent.

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; am. Register, February, 1977, No. 254, eff. 3−1−77; renum. from NR 102.07, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.10 Outstanding resource waters. (1) The following surface waters are designated as outstanding resource waters:

(a) *National wild and scenic rivers.* All rivers designated under the national wild and scenic rivers act, as amended, 16 USC 1271 to 1287, except those portions flowing through Indian reservations, including:

1. St. Croix river between the northern boundary of the Hudson city limits and the St. Croix flowage dam in Douglas county except that the portion of the St. Croix river from the northern boundary of the St. Croix Falls city limits to a distance one mile below the STH 243 bridge at Osceola shall be classified exceptional resource waters under s. NR 102.11.

2. Namekagon river between its confluence with the St. Croix river and the outlet of Lake Namekagon in Bayfield county.

(b) *State wild and scenic rivers.* All state wild and scenic rivers designated under s. 30.26, Stats., including:

1. Pike river in Marinette county.

2. Pine river and its tributary Popple river in Florence and Forest counties.

(c) Wolf river upstream of the northern Menominee county line.

(d) The following Class I trout waters:

1. Adams county — Big Roche−a−Cri creek

2. Barron county — Yellow river

3. Bayfield county — Flag river, Sioux river

4. Burnett county — North Fork Clam river, South Fork Clam river

5. Chippewa county — Duncan creek, Elk creek, McCann creek

6. Dane county — Black Earth creek above the easternmost CTY KP crossing

7. Door county — Logan creek

8. Douglas county — Bois Brule river and its tributaries including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth

9. Dunn county — Elk creek

10. Florence county — Brule river including Montagne creek and Riley creek tributaries; tributaries to the Pine−Popple rivers including Chipmunk, Cody, Haley, Haymarsh, LaMontagne, Lepage, Lunds, Martin, Olson, Patten, Pine, Riley, Rock, Simpson, Seven Mile, Wakefield and Woods creeks; Little Popple river

11. Forest county — Brule river

13. Kewaunee county — Little Scarboro creek

14. Langlade county — Clearwater creek, Drew creek, Evergreen river, South Branch Oconto river

15. Lincoln county — Center fork New Wood creek, Little Pine creek, Prairie river

16. Marathon county — Holt creek, Spranger creek, Plover river

17. Marinette county — Cedarville creek, Otter creek, Holmes creek, East Thunder creek, North fork Thunder river, Eagle creek, Little Eagle creek, Plumadore creek, Meadow brook, Upper Middle Inlet creek, Middle Inlet creek, Wausaukee river, Little Wausaukee creek, Coldwater brook, Medicine brook, South Branch Miscauno river, Miscauno river, Swede John creek, South Branch Pemebonwon river, Spikehorn creek, Silver creek, Little Silver creek, Sullivan creek; tributaries to the Pike river including Little South Branch Pike river, Camp D creek, Camp F creek, Camp 9 creek, Cole creek, Glen creek, Harvey creek, North Branch Harvey creek, South Branch Harvey creek, Hemlock creek, Holloway creek, K.C. creek, Little Harvey creek, Lost creek, MacIntire creek, Phillips creek, Sackerson creek, Shinns creek, Sidney creek, Smeesters creek, Springdale brook, Whiskey creek

18. Marquette county — Chaffee creek, Lawrence creek, Tagatz creek

19. Monroe county — Rullands Coulee creek

20. Oconto county — First South Branch Oconto river, Second South Branch Oconto river, South Branch Oconto river, Hills Pond creek

21. Polk county — Clam river, McKenzie creek

22. Portage county — Emmons creek, Radley creek, Sannes creek, Tomorrow river, Trout creek

23. Richland county — Camp creek

24. Sheboygan county — Nichols creek

25. St. Croix county — Kinnickinnic river above STH "35"

26. Vernon county — Rullands Coulee creek, Spring Coulee creek, Timber Coulee creek

27. Vilas county — Deerskin river, Plum creek

28. Walworth county — Bluff creek, Potawatomi creek, Van Slyke creek

29. Waupaca county — Emmons creek, Griffin creek, Jackson creek, Leers creek, Peterson creek, Radley creek, Sannes creek, Spaulding creek, Trout creek, Whitcomb creek, North Branch Little Wolf river

30. Waushara county — Willow creek north of Redgranite, Mecan river north of Richford, Little Pine creek, West Branch White river

(e) The following Class II trout waters:

1. Barron county — Yellow river

2. Burnett county — North Fork Clam river

3. Forest county — Brule river, Peshtigo river

4. Grant county — Big Green river, Castle Rock creek
5. Marinette county — Peshtigo river
6. Polk county — McKenzie creek
7. Vilas county — Plum creek

(f) The following cold or warm water streams and rivers or portions thereof:

1d.	Ashland	Bad River	SEG 1: Origin to Outfall in Mellen at NW¼SW¼ S6 T44N R2W
		Brunsweiler River	SEG 1: Origin to Inlet of Spider Lake
			SEG 2: Outlet of Moquah Lake to Inlet of Mineral Lake
			SEG 3: Outlet of Mineral Lake to Inlet of Beaverdam Lake
			SEG 4: Outlet of Beaverdam Lake (at the dam) to the Bad River Indian Reservation Boundary
1h.	Ashland & Bayfield	Marengo River	SEG 1: Origin to Inlet of Marengo Lake
			SEG 2: Outlet of Marengo Lake to Bad River Indian Reservation Boundary
1p.	Ashland & Sawyer	E. Fork Chippewa River	SEG1: T42N R1E S17/18 Line to Ashland County Highway "N" in Glidden
			SEG 6: Outlet of Barker Lake to Confluence with Chippewa Flowage
			SEG 3: Outlet of Pelican Lake to Inlet of Blaisdell Lake
			SEG 4: Outlet of Blaisdell Lake to Inlet of Hunter Lake
			SEG 5: Outlet of Hunter Lake to Inlet of Barker Lake
1t.	Barron	Engle Creek	Class I & II Portions
		Hickey Creek	Class I & II Portions
		Red Cedar River	SEG 1: Outlet of Red Cedar Lake to Inlet of Rice Lake
		Rock Creek	SEG 2: All within Barron County
		Upper Pine Creek	Above Dallas Flowage
2.	Bayfield	Bark River	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth
		Big Brook	All
		Cranberry River & Tribs.	All−Class I Portion including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		East Fork Iron River & Tribs.	All−Class I Portion
		East Fork White River	All−Class I Portion
		Eighteen Mile Cr. & Tribs.	All−Class I Portion
		Fish Creek (Main)	All including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Long Lake Branch & Tribs.	From below Drummond Lake to White River
			All−Class I Portions
		No. Fork Fish Creek & Tribs.	All−Class I & II Portions
		Onion River & Tribs.	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Pikes Creek & Tribs.	All−Class I Portion including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.

		Sioux River & Tribs.	All−Class I & II Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		So. Fork White River	All−Class I Portion
		Thompson Creek	All−Class I Portion
		Twenty Mile Creek	All−Class I & II Portions
		White River	All−Class I Portion
		Whittlesey Creek & Tribs.	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
2d.	Bayfield & Ashland	Beartrap Creek	SEG 1: Origin to Bad River Indian Reservation Boundary
2h.	Bayfield, Ashland & Sawyer	West Fork Chippewa River	SEG 1: Origin (Outlet of Chippewa Lake) to Inlet of Day Lake
			SEG 2: Outlet of Day Lake to Inlet of Upper Clam Lake
			SEG 3: Outlet of Upper Clam Lake to Inlet of Lower Clam Lake
			SEG 4: Outlet of Lower Clam Lake to Inlet of Cattail Lake
			SEG 5: Outlet of Cattail Lake to Inlet of Meadow Lake
			SEG 6: Outlet of Meadow Lake to Inlet of Partridge Crop Lake
			SEG 7: Outlet of Partridge Crop Lake to Inlet of Moose Lake
			SEG 8: Outlet of Moose Lake to Sawyer County Highway “B”
2p.	Bayfield, Sawyer, Washburn, Douglas & Burnett	Totagatic River	SEG 1: Origin (Confluence of West Fork Totagatic River and East Fork Totagatic River) to Inlet of Nelson Lake
			SEG 2: Outlet of Totagatic Flowage to Inlet of Colton Flowage
			SEG 3: Outlet of Colton Flowage to Inlet of Minong Flowage
			SEG 4: Outlet of Minong Flowage to Confluence with Namekagon River
3.	Burnett	North Fork Clam River	County Highway “H” to Confluence with Clam River
		Tributaries to the N. & S. Forks of the Clam River	All−Class I & II Portions
4.	Dane	Mt. Vernon Creek	All−Class I Portion
5.	Door	Mink River	All
5m.	Douglas	Amnicon River	SEG 1: Origin (Outlet of Amnicon Lake) to Inlet of Lyman Lake
			SEG 2: Outlet of Lyman Lake to mouth at Lake Superior, including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Moose River	All
		Spruce River	All
		St. Croix River	SEG 1: Outlet of Upper St. Croix Lake to Inlet of St. Croix Flowage
6.	Forest	Allen Creek	All
		Brule Creek	All
		Elvoy Creek	All
		Jones Creek	Class I & II portions
		North Otter Creek	All

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6m.	Forest & Langlade	Swamp Creek	SEG 1: Outlet of Lake Lucerne to Mole Lake Indian Reservation Boundary
			SEG 3: All below Mole Lake Indian Reservation Boundary to Confluence of Wolf River
7.	Grant	Little Green River	All
7m.	Iron & Ashland	Tyler Forks	SEG 1: Origin in Iron County to Bad River Indian Reservation Eastern Boundary in Ashland County
			SEG 3: From Bad River Indian Reservation Southern Boundary to Confluence with Bad River
		Potato River	SEG 1: Origin to Bad River Indian Reservation Boundary
8.	Iron, Ashland & Price	Flambeau River	SEG 1: Turtle−Flambeau Flowage (Outlet @ Turtle−Flambeau Dam) to Inlet of Upper Park Falls Flowage
		No. Fork Flambeau River	From Turtle−Flambeau Flowage Dam downstream to Park Falls
9.	LaCrosse	Berge Coulee Creek	All
10.	Langlade	Elton Creek	Class I Portion
		Little Evergreen Creek	All
		Mayking Creek	All
		Michelson Creek	All
		Mid Branch Embarrass River	Class I Portion
10m.	Lincoln	New Wood River	Origin (T33N R4E S14) to Confluence with Wisconsin River
11.	Marathon	Falstad Creek	Class II Portion
		So. Branch Embarrass River	Class I Portion
12.	Marinette	No. Branch Beaver Creek	Entire River & tributaries
13.	Oneida	Noisy Creek	Class II Portion
		Squirrel River	Outlet of Squirrel Lake to Confluence with Tomahawk River
		Tomahawk River	SEG 2: Outlet of Willow Flowage Dam to Inlet of Lake Nokomis
14.	Pierce	Kinnickinnic River	From Powell Dam to St. Croix River
15.	Polk	Sand Creek & Tribs	All−Class I & II Portions
15e.	Polk & Burnett	Clam River	SEG 1: Outlet of Clam Falls Flowage to Inlet of Clam Lake
			SEG 2: Outlet of Lower Clam Lake to Section Line @ T39N R16W S21/22
15m.	Price	Elk River	SEG 1: Headwaters to Inlet of Musser Lake
	Price & Lincoln	Spirit River	Outlet of Spirit Lake to Inlet of Spirit River Flowage
16.	Price, Rusk & Sawyer	So. Fork Flambeau River	All−Round L. Dam downstream to Jxn with No. Fork Flambeau R.
17.	Richland	Elk Creek	All
18.	Rusk	Devils Creek	All−Class I & II Portions
		Soft Maple Creek	SEG 1: Origin to Rusk County Highway “F”
		So. Fork Main Creek	Class I & II Portions (T35N R3W S28 downstream to T34N R4W S11)
		Swift Creek	Outlet of Island Lake to Inlet of Fireside Lake
19.	Sauk	Otter Creek	From headwaters to southern section line of T11N R6E S33
		Parfrey’s Glen	From headwaters to CTH DL
20.	Sawyer	Benson Creek	All−Class I Portion

		Couderay River	SEG 1: Origin at Outlet of Billy Boy Flowage to Inlet of Grimh Flowage (Including Waters within Lac Courte Oreilles Indian Reservation)
		Eddy Creek	All−Class I Portion
		Grindstone Creek	All−Class I Portion
		Knuteson Creek	SEG 1: Outlet of Wise Lake to Inlet of Knuteson Lake
			SEG 2: Outlet of Knuteson Lake to Inlet of Lake Chetek
		Little Weirgor Creek & Tribs	All−Class I & II Portions
		McDermott Creek	All
		Mosquito Brook	All−Class I Portion
		Teal River	Outlet of Teal Lake to Confluence with West Fork Chippewa River
20m.	Sawyer & Rusk	Thornapple River	SEG 1: Origin to Rusk County Highway "J"
		Chippewa River	SEG 1: Dam at Chippewa Flowage to Inlet of Radisson Flowage (T38N R7W S13)
21.	Shawano	Middle Br. Embarrass R.	Origin to but not including Homme Pond
		No. Br. Embarrass R.	Origin to CTH J
		So. Br. Embarrass R.	Origin to but not including Tigerton Pond
21g.	Taylor & Chippewa	Yellow River	SEG 1: Confluence with South Fork Yellow River to Inlet of Chequamegon Waters Flowage
			SEG 2: Outlet of Chequamegon Waters Flowage (at Miller Dam) to State Highway 64/73
21r.	Taylor & Price	Silver Creek	SEG 1: Origin to Westboro Sanitary District Outfall
22.	Vilas	Allequash Springs	Class I & II Portions
		Brule Creek	All
		East Br. Blackjack Cr.	All
		Elvoy Creek & Springs	Class I & II Portions
		Manitowish River	SEG 1: Adjacent to Dam Road Downstream to Inlet of Boulder Lake
			SEG 2: Outlet of Boulder Lake to Inlet of Island Lake
		Mishonagon Creek	Class I & II Portions
		Siphon Creek	All
		Spring Meadow Creek	Class I Portion
		Tamarack Creek	All
		Trout River	SEG 1: Outlet of Trout Lake to Lac Du Flambeau Indian Reservation Eastern Boundary
22m.	Vilas & Oneida	Wisconsin River	SEG 1: Orgin (Outlet of Lac Vieux Desert) to Inlet of Watersmeet Lake
23.	Washburn	Beaver Brook	All−Class I Portion
		Sawyer Creek	All−Class I & II Portions
		So. Fork Bean Brook	All−Class I Portion
		Stuntz Brook	Origin to Confluence with Namekagon River
23m.	Washburn & Barron	Bear Creek	SEG 1: Outlet of Kekegama Lake to Inlet of Bear Lake
			SEG 2: Outlet of Bear Lake to Inlet at Stump Lake

(1m) The following lakes are designated as outstanding resource waters:

1.	Ashland	Bad River Slough
		Kakagon Slough
		Lake Superior within ¼ mile of the shoreline of the islands within the Apostle Island National Lakeshore
2.	Barron	Bear Lake (T36N R12W S2)
		Red Cedar Lake
		Sand Lake
		Silver Lake
3.	Bayfield	Bark Bay Slough
		Diamond Lake
		Lake Superior within ¼ mile of the shoreline of the islands within the Apostle Island National Lakeshore
		Middle Eau Claire Lake

		Namekagon Lake
		Owen Lake
		Pike Chain of Lakes (Pike, Millicent, Buskey Bay, Hart, Twin Bear, Eagle, Flynn and Hildur Lakes)
		Star Lake
		Upper Eau Claire Lake
4.	Burnett	Big Mckenzie Lake
		Big Sand Lake
		Sand Lake (T40N R15W S25)
5.	Columbia	Crystal Lake
6.	Douglas	Bond Lake
		Lower Eau Claire Lake
		Nebagamon Lake
		St. Croix (Gordon) Flowage
		Upper St. Croix Lake
		Whitefish Lake (Bardon)
7.	Florence	Edith Lake
		Keyes Lake
		Lost Lake
		Perch Lake
		Riley Lake, South
8.	Forest	Butternut Lake
		Franklin Lake
		Lucerne Lake (Stone)
		Metonga Lake
9.	Iron	Catherine Lake
		Cedar Lake
		Gile Flowage
		Hewitt Lake
		Owl Lake
		Trude Lake
		Turtle−Flambeau Flowage
9m.	Marinette	Caldron Falls Flowage
10.	Oconto	Archibald Lake
		Bass Lake (T32N R15E S9)
		Bear Paw Lake
		Boot Lake
		Chain Lake
11.	Oneida	Big Carr Lake
		Clear Lake (T39N R7E S16)
		Little Tomahawk Lake
		Tomahawk Lake
		Two Sisters Lake
		Willow Flowage
12.	Polk	Pipe Lake
13.	Price	Cochram Lake
		Tucker Lake
14.	Rusk	Bass Lake (T34N R9W S16)
		Fish Lake
		Island Chains of Lakes (Chain, Clear, McMann, and Island Lakes)
		Three Lakes No. 1 (T36N R9W S25)
15.	St. Croix	Bass Lake (T30N R19W S23)
		Perch Lake
16.	Sauk	Devils Lake
17.	Sawyer	Barker Lake
		Blaisdell Lake
		Camp Smith Lake
		Evergreen Lake
		Grindstone Lake
		Lac Court Oreilles
		Lake Chippewa (Chippewa Flowage)
		Nelson Lake
		Osgood Lake
		Perch Lake (T42N R6W S25)
		Round Lake (Big Round)
		Sand Lake
		Spider Lake
		Teal Lake
		Whitefish Lake
18.	Vilas	Black Oak Lake
		Crab Lake
		Crystal Lake (T41N R7E S27)
		Lac Vieux Desert
		North Twin Lake
		Pallette Lake (Clear)
		Partridge Lake
		Plum Lake
		South Twin Lake
		Star Lake
		Stormy Lake
		Trout Lake
		White Sand Lake (T24N R7E S26)
19.	Walworth	Lulu Lake
20.	Washburn	Bass Lake (T40N R10W S17)
		Long Lake
		Middle McKenzie Lake
		Shell Lake
		Stone Lake (T39N R10W S24)
21.	Waukesha	Spring Lake (T5N R18E S9)
22.	Waupaca	Graham Lake (Nelson)
		North Lake
23.	Waushara	Gilbert Lake
		Lucerne Lake (Egans)
		Norwegian Lake
		Pine Lake (Springwater)

(2) The waters in sub. (1) and (1m) may not be lowered in quality.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the outstanding resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (1) (d), cr. (1) (e), Register, July, 1989, No. 403, eff. 8−1−89; cr. (1) (f) and (1m), am. (2), Register, May, 1993, No. 449, eff. 6−1−93; am. (1m) 6., 9. and 11., cr. (1m) 9m., Register, February, 1998, No. 506, eff. 3−1−98; CR 05−089: am. (1) (d) 8., (f) 2., (1m) 1. and 3. Register July 2006 No. 607, eff. 8−1−06; CR 05−105: renum. (1) (f) 1. to be 1t. and am., cr. (1) (f) 1d., 1h., 1p., 2d., 2h., 2p., 5m., 6m.,. 7m., 10m., 15e., 15m., 15s., 20m., 21g., 21r., 22m., and 23m., am. (1) (f) 3., 8. 13., 18., 20., 22., and 23., Register November 2006 No. 611, eff. 12−1−06; **reprinted to correct error in (1) (d) 6. Register March 2008 No. 627.**

NR 102.11 Exceptional resource waters. (1) Surface waters which provide valuable fisheries, hydrologically or geologically unique features, outstanding recreational opportunities, unique environmental settings, and which are not significantly impacted by human activities may be classified as exceptional resource waters. All the following surface waters are designated as exceptional resource waters:

(a) Class I trout waters listed in Wisconsin Trout Streams publication 6−3600 (80) that are not listed in s. NR 102.10.

(b) Other Class I trout waters:

1. Abraham Coulee creek in section 29, township 20 north, range 8 west from its headwaters to the Abraham Coulee road bridge in Trempealeau county.

2. Bear creek originating in section 3, township 20 north, range 7 west in Trempealeau county.

3. Biser creek originating in section 19, township 12 north, range 3 west in Sauk county.

4. Bostwick creek from CTH M upstream 6.2 miles to the headwaters in LaCrosse county.

5. Bufton Hollow creek originating in section 23, township 12 north, range 2 west in Richland county.

6. Columbus creek originating in section 29, township 20 north, range 6 west in Jackson county.

7. Dutch creek originating in section 12, township 19 north, range 8 west in Trempealeau county.

8. Joe Coulee creek originating in section 1, township 20 north, range 7 west in Trempealeau county.

9. Little creek originating in section 21, township 20 north, range 6 west in Jackson county.

10. Marble creek originating in section 30, township 10 north, range 3 east in Sauk county.

11. Marshall creek originating in section 4, township 11 north, range 1 west in Richland county.

12. Martin creek originating in section 22, township 6 north, range 2 east in Iowa county.

13. South Bear creek originating in section 2, township 12 north, range 2 west in Richland county.

14. Spring brook downstream from CTH Y south of Antigo to its confluence with the Eau Claire river in Marathon county.

15. Spring Coulee creek from the headwaters to SE 1/4, SE 1/4, section 33, township 16 north, range 1 east in Monroe county.

16. Unnamed creek 2−12 originating in section 36, township 20 north, range 7 west of Trempealeau county.

17. Unnamed creek 4−9 originating in section 4, township 11 north, range 1 west in Richland county.

18. Unnamed creek 5−6 originating in section 6, township 19 north, range 8 west in Trempealeau county.

19. Unnamed creek 7−4 originating in section 6, township 20 north, range 7 west in Trempealeau county.

20. Unnamed creek 8−9 originating in section 5, township 20 north, range 7 west in Trempealeau county.

21. Unnamed creek 8−14 originating in section 1, township 20 north, range 8 west in Trempealeau county.

22. Unnamed creek 9−13 originating in section 4, township 20 north, range 6 west in Jackson county.

23. Unnamed creek 10−8 originating in section 10, township 11 north, range 1 west in Richland county.

24. Unnamed creek 10−10 originating in section 14, township 20 north, range 6 west in Jackson county.

25. Unnamed creek 11−4 originating in section 1, township 20 north, range 7 west in Trempealeau county.

26. Unnamed creek 11−7 originating in section 2, township 20 north, range 7 west in Trempealeau county.

27. Unnamed creek 13−3a originating in section 19, township 20 north, range 6 west in Trempealeau county.

28. Unnamed creek 13−3b originating in section 6, township 20 north, range 6 west in Trempealeau county.

29. Unnamed creek 15−13 originating in section 1, township 20 north, range 8 west in Trempealeau county.

30. Unnamed creek 15−4 originating in section 3, township 20 north, range 6 west in Trempealeau county.

31. Unnamed creek 16−2 originating in section 22, township 20 north, range 6 west in Jackson county.

32. Unnamed creek 17−5 originating in SE 1/4, section 5, township 20 north, range 6 west in Jackson county.

33. Unnamed creek 24−3a originating in section 24, township 11 north, range 1 west in Richland county.

34. Unnamed creek 26−7 originating in section 2, township 20 north, range 6 west in Jackson county.

35. Unnamed creek 34−2 originating in section 17, township 20 north, range 8 west in Trempealeau county.

36. Unnamed creek 34−15 originating in section 27, township 20 north, range 7 west in Trempealeau county.

37. Unnamed stream originating in section 29, township 10 north, range 3 east in Sauk county.

38. Washington Coulee creek originating in section 29, township 20 north, range 6 west in Jackson county.

(c) The following Class II trout waters:

1. Ashland county — White river above the Bad River Indian reservation

2. Bayfield county — White river

3. Dane county — Mt. Vernon creek

4. Forest county — North Branch Oconto river

5. Grant county — Blue river

6. Iowa county — Blue river

7. Langlade county — Prairie river, South Branch Oconto river

8. Lincoln county — Prairie river

9. Marquette county — Mecan river

10. Oconto county — North Branch Oconto river, South Branch Oconto river

11. Pierce county — Rush river

12. Portage county — Tomorrow river

13. Richland county — Willow creek

14. St. Croix county — Willow river, Race Branch

15. Waushara county — Mecan river

(d) The following cold or warm water streams and rivers or portions thereof:

1g.	Ashland	Bad River	SEG 2: Outfall in Mellen at NE¼SW¼ S6 T44N R2W to Bad River Indian Reservation Boundary
1r.	Ashland & Sawyer	East Fork Chippewa River	SEG 2: Ashland County Highway ”N” to Confluence of Rocky Run Creek (Includes Glidden POTW)
1t.	Barron	Brill River	All−Class II Portion
2.	Crawford	Copper Creek	All
		Plum Creek	All

		Sugar Creek	From headwaters to T10N R6W S10
		Tainter Creek	From Vernon County Line to CTH B
3.	Dane	Blue Mounds Branch	All
		Deer Creek	All
		Dunlap Creek	All
		Elvers Creek (Bohn Cr.)	All
		Flynn Creek	All
		Fryes Feeder Creek	All
		Garfoot Creek	All
		Milum Creek	All
		Rutland Branch	All
		Ryan Creek	All
		Schalpbach Creek	All
		Sixmile Creek	All
		Spring Creek (Lodi)	All
4.	Dane, Sauk, Iowa, Grant, Richland, Crawford	Wisconsin River	From below Prairie du Sac to Prairie du Chien
5.	Dane & Green	Little Sugar River	Above New Glarus
		Story Creek (Tipperary)	All, originating in T5N R8E S36
		Sugar Creek	All
6.	Dunn	Sand Creek	From Chippewa County Line to mouth
7.	Eau Claire	Lowes Creek	From Hwy 37 & 85 upstream to headwaters
8.	Fond du Lac	Feldner's Creek	From headquarters to Mischo's Millpond
		Lake Fifteen Creek	Entire Creek above & below Lake Fifteen
9.	Forest	Armstrong Creek	All
		Middle Br. Peshtigo R.	All
		North Br. Peshtigo R.	All
		North Br. Popple R.	All
		West Br. Armstrong Creek	Class II Portion
10.	Grant	Doc Smith Branch	All
		Little Platte River	From Arthur downstream to Platte River
11.	Grant & Iowa	Big Spring Branch	From Springhead to Blue River
12.	Green	Burgy Creek	All
		Gill Creek	All
		Hefty Creek, North Branch	All
		Hefty Cr., Center Branch	All
		Liberty Creek	All
		Norwegian Creek	All
		Richland Creek	All
		Ross Crossing	All
		Sylvester Creek	All
		Spring Valley Creek	All
		Ward Creek	All
13.	Green & Rock	Allen Creek	Below Evansville
14.	Iowa	Harker−Lee−Martin System	From headwaters to T6N R2ES10
15.	Iron	Maintowish River	All
15m.	Iron & Ashland	Vaughn Creek	SEG 1: Origin to Bad River Indian Reservation Boundary
16.	Jackson	Trempealeau River	From STH 95 at Hixton to CTHP at Taylor
17.	Jefferson	Allen Creek	All
18.	Kewaunee	Casco Creek	From T24N R24E S19 downstream of Rock Ledge to Kewaunee River
19.	La Crosse	Bostwick Creek	From headwaters to County Hwy 'O'
		Coon Creek	All
		Dutch Creek	From headwaters to Russian Coulee Road (section 8)
20.	Lafayette	Galena River	From headwaters to Buncombe Road
21.	Langlade	East Br. Eau Claire R.	From STH 64 upstream to firelane crossing in T33N R11E S35 SW1/4
		Hunting River	From Fitzgerald Dam Road downstream to T33N R11E S1
22.	Lincoln	North Br. Prairie River	From headwaters to CTHJ to T33N R8E
		Silver Creek	All
23.	Manitowoc	Branch River	All
24.	Monroe	Big Creek	From headwaters to Acorn Rd (S7)
		Farmers Valley Creek & Tribs	From headwaters to I−90 (S19)

		Soper Creek	All
25.	Oneida	Bearskin Creek	From Tomahawk River to Little Bearskin Lake
25m.	Oneida & Lincoln	Wisconsin River	SEG 2: Hat Rapids Dam to Lincoln County A crossing
			SEG 4: Grandfather Dam to Inlet of Alexander Lake
26.	Pierce	Big River	Class I Portion
		Cady Creek	From CTH P upstream
		Trimbelle River	All
26c.	Polk & Burnett	Clam River	SEG 3: Section Line @ T39N R16W S21/22 to Inlet of Clam River Flowage
			SEG 4: Outlet of Clam River Flowage to Confluence with St. Croix River
26g.	Price	North Fork Jump River	SEG 1: Origin (outlet of Cranberry Lake) to Inlet of Spring Creek Flowage
			SEG 2: Outlet of Spring Creek Flowage to Confluence with South Fork Jump River
26n.	Price, Rusk & Taylor	Jump River	SEG 1: Confluence of the North Fork Jump River and South Fork Jump River to the Village of Jump River
26r.	Price, Sawyer, Rusk	Flambeau River	SEG 2: Crowley Dam to Inlet of Big Falls Flowage
26w.	Price & Taylor	South Fork Jump River	Origin to Confluence with North Fork Jump River
27.	Richland	Babb Hollow	All−Trib to Mill Creek
		Hanzel Creek (Hansell)	All−Trib to Melancthon Cr.
		Melancthon Creek	Class II Section
		Coulter Hollow Creek	All−Trib to Mill Creek
		E. Branch Mill Creek	All
		Happy Hollow Creek	All−Trib to Willow Creek
		Higgins Creek	All−Trib to Mill Creek
		Hood Hollow Creek	All−Trib to Mill Creek
		Jacquish Hollow Creek	All−Trib to Willow Creek
		Kepler Branch	All−Trib to Mill Creek
		Mill Creek	From headwaters to above Boaz
		Miller Branch	All−Trib to Mill Creek
		Pine Valley Creek	All−Trib to Mill Creek
		Ryan Hollow	All−Trib to West Branch Mill Creek
		Wheat Hollow Creek	All
		W. Branch Mill Creek	All
28.	Rock	Bass Creek	All
		East Fork Raccoon Cr.	All
		Little Turtle Creek	All
		Raccoon Creek	All
		Spring Brook	All
		Turtle Creek	All
		Unnamed Creek T2N R14E S31	All
29.	Rusk	Big Weirgor Creek	All−Class III Portion
		Main Creek	Rusk County Highway P to Inlet of Holcombe Flowage
		Soft Maple Creek	SEG 2: Rusk County Highway “F” to Confluence with Chippewa River
30.	Rusk, Taylor & Chippewa	Jump River	From Village of Jump River downstream to Holcombe Flowage
31.	Sauk	Beaver Creek (Trib to Dell Creek)	All
		Camels Creek (Trib to Dell Creek)	All
		Dell Creek	All
31m.	Sawyer	Couderay River	SEG 2: Dam at Grimh Flowage to Confluence with Chippewa River
32.	Shawano	Kroenke Creek	Class II Portion
		Red River	From Lower Red Lake Dam to Wolf River
		West Br. Red River	Class II Portion

33.	Sheboygan	Ben Nutt Creek	Class II Portion to Junction with Mill Creek
34.	St. Croix	Apple River	From NSP plant below CTH I to Mouth
		Cady Creek	All
		Willow River	Extend Class II Portion into Delta in Lake Mallileau
35.	St. Croix & Pierce	St. Croix River	From No. Boundary of Hudson City limits to the river mouth in Pierce Co.
35m.	Taylor & Price	Silver Creek	SEG 2: Westboro Sanitary District Outfall to Confluence with South Fork Jump River
36.	Trempealeau	Buffalo River	From Hwy 53 to Strum Pond
37.	Vernon	Bishop Branch	All
		Cheyenne Valley Creek	All
		Coon Creek	From La Crosse county line to Chaseburg
		Frohock Valley Creek	All
		Hornby Creek	All
		Reads Creek	All
		Tainter Creek	All
38.	Vilas	Manitowish River	From Rest Lake Dam downstream to Iron County line
38m.	Vilas & Oneida	Wisconsin River	SEG 2: State Highway 70 to Inlet at Rainbow Flowage (Oneida County Line)
			SEG 3: Outlet of Rainbow Flowage (Oneida County Highway "D" to Inlet of Rhinelander Flowage (T37N R8E S8 SE¼NE¼)
39.	Washington	E. Branch Milwaukee R.	From Long Lake outlet to STH 28
40.	Waukesha	Genesee Creek	Above STH 59
		Mukwonago River	From Eagle Springs Lake to Upper Phantom Lake
		Oconomowoc River	From below North Lake to Okauchee Lake
41.	Waupaca	Blake Brook & Branches	Class II Portion
		Little Wolf River	From junction with Wolf River upstream to Manawa Dam
		Waupaca River	Class II portion
42.	Waupaca & Shawano	Embarrass River	From Wolf River upstream to dam at Pella
43.	Waushara	Lower Pine River	From below Wild Rose Mill pond to dam at Poy Sippi

(2) The waters identified in sub. (1) may not be lowered in quality except as provided in ch. NR 207.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the exceptional resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; cr. (1) (c), Register, July, 1989, No. 403, eff. 8−1−89; cr. (1) (d), Register, May, 1993, No. 449, eff. 6−1−93;CR 05−105: renum. (1) (d) 1. to be 1t., cr. 1g., 1r., 15m., 25m., 26c., 26n., 26r., 26w., 31m., 35m., and 38m., am. 29., Register November 2006 No. 611, eff. 12−1−06.

NR 102.12 Great Lakes system. (1) The Great Lakes system includes all the surface waters within the drainage basin of the Great Lakes.

(2) For the purpose of administering ch. NR 207 and consistent with chs. NR 105 and 106, the waters identified in sub. (1) are to be protected from the impacts of persistent, bioaccumulating toxic substances by avoiding or limiting to the maximum extent practicable increases in these substances.

(3) The waters of the Lake Superior basin shall be managed to prevent any new or increased discharges of the following pollutants: DDT, DDE and metabolites, chlordane, toxaphene, hexachlorobenzene, 2,3,7,8 TCDD, octachlorostyrene, mercury and PCB's. For purposes of administering ch. NR 207, new or increased discharges of these pollutants shall be prohibited unless the applicant certifies at time of application, that the new or increased discharge is necessary after utilization of best technology in process or control using waste minimization, pollution prevention, municipal pretreatment programs, material substitution or other means of commercially available technologies which have demonstrated capability for similar applications.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; r. and recr. (1), am. (2), Register, August, 1997, No. 500, eff. 9−1−97; CR 05−089: cr. (3) Register July 2006 No. 607, eff. 8−1−06.

NR 102.13 Fish and aquatic life waters. All surface waters not included in s. NR 102.05 (1) (b) 1., 2., 3. or 5. are fish and aquatic life waters.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.14 Taste and odor criteria. (1) At certain concentrations, substances may not be toxic to humans, but may impart undesirable taste or odor to water or aquatic organisms ingested by humans. The taste and odor criterion is derived to prevent substances from concentrating in surface waters or accumulating in aquatic organisms to a level which results in undesirable tastes or odors to human consumers.

(2) The taste and odor criterion is derived as follows:

(a) For substances which impart tastes and odors to waters, the taste and odor criterion shall equal that threshold concentration (TC_w) below which objectionable tastes or odors to human con-

sumers do not occur. Threshold concentrations for substances imparting tastes and odors to water are listed in Table 1.

Table 1
Threshold Concentrations (TC_w) for Substances Causing Taste and Odor in Water

Substance	Threshold Concentration (ug/L)1
Acenaphthene	20
Chlorobenzene	20
2−Chlorophenol	0.1
3−Chlorophenol	0.1
4−Chlorophenol	0.1
Copper	1000
2,3−Dichlorophenol	0.04
2,4−Dichlorophenol	0.3
2,5−Dichlorophenol	0.5
2,6−Dichlorophenol	0.2
3,4−Dichlorophenol	0.3
2,4−Dimethylphenol	400
Hexachlorocyclopentadiene	1
2−Methyl−4−Chlorophenol	1800
3−Methyl−4−Chlorophenol	3000
3−Methyl−6−Chlorophenol	20
Nitrobenzene	30
Pentachlorophenol	30
Phenol	300
2,3,4,6−Tetrachlorophenol	1
2,4,5−Trichlorophenol	1
2,4,6−Trichlorophenol	2
Zinc	5000

[1] A threshold concentration expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the threshold concentration by 1000.

(b) For substances which impart tastes or odors to aquatic organisms, the taste and odor criterion shall be calculated as follows:

$$TOC = \frac{TC^1}{BAF}$$

Where:
- TOC = Taste and odor criterion in milligrams per liter (mg/L).
- TC = Threshold concentration in milligrams of substance per kilogram of wet tissue weight (mg/kg) of the aquatic organism being consumed below which undesirable taste and odor is not detectable to human consumers as derived in par. (d).
- BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(c) The lower of the taste and odor criteria derived as specified in pars. (a) and (b) is applicable to surface waters classified as public water supplies. The taste and odor criteria derived as specified in par. (b) are applicable to cold water and warm water sport fish communities.

(d) Threshold concentrations for substances imparting tastes or odors to water (TC_w) other than those listed in Table 1 and threshold concentrations for substances imparting tastes or odors to aquatic organisms (TC_f) shall be selected by the department using its best professional judgment.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (2) (b) and (c), Register, August, 1997, No. 500, eff. 9−1−97.

APPENDIX E-10 White River Water Quality Monitoring Study Report

STUDY REPORT

for

White River Hydroelectric Project
(FERC Project No. 2444)

Water Quality Monitoring Study

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January 31, 2023

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PROJECT INFORMATION AND BACKGROUND

Northern States Power Company – Wisconsin (NSPW or Licensee), currently holds a license issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the White River Hydroelectric Project (Project). The Project is owned, operated, and maintained by NSPW. The current license, which designates the Project as FERC No. 2444, expires on July 31, 2025. To obtain a new license, NSPW must submit a Final License Application (FLA) to FERC no later than July 31, 2023. The FLA, in part, must include an evaluation of the existing water quality associated with the Project.

On October 29, 2020, 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, in part, that NSPW complete a water quality study at the Project.

WDNR requested that data be collected and analyzed using river monitoring protocols and that river monitoring methods should be implemented in at least three locations within the Project area, including one location downstream of the dam, one location within the impoundment (within the deepest area of the reservoir, typically near the dam), and one location upstream of the impoundment. NSPW developed a study plan to include monitoring for all parameters requested by WDNR with the exception of 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 White River Project during 2022 to determine if waters within the Project boundary meet current state water quality standards. The work was completed according to the Final Study Plan provided by Mead and Hunt.

STUDY AREA

The study included water quality monitoring at three locations within the Project boundary. Monitoring location #1 was located approximately 4,800 feet upstream of the dam in a riverine area of the impoundment, monitoring location #2 was located approximately 300 feet upstream of the dam in the deep hole within the reservoir, and monitoring location #3 was located approximately 165 feet downstream of the powerhouse at the existing WDNR Monitoring Station No. 023127.

Figure 1 is a map showing the sampling locations at the Project.

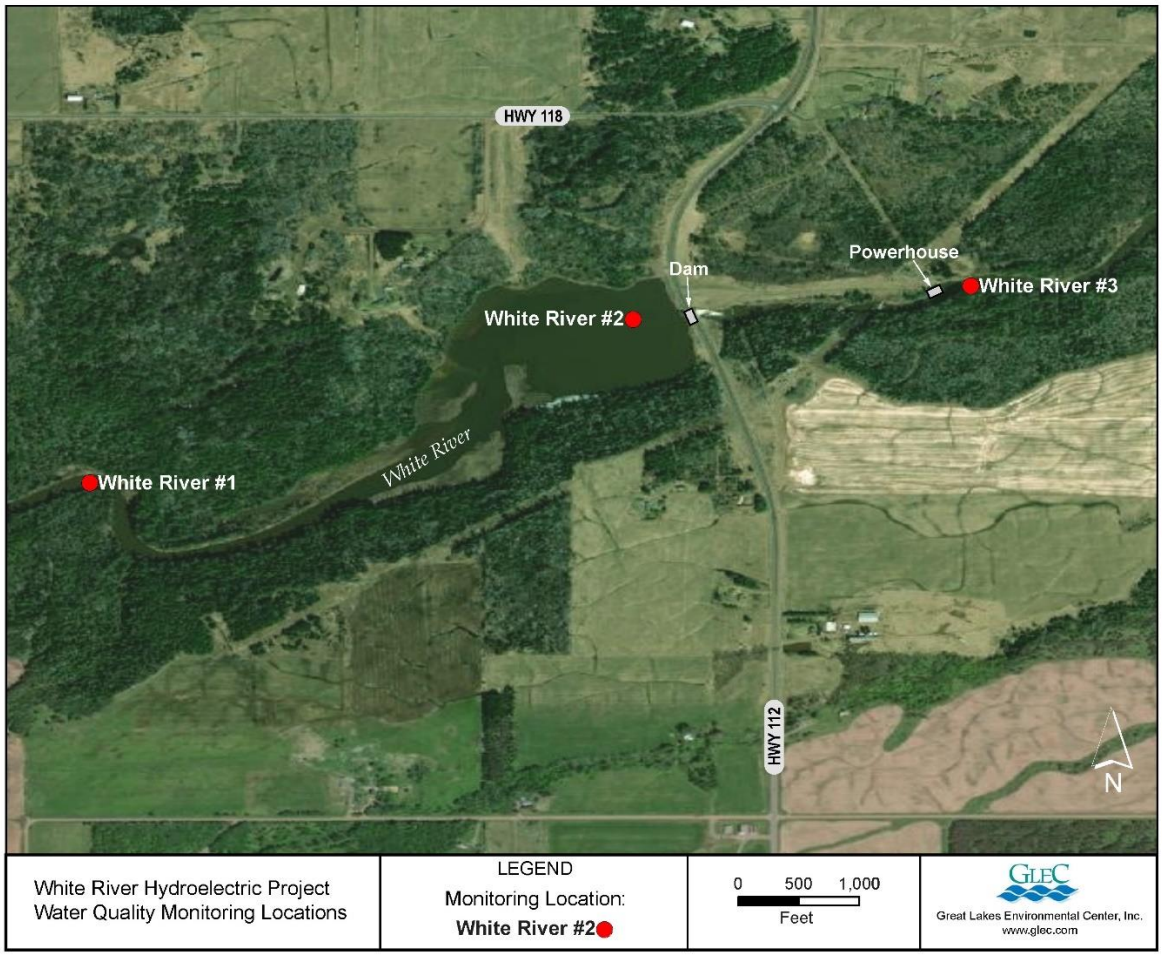

FIGURE 1. WHITE RIVER SAMPLING LOCATIONS FOR THE 2022 WATER QUALITY ASSESSMENT. WHITE RIVER #1: 46.49392, -90.92295, WHITE RIVER #2: 46.49762, -90.91066, WHITE RIVER #3: 46.49837, -90.90302

METHODOLOGY

The objective of the water quality monitoring study was to determine if the Project meets current state water quality standards. Since the White River is 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 for all monitoring locations using river monitoring protocols.

River monitoring protocols were implemented at the following three locations:

- White River Location #1: 46.49392, -90.92295, approximately 4,800 feet upstream of the dam in a riverine area of the impoundment,
- White River Location #2: 46.49762, -90.91066, approximately 300 feet upstream of the dam in the deep hole within the reservoir, and

- White River Location #3: 46.49837, -90.90302, approximately 165 feet downstream of the powerhouse at the existing WDNR Monitoring Station No. 023127

NSPW developed the study plan to include monitoring for all parameters requested by WDNR with the exception of sediment accumulation. A summary of the White River water quality assessment plan is shown in Figure 2 for all monitoring locations at the Project. At each location, the following were collected and/or recorded at the frequency outlined in Figure 2:

- 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

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 the following:

- Ammonia
- Bacteria (*E. coli*)
- Chlorophyll *a*
- Conductivity
- Dissolved Oxygen
- Dissolved Phosphorus
- Nitrate (plus Nitrite)
- pH
- 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
- Sulfate
- Total Mercury

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

Discrete multi-parameter water quality measurements of temperature, DO, pH, and specific conductance were collected at each monitoring location during each visit using a calibrated YSI ProDSS multi-parameter meter. The data collection occurred according to the schedule outlined in Figure 2.

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	6 total	Lab	x	x	x	x	x	x
Total Mercury	6 total	Lab	x	x	x	x	x	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 2. WHITE RIVER MONITORING LOCATIONS, WATER QUALITY ASSESSMENT PLAN (2022)

Continuous Monitoring of Water Temperature, pH, DO, and Specific Conductance

Continuous (hourly) temperature data was collected from May 18 to September 3, 2022 for Location #1 (the riverine area of the impoundment) and from May 18 to October 11, 2022 for Location #3 (downstream of the powerhouse) using Onset HOBO Tidbit Temperature Data Loggers. Data collection was truncated at Location #1 due to a reservoir drawdown which began on September 3, 2022 and dewatered the location where the data logger was deployed.

Continuous (hourly) temperature, DO, pH, and specific conductance data were collected at Location #1 from July 13 to September 3, 2022 and at Location #3 from July 13 to September 28, 2022 using calibrated YSI EXO3 Multi-parameter sondes. Data collection was truncated at Location #1 due to a reservoir drawdown which began on September 3, 2022 and dewatered the location where the data logger was deployed. Due to a field technician error while downloading data from the YSI EXO3 sondes, no continuous data was collected between July 29 and August 17, 2022 at either Location #1 or Location #3. This deviation from the study plan is discussed further in the Results section.

Field staff downloaded data from the sondes directly onto a laptop computer. During each visit, all equipment was checked for operation, calibration, battery life. Adjustments to the

instruments were made as needed based on the 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 White River Hydroelectric Project are summarized in Table 1.

TABLE 1. WATER QUALITY STANDARDS FOR THE WHITE RIVER HYDROELECTRIC PROJECT

<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 for a trout class II water</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 the White River, this period is from September 15-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 Cold* Waters</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>

*Cold = waters with a fish and aquatic life use designation of "cold water community"
Ta = ambient temperature

Data Analysis and Processing

Upon completion of field data collection, all data was checked for errors and omissions. Verified data is presented below and in the appendices as tables and/or plots to illustrate the results.

Equipment Calibration and Quality Assurance

The field equipment used during the 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. 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 all sample locations. 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 18, June 14, July 13, August 17, September 13, and October 11, 2022. Water quality characteristics and conditions at the White River Hydroelectric Project are detailed in this section. Several water quality plots are presented in the appendices to this report as specified below.

Discrete Multi-parameter Water Quality Measurements

A summary of the lab analyses for the water samples is provided in Table 4. A summary of the field data is provided in Table 5. Field data (DO, pH, and temperature) in bold font in Table 5 indicate parameters that were outside the Water Quality Criteria for Fish and Aquatic Life, as defined in Table1.

TABLE 4. SUMMARY OF WATER QUALITY PARAMETER SAMPLE ANALYSIS FOR THE WHITE RIVER HYDROELECTRIC PROJECT (2022)

	White River Location #1 (Upstream)						White River Location #2 (Deep Hole)						White River 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)	<30.3	<30.3	<30.0	<13.0	267.0	178.0	51.4	<30.3	<30.0	<13.0	148.0	129.0	30.5	<30.3	42.9	14.2	61.0	65.0
***E. coli* (MPN)**	56.3	36.9	62.0	49.6	137.6	23.1	20.9	13.4	25.6	3.1	162.4	24.6	23.8	30.9	53.8	40.8	155.3	21.6
Chloride (mg/L)	3.8	5.3	2.7	2.4	6.7	3.0	4.1	2.8	2.8	2.6	2.7	2.9	5.4	2.9	2.9	2.7	3.1	3.1
Chlorophyll-*a* (µg/L)	NC[1]	NC	1.40	1.10	2.29	NC	NC	NC	2.01	3.02	2.65	NC	NC	NC	2.18	2.39	3.49	NC
Dissolved Phosphorus (µg/L)	5.0	5.3	2.5	3.6	3.8	5.2	8.3	<1.5	<1.5	3.9	3.4	2.4	6.1	2.2	2.9	2.9	2.8	5.4
Nitrate (plus nitrite) (µg/L)	8.9	10.8	10.2	<3.4	3.6	<3.4	12.3	9.2	<3.4	<3.4	9.7	5.2	12.6	6.9	3.4	7.0	10.4	8.2
Sulfate (mg/L)	<0.71	3.9	3.5	4.0	4.6	4.4	<0.71	3.9	3.5	4.0	4.7	4.3	<0.71	4.0	3.5	4.0	4.7	4.2
Total Mercury (µg/L)	<0.16	<0.066	<0.066	<0.066	<0.066	<0.066	<0.16	<0.066	<0.066	<0.066	<0.066	<0.066	<0.16	<0.066	<0.066	<0.066	<0.066	<0.066
Total Nitrogen (mg/L)	0.46	0.39	0.34	0.34	0.34	0.33	0.52	0.49	0.33	0.33	0.30	0.34	0.56	0.45	0.53	0.48	0.50	0.50
Total Phosphorus (µg/L)	6.9	5.9	9.1	11.5	16.0	7.4	10.3	6.8	10.0	11.0	19.5	12.9	10.4	9.6	10.7	14.0	15.4	10.2
Total Suspended Solids (mg/L)	13.0	14.3	14.6	11.4	9.7	3.7	10.1	7.1	9.1	4.6	13.4	4.8	15.3	12.4	12.1	10.9	19.9	9.4

[1] NC = Not Collected per Study Plan

TABLE 5. SUMMARY OF WATER QUALITY FIELD PARAMETER RESULTS FOR THE WHITE RIVER HYDROELECTRIC PROJECT (2022)

Field Measurements[1]	White River Location #1 (Upstream)						White River Location #2 (Deep Hole)						White River 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)	160	NC[2]	186	198	191	196	154	NC	192	199	191	198	159	NC	190	199	191	197
DO (mg/L)	10.09	NC	9.78	8.75	9.97	11.71	9.44	NC	8.63	9.48	9.20	11.17	9.44	NC	8.80	9.39	10.19	11.13
pH (s.u.)	7.78	NC	8.31	8.21	7.91	8.15	7.92	NC	8.10	8.25	7.74	7.91	7.84	NC	7.92	8.09	7.97	7.91
Temperature (ºC)	13.0	**16.8**	**20.2**	**18.8**	12.8	**9.6**	**16.0**	**19.0**	**21.6**	**20.7**	**14.1**	9.2	**14.2**	**17.1**	**19.8**	**18.8**	13.7	9.0

[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.

Continuous Monitoring of Water Temperature, pH, DO, and Specific Conductance

Continuous temperature data was collected from May 18 to September 3, 2022 for Location #1 and from May 18 to October 11, 2022 for Location #3 using Hobo Tidbits. Continuous DO, pH, and conductivity data was collected at Location #1 from July 13 to September 3, 2022 and at Location #3 from July 13 to September 28, 2022 using calibrated YSI EXO3 Multi-parameter sondes. Some deviations from the study plan occurred as discussed below.

Recorded water temperatures were compared to the monthly ambient water temperature limits for non-specific cold waters as defined in chapter NR 102 of the Wisconsin Administrative Code. Hourly DO readings were compared to the criteria for a trout class II water as defined in chapter NR 102 of the Wisconsin Administrative Code 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 the White River, this period is from September 15-May 15. pH readings were confirmed within the acceptable range of 6.0 to 9.0 standard units, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum as defined in chapter NR 102 of the Wisconsin Administrative Code. The range, mean, and median temperatures, pH, DO, and specific conductance readings are presented in Table 6. Plots of the hourly data are presented in Appendix A.

Water temperatures indicated consistent daily and seasonal patterns and ranged from a minimum of 7.97°C (Hobo Tidbit recording) at Location #3 (downstream) to a maximum of 26.92°C (Hobo Tidbit recording) at Location #1 (upstream). The average (19.11°C Hobo Tidbit recording, 20.53°C sonde recording) and median (19.40°C Hobo Tidbit recording, 20.32°C sonde recording) water temperatures were higher at Location #1 than at Location #3 The water temperatures collected by the Hobo Tidbit and YSI EXO3 sonde displayed almost identical patterns for both locations (see water temperature plots in Appendix A).

Water temperatures recorded at Location #1 and Location #3 were above the month-by-month state regulatory thresholds for cold waters outlined above for at least one hourly measurement per day for almost all of the deployment period (Appendix A). Days when all of the hourly temperature measurements fell below the state regulatory threshold include May 26, 2022 for Location #1 and May 23, September 24-30, and October 10-11, 2022 for Location #3.

There were no instances of DO readings below the 6.0 mg/L attainment threshold or below the 7.0 mg/L attainment threshold for spawning through fry emergence at either Location #1 or Location #3 (see plots in Appendix A). DO at Location #1 ranged from 7.20 mg/L to 10.47 mg/L with an average of 8.80 mg/L and a median of 8.68 mg/L. DO at Location #3 ranged from 7.00 mg/L to 10.98 mg/L with an average of 9.11 mg/L and a median of 9.06 mg/L.

Specific conductance ranged from 169.3 µS/cm to 208.8 µS/cm at Location #1 and averaged 191.9 µS/cm. At Location #3, specific conductance ranged from 173.8 µS/cm to 208.4 µS/cm with an average of 196.1 µS/cm. A small jump in specific conductance occurred on August 25, 2022 for Location #1 and on August 24, 2022 for Location #3 (Appendix A). This jump was due to an in-field calibration performed on the sondes which was 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 which 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. pH at Location #1 ranged from 7.85 to 8.73 and averaged 8.27. The pH at Location #3 ranged from 7.83 to 8.36 and averaged 8.08.

TABLE 6. RANGE OF CONTINUOUS TEMPERATURE, PH, DO, AND SPECIFIC CONTUCTANCE READINGS FOR WHITE RIVER HYDROELECTRIC PROJECT, MAY 18, 2022 TO SEPTEMBER 3, 2022 (LOCATION #1) AND OCTOBER 11, 2022 (LOCATION #3)

	White River Location #1 (Upstream)					White River 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	10.28	16.71	7.20	169.3	7.85	7.97	9.82	7.00	173.8	7.83
Max	26.92	26.16	10.47	208.8	8.73	25.34	25.41	10.98	208.4	8.36
Mean	19.11	20.53	8.80	191.9	8.27	18.16	18.64	9.11	196.1	8.08
Median	19.40	20.32	8.68	190.4	8.24	19.16	19.53	9.06	198.7	8.10

Raw field data, including field notes, are provided in Appendix B. Analytical data, including lab analyses, are provided in Appendix C.

Deviations from the Study Plan

Due to a field technician error while downloading data from the YSI EXO3 sondes, no continuous data was collected between July 29 and August 17, 2022 at Location #1 or Location #3. The Hobo Tidbit water temperature data loggers were deployed from May 18 through September 3, 2022 at Location #1 and from May 18 through October 11, 2022 at Location #3 with no interruption in data logging. Data collection was truncated at Location #1 due to a reservoir drawdown which began on September 3, 2022 and dewatered the location where the data loggers were deployed.

GLEC developed a regression model to predict DO and temperatures for the missing data points based on data bracketing the missing dates. By developing a simple linear regression for Location #3, 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. Figure 3 shows the predicted DO values based on the simple linear regressions for Location #3. The data indicate it is very unlikely that any of the missing DO data fell below the 6.0 mg/L and 7.0 mg/L thresholds. An explanation of the methods used to develop the regressions is discussed below.

Regression Model Structure

To estimate the hourly DO values between July 29 and August 17, 2022, observed water temperatures from the adjacent Hobo Tidbit temperature logger were used as a regressor variable for pairs of observed DO and water temperatures. Regression analysis was performed on data

collected at Location #3. 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 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 temperatures for White Location #3 showed an R^2 of 0.8585 and a residual standard error of 0.301.

Prediction Intervals

The upper and lower boundary of predicted hourly DO is termed a prediction interval (Figure 3). 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 through September 28, 2022, or 1873 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.

Figure 3 displays the hourly distribution of observed water temperatures (Hobo Tidbit) and observed DO (YSI EXO3 sonde), including 24-hr moving averages to represent a “daily average” for Location #3. 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.

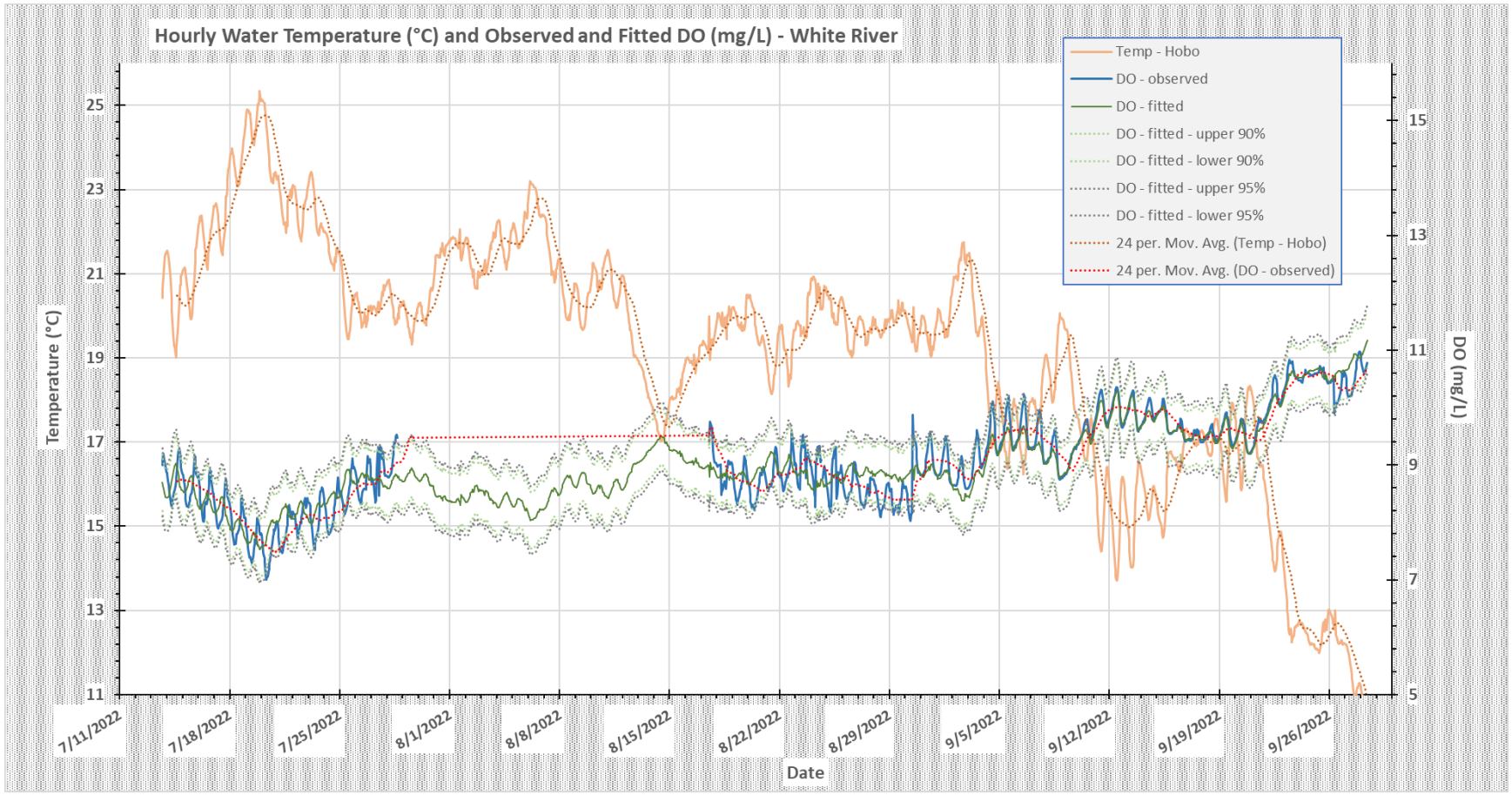

FIGURE 3. PREDICTION OF MISSED HOURLY DO VALUES FOR WHITE RIVER LOCATION #3 (DOWNSTREAM)

Analysis and Discussion

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 4).

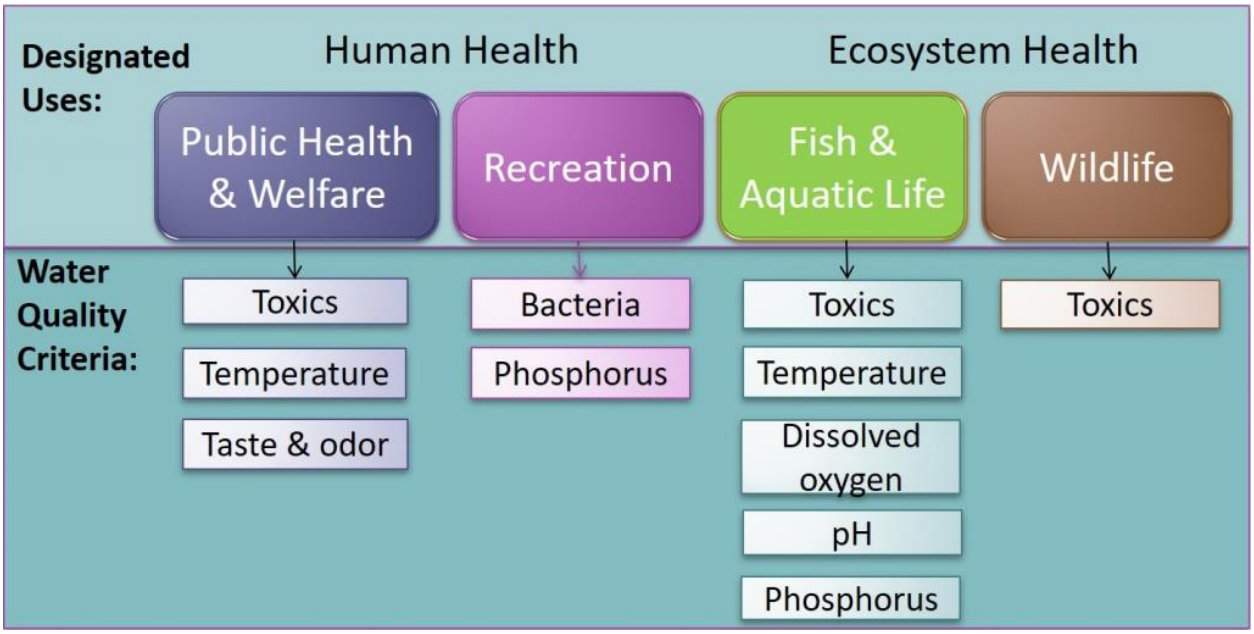

FIGURE 4. WISCONSIN GRAPHIC OF SURFACE WATER STANDARDS AND CRITERIA (Source: https://dnr.wisconsin.gov/topic/SurfaceWater/Standards.html)

None of the analyzed parameters or collected samples used in the lab analyses exceeded Wisconsin water quality criteria or standards. A narrative for each measured parameter is provided in the following paragraphs and the values are presented in Tables 4 and 5 and Appendix C.

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 White River Hydroelectric Project did not exceed this standard. Although most of the temperatures recorded during the discrete measurements and/or the continuous measurements were above the ambient temperature criteria for cold waters, it is unlikely that the impoundment caused artificial warming. Water temperature plots for Locations #1 and #3 (Appendix A) illustrate that when water temperature was above the criteria at the downstream location, it was also above the criteria in the upstream location or the reservoir was under drawdown conditions 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 the White River Hydroelectric Project exceeded this standard.

Dissolved Oxygen

Chapter NR 102.04 of the Wisconsin Administrative 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 the White River, this period is from September 15-May 15. None of the surface water dissolved oxygen measurements recorded at the White River Hydroelectric Project were lower than 7.0 mg/L.

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. None of the total mercury samples analyzed for the White River Hydroelectric project were above the detection limit.

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 2.4 and 6.7 mg/L which is typical of waterbodies in this region of Wisconsin. At these concentrations, there is no evidence of anthropogenic input.

Chlorophyll *a*

Chlorophyll *a* is sampled to determine how much algae is present in a waterbody. 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 waterbody, it can produce a foul odor and be unpleasant for swimming. The concentration of Chlorophyll *a* in this study ranged between 1.10 and 3.49 µg/L which is very low and typical of waterbodies in this region of Wisconsin.

Sulfate

Sulfates are stable in high oxygen environments. 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 an 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 sulfate at the White River Hydroelectric Project ranged from undetectable to 4.7 mg/L, which is considered a very low concentration.

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 ranged between 3.1 and 162.4 MPN. Consequently, the Wisconsin standard for *E. coli* was not exceeded at the White River Hydroelectric Project during this study.

Total and Dissolved Phosphorus

Phosphorus is usually measured in lakes in two ways; 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 an important nutrient for plant growth. In most lakes, phosphorus is the limiting nutrient, which means that all other factors that plants and algae need to grow are available in excess (sunlight, warmth, water, nitrogen, etc.) except 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 concentrations of total phosphorus and dissolved phosphorus at the White River Hydroelectric Project are far less than the concentration that would support unwanted plant growth. In this study, total phosphorus ranged from 5.9 to 19.5 µg/L. Dissolved phosphorus ranged from <1.5 to 8.3 µg/L.

Nitrate/Nitrite and Total Nitrogen

Nitrates are a form of nitrogen, which is 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 species of plants and animals that can live in the water. 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 the White River Hydroelectric Project ranged between 0.30 and 0.56 mg/L and nitrate-nitrite concentrations ranged from <3.4 to 12.6 µg/L (<0.0034 to 0.0126 mg/L). Consequently, total nitrogen and nitrate/nitrite concentrations are not a concern at the White River Hydroelectric Project.

Ammonia

Ammonia is one of several forms of nitrogen that exists 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 organisms. Ammonia concentrations at the White River Hydroelectric Project ranged between <13.0 and 267.0 µg/L (<0.0130 and 0.267 mg/L, respectively). The concentrations of ammonia at all three sampling locations increased over the season, with the highest concentrations detected during the September and October sampling events. However, these concentrations are still far below the toxicity threshold for freshwater aquatic organisms.

Total Suspended Solids (TSS)

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 the White River Hydroelectric Project ranged between 3.7 and 19.9 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.

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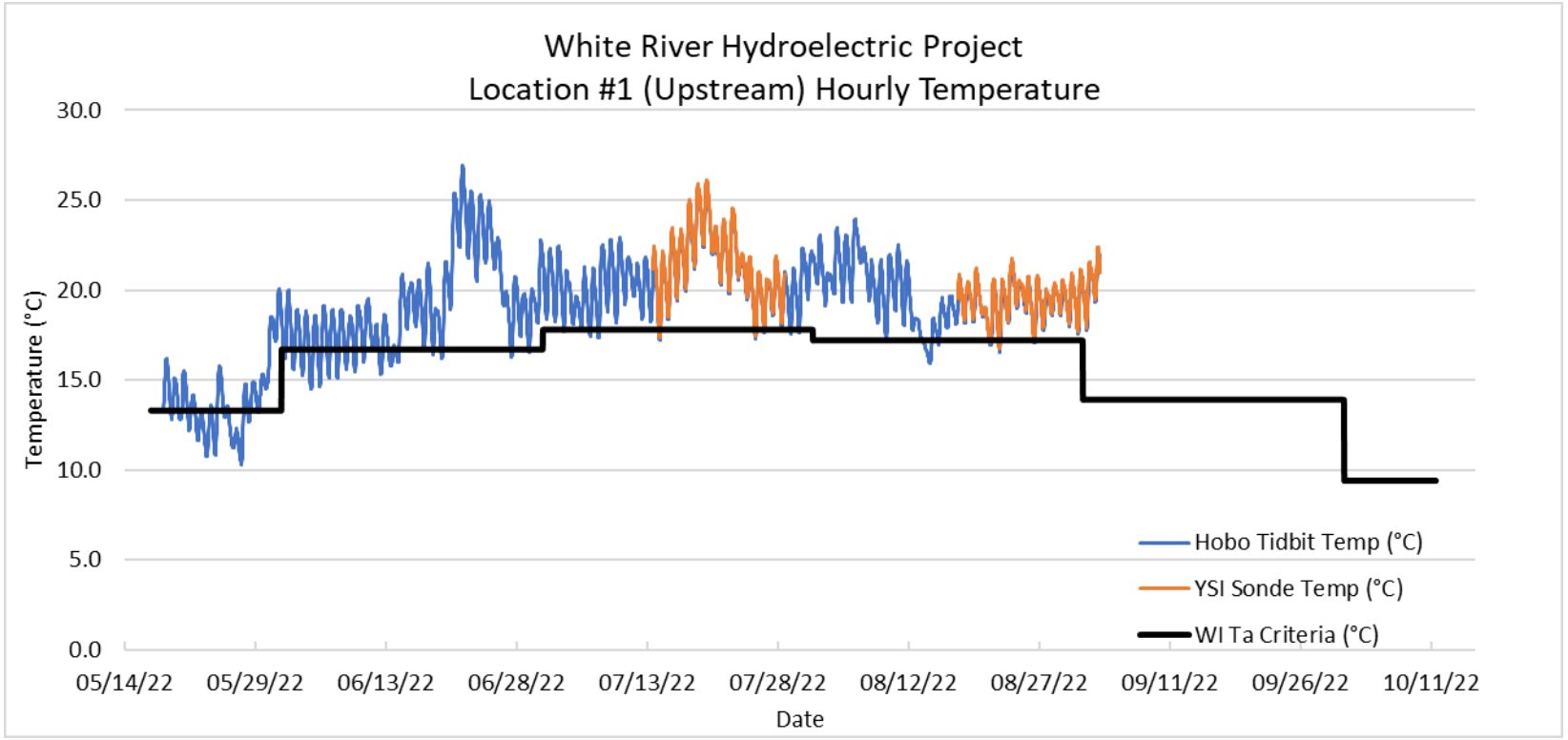
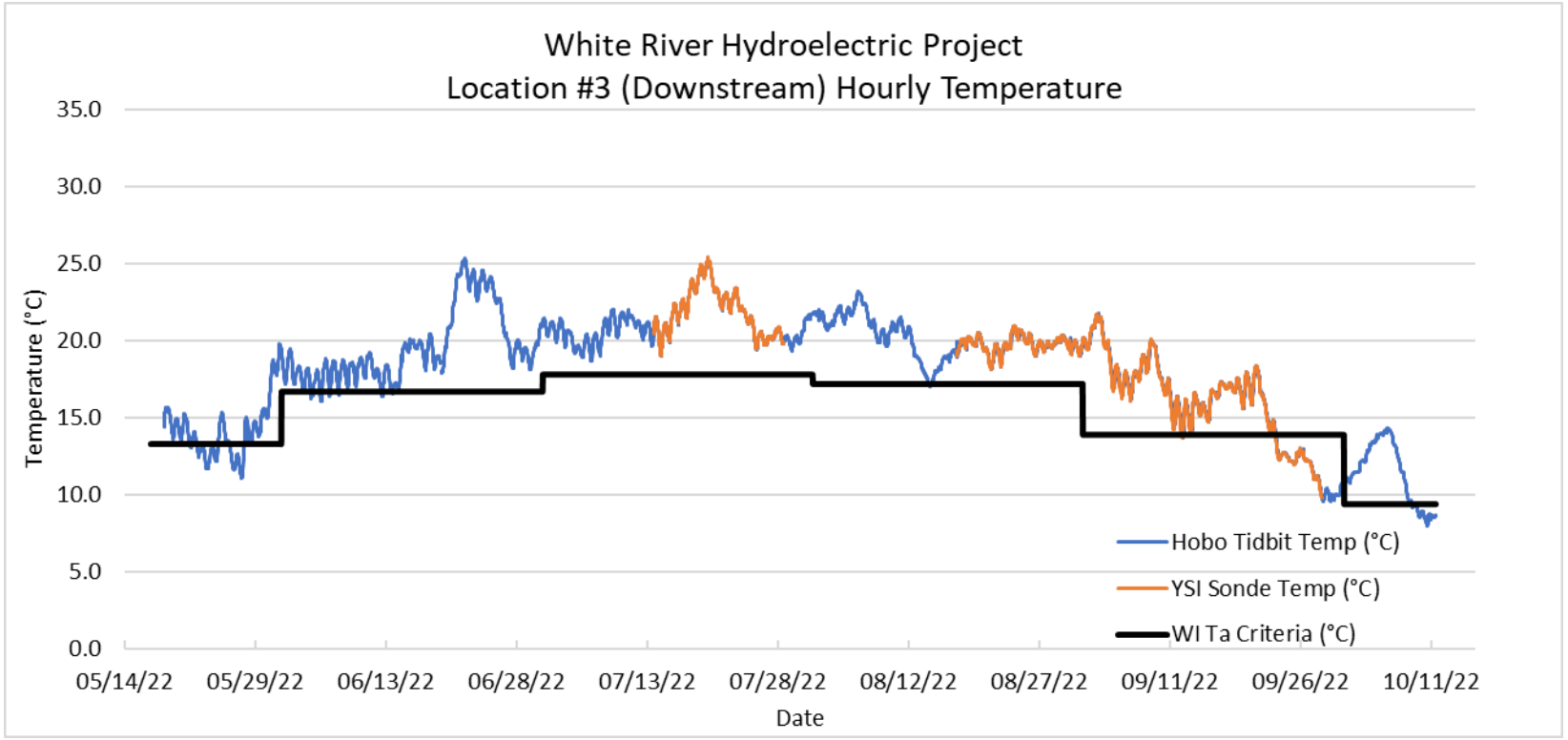
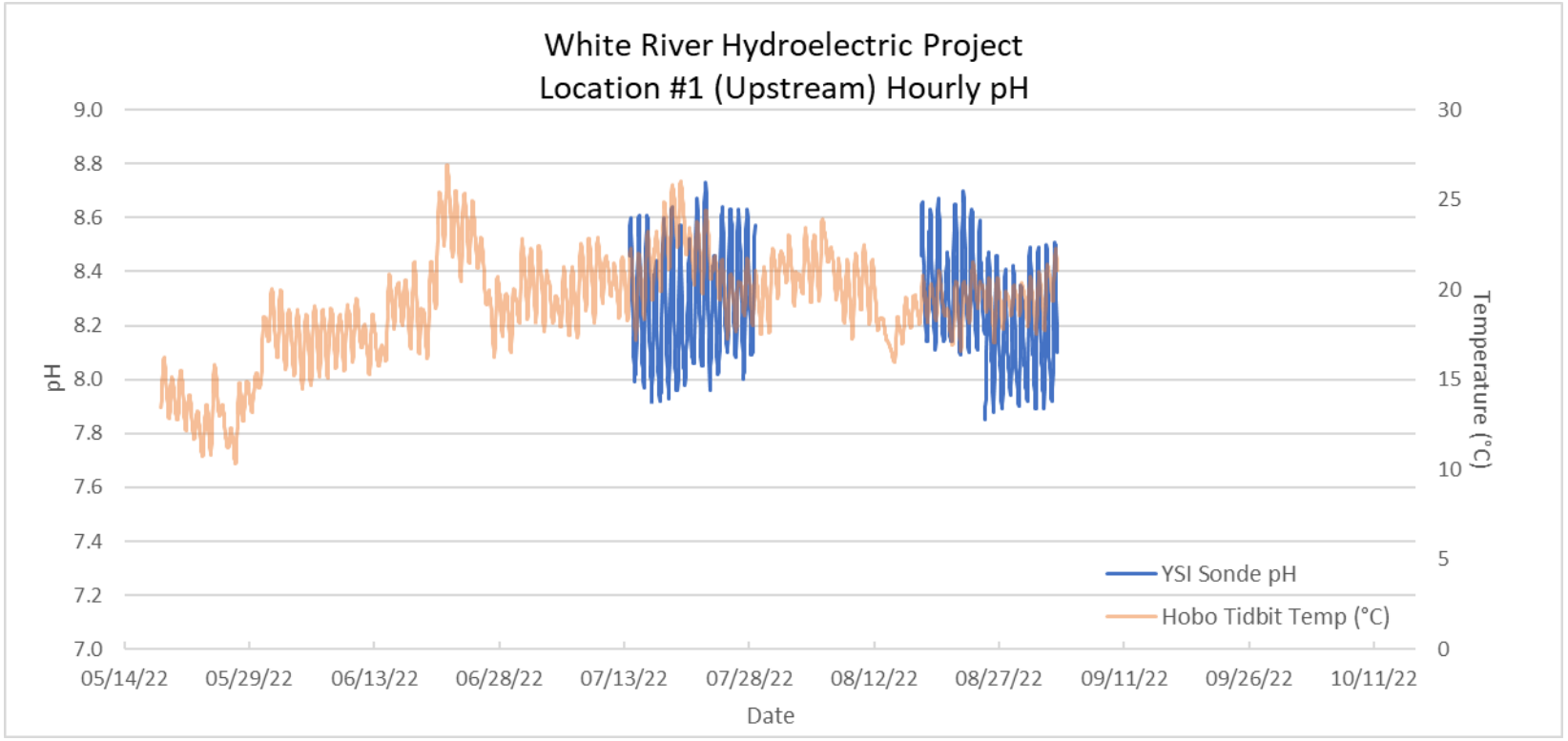
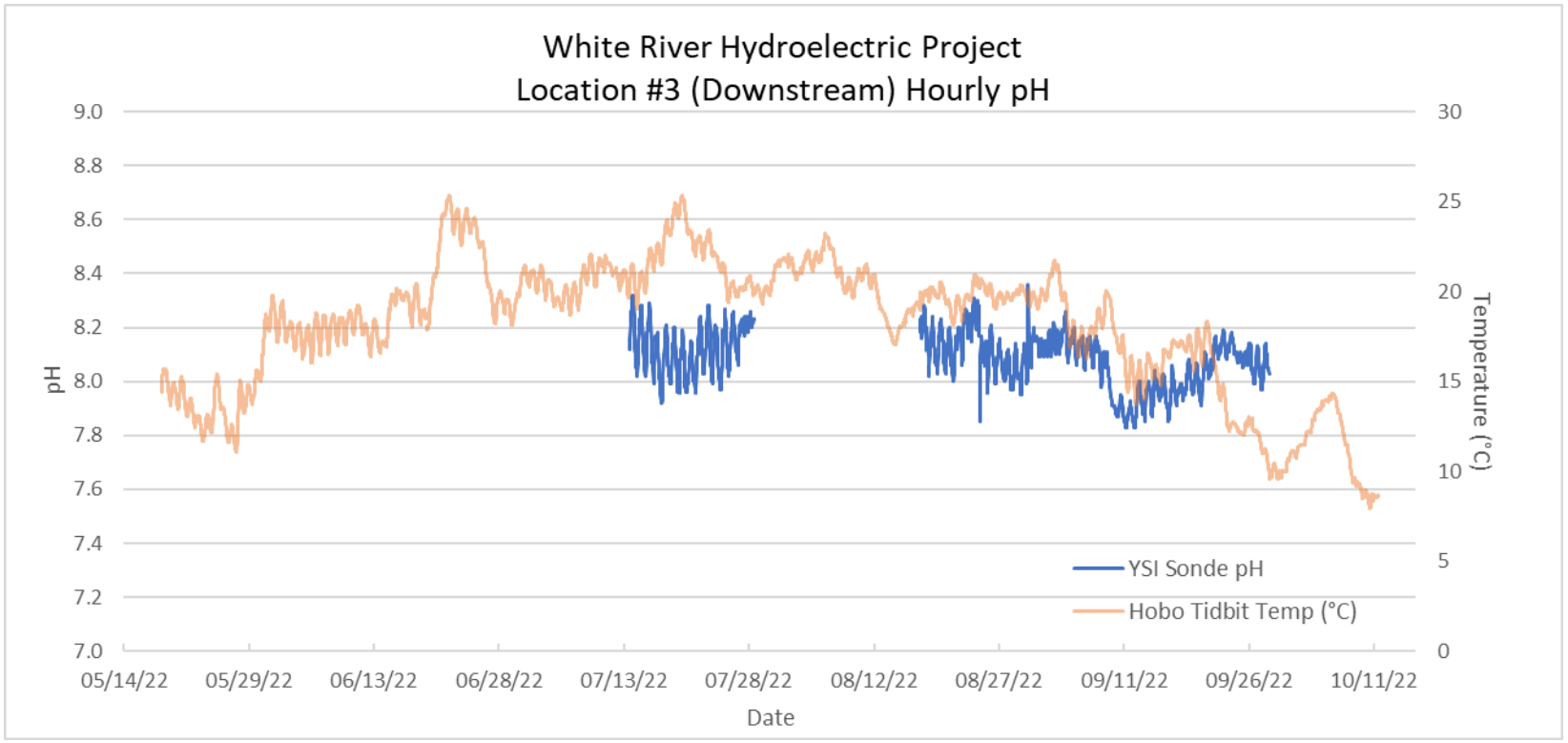
APPENDIX A

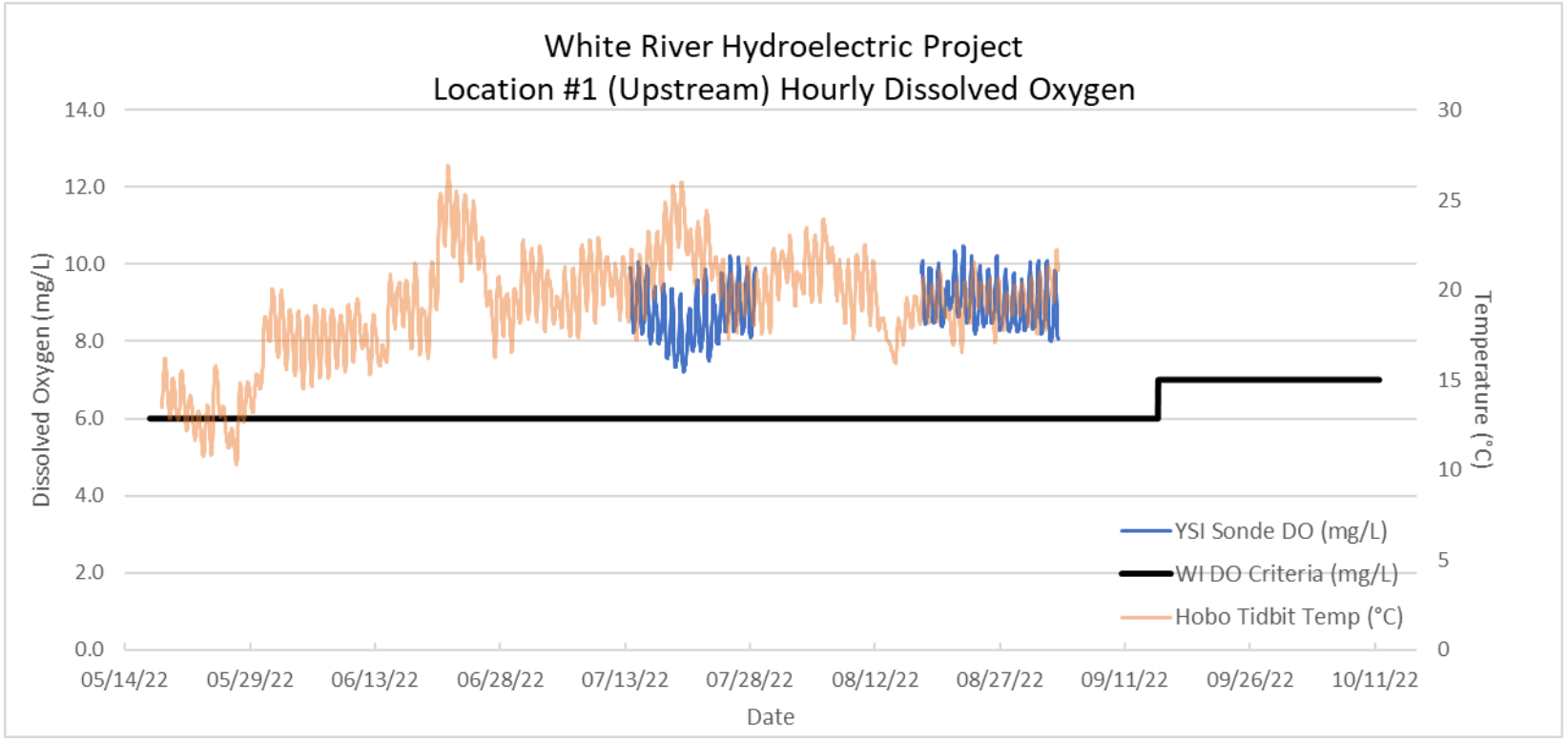
Continuous Temperature, DO, pH and Conductivity Plots

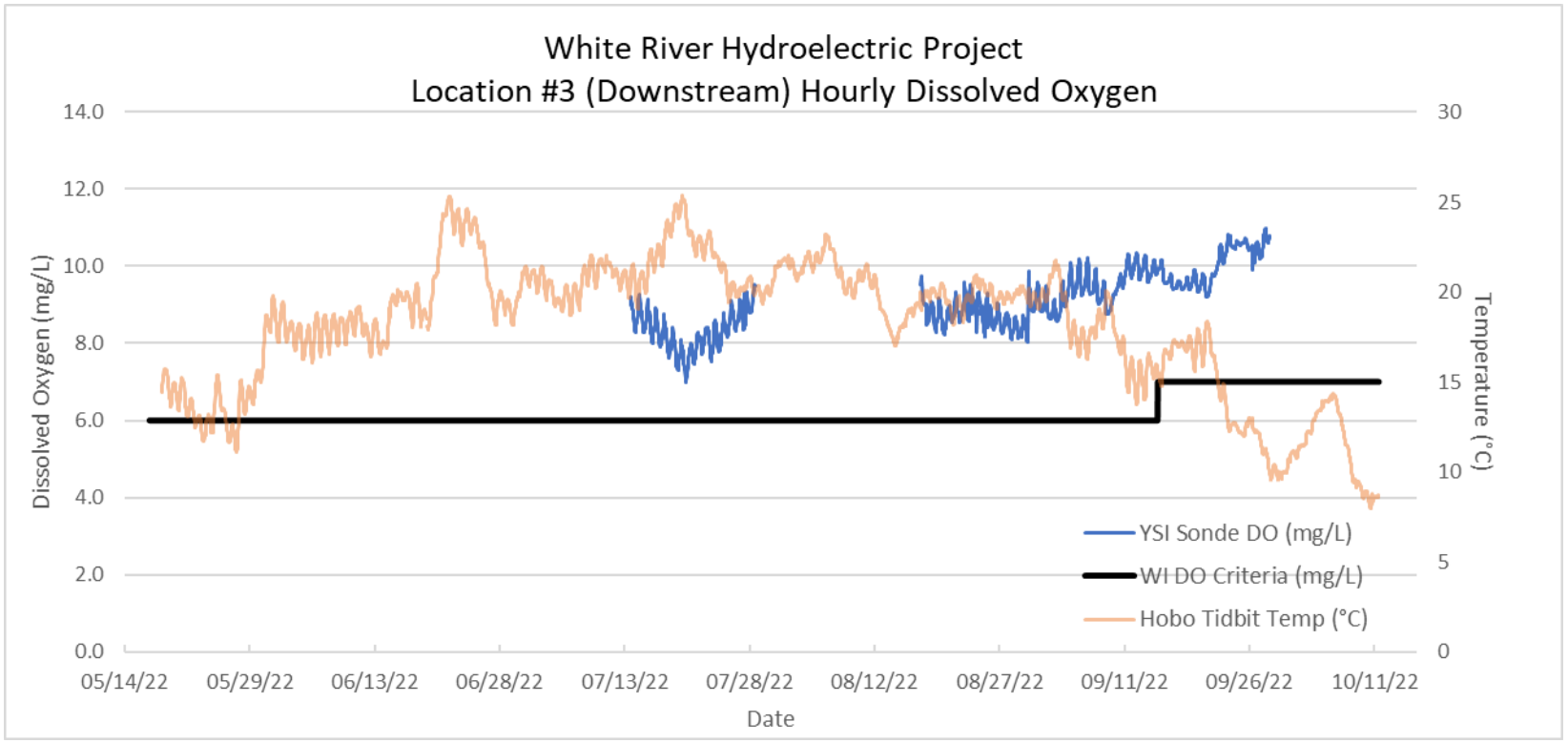

White River Hydroelectric Project
Location #1 (Upstream) Hourly Temperature
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

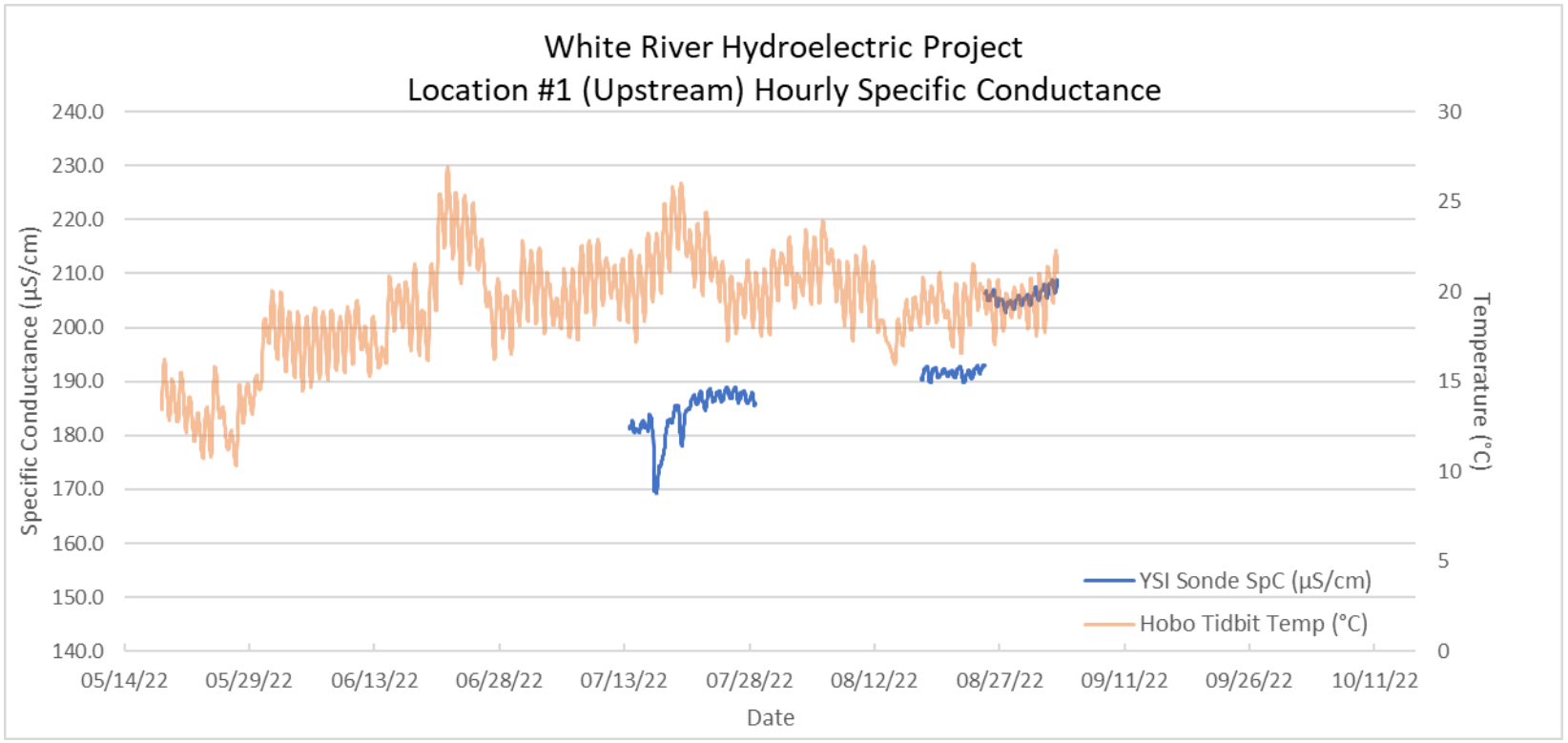

White River Hydroelectric Project
Location #3 (Downstream) Hourly Temperature
Temperature (°C)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
Hobo Tidbit Temp (°C)
YSI Sonde Temp (°C)
WI Ta Criteria (°C)

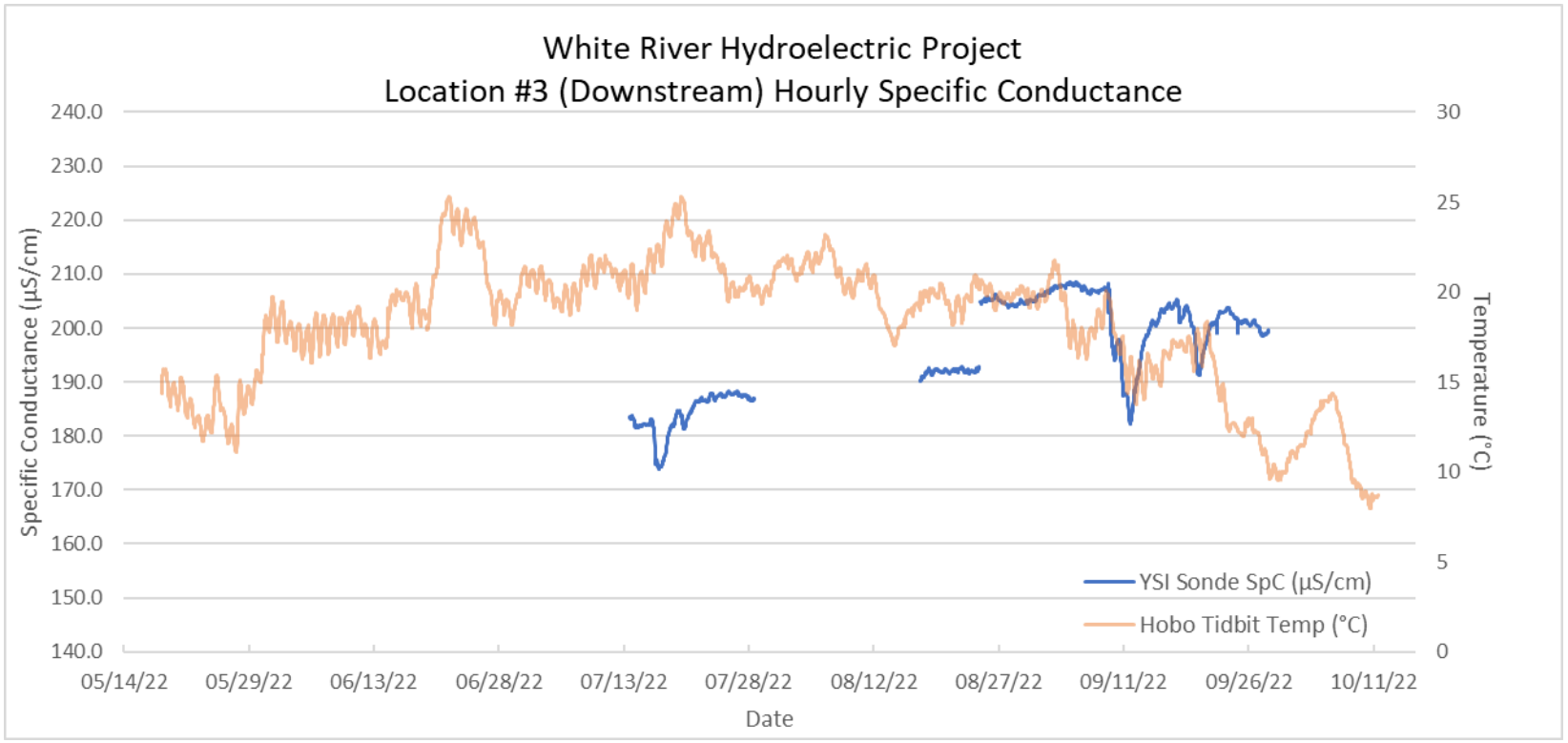

White River Hydroelectric Project
Location #1 (Upstream) Hourly pH
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
pH
30
25
20
15
10
5
0
Temperature (°C)
05/14/22
05/29/22
06/13/22
06/28/22
07/13/22
07/28/22
08/12/22
08/27/22
09/11/22
09/26/22
10/11/22
Date
YSI Sonde pH
Hobo Tidbit Temp (°C)


White River 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)


White River 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)


White River 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)


White River 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
Temperature (°C)
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)


White River 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 B

Raw Field Data Including Field Notes
(sent as a separate Excel file)

APPENDIX C

Analytical Data Including Laboratory Analysis Results
(sent as a separate Excel file)

APPENDIX E-11 White River 2022 Drawdown Monitoring Report

Document Accession #: 20221109-5140 Filed Date: 11/09/2022

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

November 9, 2022

VIA Electronic Filing

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

Subject: Drawdown Monitoring Report - Temporary Amendment of Article 401
White River Hydroelectric Project (P-2444-040)

Dear Secretary Bose:

On March 9, 2022, Northern States Power Company – Wisconsin (NSPW), licensee for the White River Hydroelectric Project (P-2444), filed a request with the Commission for a temporary amendment of license article 401 to accommodate a reservoir drawdown. The Commission subsequently issued an Order Modifying and Granting Temporary Amendment of Reservoir Elevation Requirement on August 15, 2022.

Pursuant to the Commission's aforementioned Order, licensee is directed to file a final drawdown report with the Commission, Wisconsin Department of Natural Resources, Bad River Band of Lake Superior Tribe of Chippewa Indians and National Park Service within 45 days of completing the reservoir refill. Accordingly, licensee hereby files its drawdown monitoring report. A copy of the report was provided to the above-referenced agencies via e-mail concurrent with this filing.

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: 2022.11.09 15:38:31 -06'00'

Scott A. Crotty
Senior Hydro Operations Manager

Attachment – Drawdown Monitoring Report

c: Cheryl Laatsch – Wisconsin DNR (e-mail)
Jessica Strand, Naomi Tillison – Bad River Tribe (via e-mail)
Susan Rosebrough – National Park Service
Don Hartinger, Scott Crotty, Brad Smith, Pat Flowers – Xcel Energy (via e-mail)
Project Files

Document Accession #: 20221109-5140 Filed Date: 11/09/2022

Drawdown Monitoring Report for White River Flowage

White River Hydroelectric Project (FERC Project No. 2444)

Northern States Power Company – Wisconsin

November 2022

Drawdown Monitoring Report for the White River Flowage

1.0 INTRODUCTION

The White River Hydroelectric Project (P-2444) is located on the White River approximately six miles south of Ashland, Wisconsin in Ashland County. The Project is owned and operated by Northern States Power Company - Wisconsin (NSPW or licensee) and operates under a 30-year license issued by the Federal Energy Regulatory Commission (Commission). At full pool elevation of 711.6' (local datum), the reservoir covers approximately 56 acres with a maximum depth of 26 feet. The licensed reservoir elevation range is 710.4' - 711.6'. The minimum flow requirement for the bypass channel is 16 cfs year-round.

2.0 BACKGROUND

On March 9, 2022, licensee submitted a request to the Commission for a temporary amendment of the Project's reservoir elevation requirement. The request, in part, included a drawdown management plan (Plan) that was developed in consultation with the Wisconsin Department of Natural Resources (WDNR) and Bad River Tribe. The Plan included a proposed 8-foot reservoir drawdown and corresponding environmental monitoring and mitigation measures. The Commission subsequently issued an Order Modifying and Granting Temporary Amendment of Reservoir Elevation Requirement on August 15, 2022.

3.0 DRAWDOWN NEED

The seals on the top half of spillway gate 1 (gate 1 is a split gate with an upper and lower gate that can operate independently) had become deteriorated and a reservoir drawdown was the only means to dewater the gate and conduct repairs. Licensee proposed an 8-foot drawdown that also included plans to address any discovery work that may become known during the drawdown.

4.0 DRAWDOWN MANAGEMENT PLAN

The drawdown management plan included the following key elements:

- a target drawdown elevation of 703.4' (8-foot drawdown from full pool)
- a drawdown rate of 6 inches per day not to exceed 1 inch every 4 hours
- turbidity monitoring at four sites, one upstream of the reservoir and three downstream of the White River Dam
- environmental inspections for every 1-foot of drawdown (i.e., every other day) beginning at elevation 709.9' and continuing until the target elevation is reached

5.0 DRAWDOWN OPERATIONS

5.1 Reservoir Drawdown Schedule

Licensee informed the WDNR and Bad River Tribe via e-mail on August 18, 2022, that the drawdown would commence on August 31. The drawdown began on August 31 at 0600 hours at a rate of 6 inches per day and not to exceed 1 inch every four hours. The drawdown target elevation was reached on September 16. Licensee was able to begin the gate seal repairs prior to reaching the target elevation. Therefore, the reservoir refill began on the same day as the target elevation was achieved (September 16). Normal full pool was restored on September 25.

Licensee notified the Commission of the reservoir returning to its normal operating range via letter dated September 29, 2022. Reservoir elevation data for the duration of the drawdown is included in **Appendix A.**

5.2 Weather and River Flows

Weather conditions were dry for virtually the entire drawdown phase with the exception of a rain event that occurred on September 9, 2022, which resulted in approximately 1 -1.5" inches in the watershed. Flows were consistent throughout the drawdown with a minor uptick that corresponded to the aforementioned rain event.

5.3 Turbidity Monitoring

Turbidity monitoring was conducted at four sites, one upstream of the reservoir and three downstream of the dam. The four sites included, from upstream to downstream, Maple Ridge Road (Site 1), immediately below the dam (Site 2), below the powerhouse (Site 3), and State Highway 13 (Site 4). **Appendix B** includes a map depicting the four sampling sites. Turbidity monitoring included collecting grab samples once per day from Sites 1 and 4. For Sites 2 and 3, four samples per day were collected during the drawdown phase and for any storm event resulting in more than one half inch of rain in 24 hours during the target elevation maintenance phase.

The Plan directed NSPW to review its drawdown operations to determine if any mitigating measures would be warranted should turbidity levels exceed the threshold level. The threshold level was defined as when downstream grab results were greater than twice the corresponding upstream result (Site 1) and greater than twice the Baseline Range at two or more of the downstream sites (Sites 2, 3, and/or 4). **Appendix C** includes a summary of the baseline turbidity sampling. The threshold guideline was developed considering that baseline conditions were anticipated to be highly variable given the historical total suspended solids data and the flashiness of the river following rain events. There were no runoff events captured during the baseline monitoring effort.

5.4 Turbidity Monitoring Results

Daily turbidity monitoring began on August 31, 2022 concurrent with the commencement of the reservoir drawdown and ended with the 1000 hour sample on September 16, 2022. Sites 1 and 4 were sampled once per day while sites 2 and 3 were sampled four times per day. When threshold levels were reached, sampling was increased to four times per day for all sites. A summary of the turbidity monitoring during the drawdown is included in **Appendix D**.

Threshold exceedances occurred several times during the drawdown, all of which followed the September 9 rain event. The first exceedance occurred on September 9. Despite the rainfall, there was only a modest increase in flows. Exceedances also occurred from September 12-16. There were no operational actions that could have been implemented to limit the increase in turbidity levels as the increase in flows was insufficient to trigger any significant change in gate operation.

5.5 Total Suspended Solids

Total suspended solids (TSS) were collected weekly throughout the active drawdown period. The TSS monitoring results are included in **Appendix E**. Turbidity is utilized as an indicator of TSS; however, the relationship is not always 1:1. The weekly TSS results are lower than

a 1:1 relationship, indicating that the turbidity readings in NTU are reflective of somewhat lower levels of TSS in mg/L. Overall, the TSS results appear to be within a normal range (including the historic USGS data range) for a medium-sized river in the hydrogeology of the region.

5.6 Environmental Surveys

Environmental surveys were conducted every other day beginning on September 3 and ending on September 16. The following species were recorded during the eight surveys: 204 live mussels, 3 northern brook lamprey (1 live, 2 dead), 1 central mudminnow, and one black bullhead. All live mussels and fish species were relocated to a permanently inundated area of the reservoir. Additional details from each environmental inspection are included in **Appendix F**.

6.0 Photographic Record

Photographs from the drawdown and environmental inspections are included in **Appendix G.**

Attachment A

White River Flowage Reservoir Elevation Data

2022 White River Drawdown Reservoir Elevation

Date/Time	Reservoir Elevation (ft.)	Comments
8/31/22 6:00	**711.40**	**Begin reservoir drawdown**
8/31/22 7:00	711.39	
8/31/22 8:00	711.40	
8/31/22 9:00	711.36	
8/31/22 10:00	Instrument error	
8/31/22 11:00	Instrument error	
8/31/22 12:00	711.32	
8/31/22 13:00	711.24	
8/31/22 14:00	711.22	
8/31/22 15:00	711.23	
8/31/22 16:00	711.24	
8/31/22 17:00	711.17	
8/31/22 18:00	711.14	
8/31/22 19:00	711.15	
8/31/22 20:00	711.15	
8/31/22 21:00	711.08	
8/31/22 22:00	711.06	
8/31/22 23:00	711.06	
9/1/22 0:00	711.07	
9/1/22 1:00	711.00	
9/1/22 2:00	710.97	
9/1/22 3:00	710.98	
9/1/22 4:00	710.98	
9/1/22 5:00	710.91	
9/1/22 6:00	710.89	
9/1/22 7:00	710.90	
9/1/22 8:00	710.91	
9/1/22 9:00	710.84	
9/1/22 10:00	710.81	
9/1/22 11:00	710.82	
9/1/22 12:00	710.83	
9/1/22 13:00	710.74	
9/1/22 14:00	710.72	
9/1/22 15:00	710.73	
9/1/22 16:00	710.73	
9/1/22 17:00	710.66	
9/1/22 18:00	710.64	
9/1/22 19:00	710.65	
9/1/22 20:00	710.66	
9/1/22 21:00	710.58	
9/1/22 22:00	710.56	
9/1/22 23:00	710.57	
9/2/22 0:00	710.57	
9/2/22 1:00	710.49	
9/2/22 2:00	710.47	
9/2/22 3:00	710.48	

Date/Time	Reservoir Elevation (ft.)	Comments
9/2/22 4:00	710.49	
9/2/22 5:00	710.41	
9/2/22 6:00	710.39	
9/2/22 7:00	Instrument error	
9/2/22 8:00	Instrument error	
9/2/22 9:00	Instrument error	
9/2/22 10:00	710.31	
9/2/22 11:00	710.31	
9/2/22 12:00	710.32	
9/2/22 13:00	710.24	
9/2/22 14:00	710.22	
9/2/22 15:00	710.23	
9/2/22 16:00	710.24	
9/2/22 17:00	710.16	
9/2/22 18:00	710.14	
9/2/22 19:00	710.15	
9/2/22 20:00	710.16	
9/2/22 21:00	710.08	
9/2/22 22:00	710.06	
9/2/22 23:00	710.06	
9/3/22 0:00	710.08	
9/3/22 1:00	709.99	
9/3/22 2:00	709.97	
9/3/22 3:00	709.98	
9/3/22 4:00	709.99	
9/3/22 5:00	709.91	
9/3/22 6:00	709.89	
9/3/22 7:00	709.91	
9/3/22 8:00	709.89	
9/3/22 9:00	709.83	
9/3/22 10:00	709.81	
9/3/22 11:00	Instrument error	
9/3/22 12:00	709.82	
9/3/22 13:00	709.74	
9/3/22 14:00	709.72	
9/3/22 15:00	709.73	
9/3/22 16:00	709.73	
9/3/22 17:00	709.66	
9/3/22 18:00	709.65	
9/3/22 19:00	709.66	
9/3/22 20:00	709.65	
9/3/22 21:00	709.57	
9/3/22 22:00	709.56	
9/3/22 23:00	709.57	
9/4/22 0:00	709.57	
9/4/22 1:00	709.58	

Date/Time	Reservoir Elevation (ft.)	Comments
9/4/22 2:00	709.49	
9/4/22 3:00	709.47	
9/4/22 4:00	709.49	
9/4/22 5:00	709.41	
9/4/22 6:00	709.39	
9/4/22 7:00	709.40	
9/4/22 8:00	709.40	
9/4/22 9:00	709.32	
9/4/22 10:00	709.31	
9/4/22 11:00	709.32	
9/4/22 12:00	709.33	
9/4/22 13:00	709.23	
9/4/22 14:00	709.22	
9/4/22 15:00	709.23	
9/4/22 16:00	709.23	
9/4/22 17:00	709.16	
9/4/22 18:00	709.15	
9/4/22 19:00	709.15	
9/4/22 20:00	709.16	
9/4/22 21:00	709.07	
9/4/22 22:00	709.06	
9/4/22 23:00	709.07	
9/5/22 0:00	709.07	
9/5/22 1:00	708.99	
9/5/22 2:00	708.97	
9/5/22 3:00	708.99	
9/5/22 4:00	708.97	
9/5/22 5:00	708.91	
9/5/22 6:00	708.90	
9/5/22 7:00	708.90	
9/5/22 8:00	708.91	
9/5/22 9:00	708.82	
9/5/22 10:00	708.81	
9/5/22 11:00	708.82	
9/5/22 12:00	708.81	
9/5/22 13:00	708.74	
9/5/22 14:00	708.73	
9/5/22 15:00	708.73	
9/5/22 16:00	708.73	
9/5/22 17:00	708.65	
9/5/22 18:00	708.65	
9/5/22 19:00	708.65	
9/5/22 20:00	708.64	
9/5/22 21:00	708.58	
9/5/22 22:00	708.56	
9/5/22 23:00	708.57	
9/6/22 0:00	708.58	
9/6/22 1:00	708.49	
9/6/22 2:00	708.47	

Date/Time	Reservoir Elevation (ft.)	Comments
9/6/22 3:00	708.48	
9/6/22 4:00	708.49	
9/6/22 5:00	708.40	
9/6/22 6:00	708.40	
9/6/22 7:00	708.40	
9/6/22 8:00	708.40	
9/6/22 9:00	708.33	
9/6/22 10:00	708.31	
9/6/22 11:00	708.32	
9/6/22 12:00	708.32	
9/6/22 13:00	708.24	
9/6/22 14:00	708.22	
9/6/22 15:00	708.23	
9/6/22 16:00	708.22	
9/6/22 17:00	708.16	
9/6/22 18:00	708.15	
9/6/22 19:00	708.14	
9/6/22 20:00	708.15	
9/6/22 21:00	708.07	
9/6/22 22:00	708.07	
9/6/22 23:00	708.07	
9/7/22 0:00	708.06	
9/7/22 1:00	708.00	
9/7/22 2:00	707.98	
9/7/22 3:00	707.98	
9/7/22 4:00	707.98	
9/7/22 5:00	707.91	
9/7/22 6:00	707.90	
9/7/22 7:00	707.91	
9/7/22 8:00	707.89	
9/7/22 9:00	707.82	
9/7/22 10:00	707.82	
9/7/22 11:00	707.83	
9/7/22 12:00	707.82	
9/7/22 13:00	707.73	
9/7/22 14:00	707.73	
9/7/22 15:00	707.73	
9/7/22 16:00	707.73	
9/7/22 17:00	707.65	
9/7/22 18:00	707.65	
9/7/22 19:00	707.65	
9/7/22 20:00	707.65	
9/7/22 21:00	707.57	
9/7/22 22:00	707.57	
9/7/22 23:00	707.57	
9/8/22 0:00	707.57	
9/8/22 1:00	707.49	
9/8/22 2:00	707.48	
9/8/22 3:00	707.48	

Date/Time	Reservoir Elevation (ft.)	Comments
9/8/22 4:00	707.47	
9/8/22 5:00	707.40	
9/8/22 6:00	707.40	
9/8/22 7:00	707.41	
9/8/22 8:00	707.40	
9/8/22 9:00	707.32	
9/8/22 10:00	707.32	
9/8/22 11:00	707.31	
9/8/22 12:00	707.33	
9/8/22 13:00	707.23	
9/8/22 14:00	707.23	
9/8/22 15:00	707.22	
9/8/22 16:00	707.24	
9/8/22 17:00	707.15	
9/8/22 18:00	707.15	
9/8/22 19:00	707.15	
9/8/22 20:00	707.15	
9/8/22 21:00	707.07	
9/8/22 22:00	707.07	
9/8/22 23:00	707.07	
9/9/22 0:00	707.07	
9/9/22 1:00	706.98	
9/9/22 2:00	706.98	
9/9/22 3:00	706.98	
9/9/22 4:00	706.98	
9/9/22 5:00	706.91	
9/9/22 6:00	706.90	
9/9/22 7:00	706.90	
9/9/22 8:00	706.90	
9/9/22 9:00	706.83	
9/9/22 10:00	706.82	
9/9/22 11:00	706.82	
9/9/22 12:00	706.82	
9/9/22 13:00	706.73	
9/9/22 14:00	706.73	
9/9/22 15:00	706.73	
9/9/22 16:00	706.73	
9/9/22 17:00	706.65	
9/9/22 18:00	706.65	
9/9/22 19:00	706.65	
9/9/22 20:00	706.66	
9/9/22 21:00	706.56	
9/9/22 22:00	706.57	
9/9/22 23:00	706.57	
9/10/22 0:00	706.57	
9/10/22 1:00	706.49	
9/10/22 2:00	706.48	
9/10/22 3:00	706.48	
9/10/22 4:00	706.48	

Date/Time	Reservoir Elevation (ft.)	Comments
9/10/22 5:00	706.41	
9/10/22 6:00	706.40	
9/10/22 7:00	706.40	
9/10/22 8:00	706.40	
9/10/22 9:00	706.32	
9/10/22 10:00	706.32	
9/10/22 11:00	706.32	
9/10/22 12:00	706.33	
9/10/22 13:00	706.22	
9/10/22 14:00	706.24	
9/10/22 15:00	706.23	
9/10/22 16:00	706.23	
9/10/22 17:00	706.16	
9/10/22 18:00	706.15	
9/10/22 19:00	706.15	
9/10/22 20:00	706.15	
9/10/22 21:00	706.07	
9/10/22 22:00	706.07	
9/10/22 23:00	706.07	
9/11/22 0:00	706.07	
9/11/22 1:00	705.99	
9/11/22 2:00	705.98	
9/11/22 3:00	705.98	
9/11/22 4:00	705.98	
9/11/22 5:00	705.90	
9/11/22 6:00	705.90	
9/11/22 7:00	705.90	
9/11/22 8:00	705.90	
9/11/22 9:00	705.82	
9/11/22 10:00	705.82	
9/11/22 11:00	705.82	
9/11/22 12:00	705.83	
9/11/22 13:00	705.73	
9/11/22 14:00	705.73	
9/11/22 15:00	705.73	
9/11/22 16:00	705.73	
9/11/22 17:00	705.65	
9/11/22 18:00	705.65	
9/11/22 19:00	705.65	
9/11/22 20:00	705.65	
9/11/22 21:00	705.57	
9/11/22 22:00	705.57	
9/11/22 23:00	705.57	
9/12/22 0:00	705.56	
9/12/22 1:00	705.49	
9/12/22 2:00	705.48	
9/12/22 3:00	705.48	
9/12/22 4:00	705.47	
9/12/22 5:00	705.40	

Date/Time	Reservoir Elevation (ft.)	Comments
9/12/22 6:00	705.41	
9/12/22 7:00	705.40	
9/12/22 8:00	705.40	
9/12/22 9:00	705.32	
9/12/22 10:00	705.32	
9/12/22 11:00	705.32	
9/12/22 12:00	705.32	
9/12/22 13:00	705.23	
9/12/22 14:00	705.23	
9/12/22 15:00	705.23	
9/12/22 16:00	705.23	
9/12/22 17:00	705.15	
9/12/22 18:00	705.15	
9/12/22 19:00	705.16	
9/12/22 20:00	705.15	
9/12/22 21:00	705.07	
9/12/22 22:00	705.07	
9/12/22 23:00	705.07	
9/13/22 0:00	705.08	
9/13/22 1:00	704.98	
9/13/22 2:00	704.98	
9/13/22 3:00	704.98	
9/13/22 4:00	704.97	
9/13/22 5:00	704.96	
9/13/22 6:00	704.90	
9/13/22 7:00	704.90	
9/13/22 8:00	704.90	
9/13/22 9:00	704.83	
9/13/22 10:00	704.82	
9/13/22 11:00	704.82	
9/13/22 12:00	704.82	
9/13/22 13:00	704.73	
9/13/22 14:00	704.73	
9/13/22 15:00	704.75	
9/13/22 16:00	704.74	
9/13/22 17:00	704.65	
9/13/22 18:00	704.65	
9/13/22 19:00	704.65	
9/13/22 20:00	704.65	
9/13/22 21:00	704.57	
9/13/22 22:00	704.57	
9/13/22 23:00	704.57	
9/14/22 0:00	704.57	
9/14/22 1:00	704.57	
9/14/22 2:00	704.57	
9/14/22 3:00	704.49	
9/14/22 4:00	704.49	
9/14/22 5:00	704.39	
9/14/22 6:00	704.40	
9/14/22 7:00	704.40	
9/14/22 8:00	704.40	
9/14/22 9:00	704.32	
9/14/22 10:00	704.32	
9/14/22 11:00	704.32	
9/14/22 12:00	704.32	
9/14/22 13:00	704.23	
9/14/22 14:00	704.23	
9/14/22 15:00	704.23	
9/14/22 16:00	704.23	
9/14/22 17:00	704.15	
9/14/22 18:00	704.15	
9/14/22 19:00	704.15	
9/14/22 20:00	704.15	
9/14/22 21:00	704.07	
9/14/22 22:00	704.07	
9/14/22 23:00	704.07	
9/15/22 0:00	704.07	
9/15/22 1:00	703.99	
9/15/22 2:00	703.98	
9/15/22 3:00	703.98	
9/15/22 4:00	703.98	
9/15/22 5:00	703.90	
9/15/22 6:00	703.90	
9/15/22 7:00	703.90	
9/15/22 8:00	703.90	
9/15/22 9:00	703.82	
9/15/22 10:00	703.82	
9/15/22 11:00	703.82	
9/15/22 12:00	703.82	
9/15/22 13:00	703.74	
9/15/22 14:00	703.73	
9/15/22 15:00	703.73	
9/15/22 16:00	703.73	
9/15/22 17:00	703.65	
9/15/22 18:00	703.65	
9/15/22 19:00	703.65	
9/15/22 20:00	703.65	
9/15/22 21:00	703.57	
9/15/22 22:00	703.57	
9/15/22 23:00	703.57	
9/16/22 0:00	703.57	
9/16/22 1:00	703.48	
9/16/22 2:00	703.48	
9/16/22 3:00	703.48	
9/16/22 4:00	703.48	
9/16/22 5:00	**703.40**	**Target elev. achieved**
9/16/22 6:00	703.40	
9/16/22 7:00	703.40	

Date/Time	Reservoir Elevation (ft.)	Comments
9/16/22 8:00	703.40	
9/16/22 9:00	703.40	
9/16/22 10:00	703.40	
9/16/22 11:00	703.40	**Begin reservoir refill**
9/16/22 12:00	703.50	
9/16/22 13:00	704.22	
9/16/22 14:00	704.41	
9/16/22 15:00	704.43	
9/16/22 16:00	704.51	
9/16/22 17:00	704.50	
9/16/22 18:00	704.50	
9/16/22 19:00	704.50	
9/16/22 20:00	704.50	
9/16/22 21:00	704.50	
9/16/22 22:00	704.50	
9/16/22 23:00	704.50	
9/17/22 0:00	704.50	
9/17/22 1:00	704.50	
9/17/22 2:00	704.50	
9/17/22 3:00	704.50	
9/17/22 4:00	704.50	
9/17/22 5:00	704.50	
9/17/22 6:00	704.50	
9/17/22 7:00	704.59	
9/17/22 8:00	704.60	
9/17/22 9:00	704.69	
9/17/22 10:00	704.71	
9/17/22 11:00	704.79	
9/17/22 12:00	704.80	
9/17/22 13:00	704.89	
9/17/22 14:00	704.91	
9/17/22 15:00	704.99	
9/17/22 16:00	705.00	
9/17/22 17:00	705.00	
9/17/22 18:00	705.00	
9/17/22 19:00	705.00	
9/17/22 20:00	705.00	
9/17/22 21:00	705.00	
9/17/22 22:00	705.00	
9/17/22 23:00	704.99	
9/18/22 0:00	705.00	
9/18/22 1:00	705.01	
9/18/22 2:00	705.00	
9/18/22 3:00	705.00	
9/18/22 4:00	705.00	
9/18/22 5:00	705.00	
9/18/22 6:00	705.01	
9/18/22 7:00	705.09	
9/18/22 8:00	705.10	

Date/Time	Reservoir Elevation (ft.)	Comments
9/18/22 9:00	705.20	
9/18/22 10:00	705.20	
9/18/22 11:00	705.30	
9/18/22 12:00	705.30	
9/18/22 13:00	705.40	
9/18/22 14:00	705.40	
9/18/22 15:00	705.50	
9/18/22 16:00	705.50	
9/18/22 17:00	705.50	
9/18/22 18:00	705.50	
9/18/22 19:00	705.50	
9/18/22 20:00	705.50	
9/18/22 21:00	705.50	
9/18/22 22:00	705.51	
9/18/22 23:00	705.50	
9/19/22 0:00	705.50	
9/19/22 1:00	705.50	
9/19/22 2:00	705.50	
9/19/22 3:00	705.50	
9/19/22 4:00	705.50	
9/19/22 5:00	705.50	
9/19/22 6:00	705.50	
9/19/22 7:00	705.50	
9/19/22 8:00	705.50	
9/19/22 9:00	705.51	
9/19/22 10:00	705.50	
9/19/22 11:00	705.50	
9/19/22 12:00	705.50	
9/19/22 13:00	705.50	
9/19/22 14:00	705.50	
9/19/22 15:00	705.50	
9/19/22 16:00	705.50	
9/19/22 17:00	705.50	
9/19/22 18:00	705.53	
9/19/22 19:00	705.49	
9/19/22 20:00	705.50	
9/19/22 21:00	705.50	
9/19/22 22:00	705.50	
9/19/22 23:00	705.49	
9/20/22 0:00	705.49	
9/20/22 1:00	705.49	
9/20/22 2:00	705.50	
9/20/22 3:00	705.49	
9/20/22 4:00	705.49	
9/20/22 5:00	705.50	
9/20/22 6:00	705.49	
9/20/22 7:00	705.49	
9/20/22 8:00	705.50	
9/20/22 9:00	705.52	

Date/Time	Reservoir Elevation (ft.)	Comments
9/20/22 10:00	705.53	
9/20/22 11:00	705.57	
9/20/22 12:00	705.60	
9/20/22 13:00	705.63	
9/20/22 14:00	705.78	
9/20/22 15:00	705.83	
9/20/22 16:00	705.87	
9/20/22 17:00	705.97	
9/20/22 18:00	706.01	
9/20/22 19:00	705.99	
9/20/22 20:00	706.00	
9/20/22 21:00	706.00	
9/20/22 22:00	706.00	
9/20/22 23:00	706.00	
9/21/22 0:00	706.00	
9/21/22 1:00	706.00	
9/21/22 2:00	706.00	
9/21/22 3:00	706.00	
9/21/22 4:00	706.00	
9/21/22 5:00	706.00	
9/21/22 6:00	706.00	
9/21/22 7:00	706.00	
9/21/22 8:00	706.00	
9/21/22 9:00	706.03	
9/21/22 10:00	706.19	
9/21/22 11:00	706.39	
9/21/22 12:00	706.55	
9/21/22 13:00	706.71	
9/21/22 14:00	706.86	
9/21/22 15:00	707.01	
9/21/22 16:00	707.01	
9/21/22 17:00	706.99	
9/21/22 18:00	707.00	
9/21/22 19:00	707.00	
9/21/22 20:00	707.00	
9/21/22 21:00	707.00	
9/21/22 22:00	707.00	
9/21/22 23:00	707.01	
9/22/22 0:00	707.00	
9/22/22 1:00	707.00	
9/22/22 2:00	707.01	
9/22/22 3:00	707.00	
9/22/22 4:00	707.00	
9/22/22 5:00	707.00	
9/22/22 6:00	707.00	
9/22/22 7:00	707.13	
9/22/22 8:00	707.29	
9/22/22 9:00	707.41	
9/22/22 10:00	707.51	

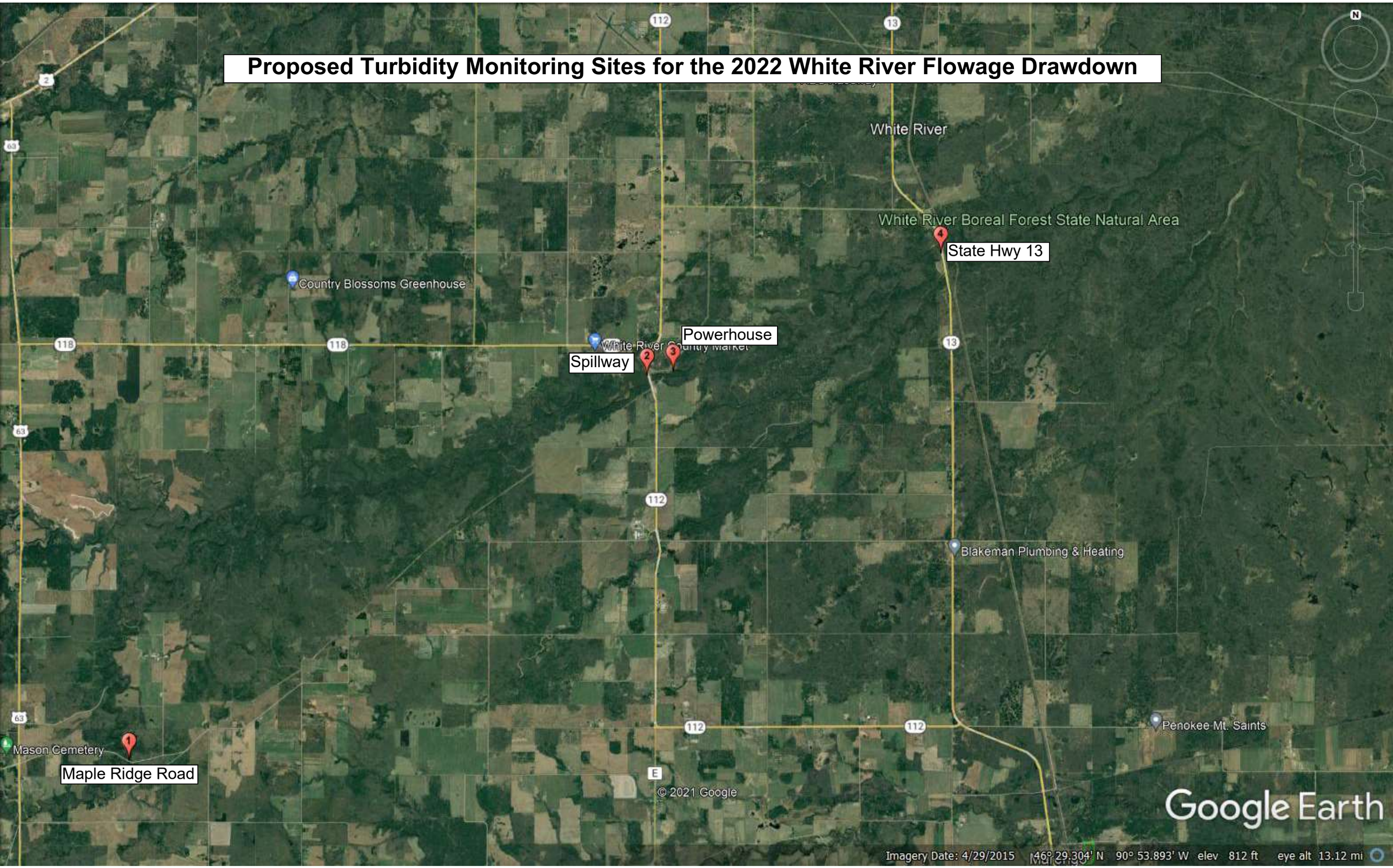
Date/Time	Reservoir Elevation (ft.)	Comments
9/22/22 11:00	707.59	
9/22/22 12:00	707.69	
9/22/22 13:00	707.78	
9/22/22 14:00	707.89	
9/22/22 15:00	707.99	
9/22/22 16:00	708.01	
9/22/22 17:00	708.00	
9/22/22 18:00	708.00	
9/22/22 19:00	708.00	
9/22/22 20:00	708.00	
9/22/22 21:00	708.00	
9/22/22 22:00	708.00	
9/22/22 23:00	708.01	
9/23/22 0:00	707.99	
9/23/22 1:00	708.00	
9/23/22 2:00	708.00	
9/23/22 3:00	708.00	
9/23/22 4:00	708.00	
9/23/22 5:00	708.00	
9/23/22 6:00	708.00	
9/23/22 7:00	708.01	
9/23/22 8:00	708.05	
9/23/22 9:00	708.17	
9/23/22 10:00	708.27	
9/23/22 11:00	708.37	
9/23/22 12:00	708.49	
9/23/22 13:00	708.59	
9/23/22 14:00	708.68	
9/23/22 15:00	708.76	
9/23/22 16:00	708.87	
9/23/22 17:00	708.97	
9/23/22 18:00	709.01	
9/23/22 19:00	709.00	
9/23/22 20:00	709.00	
9/23/22 21:00	709.00	
9/23/22 22:00	708.99	
9/23/22 23:00	709.00	
9/24/22 0:00	709.00	
9/24/22 1:00	708.99	
9/24/22 2:00	709.01	
9/24/22 3:00	709.00	
9/24/22 4:00	708.99	
9/24/22 5:00	709.00	
9/24/22 6:00	709.00	
9/24/22 7:00	709.05	
9/24/22 8:00	709.17	
9/24/22 9:00	709.27	
9/24/22 10:00	709.37	
9/24/22 11:00	709.47	

Date/Time	Reservoir Elevation (ft.)	Comments
9/24/22 12:00	709.58	
9/24/22 13:00	709.61	
9/24/22 14:00	709.69	
9/24/22 15:00	709.78	
9/24/22 16:00	709.88	
9/24/22 17:00	709.97	
9/24/22 18:00	710.01	
9/24/22 19:00	710.01	
9/24/22 20:00	710.00	
9/24/22 21:00	710.00	
9/24/22 22:00	710.01	
9/24/22 23:00	710.01	
9/25/22 0:00	710.00	
9/25/22 1:00	709.99	
9/25/22 2:00	710.00	
9/25/22 3:00	710.00	
9/25/22 4:00	709.99	
9/25/22 5:00	710.00	
9/25/22 6:00	710.01	
9/25/22 7:00	710.08	
9/25/22 8:00	710.17	
9/25/22 9:00	710.28	
9/25/22 10:00	710.38	
9/25/22 11:00	**710.48**	**Reservoir returned to normal operating range (710.4 ' - 711.6')**
9/25/22 12:00	710.58	
9/25/22 13:00	710.68	

Date/Time	Reservoir Elevation (ft.)	Comments

Attachment B

Maps of Turbidity Monitoring Sites


Proposed Turbidity Monitoring Sites for the 2022 White River Flowage Drawdown
White River
White River Boreal Forest State Natural Area
State Hwy 13
Country Blossoms Greenhouse
Powerhouse
Spillway
Blakeman Plumbing & Heating
Penokee Mt. Saints
Mason Cemetery
Maple Ridge Road
© 2021 Google
Google Earth
Imagery Date: 4/29/2015 46° 29.304' N 90° 53.893' W elev 812 ft eye alt 13.12 mi

Document Accession #: 20221109-5140 Filed Date: 11/09/2022

Proposed Turbidity Monitoring Sites for the 2022 White River Flowage Drawdown

1/31/2022, 11:03:32 AM

Lakes
Meander Lines
County
Private
Tie Lines
All Roads
Town
Federal

1:12,526

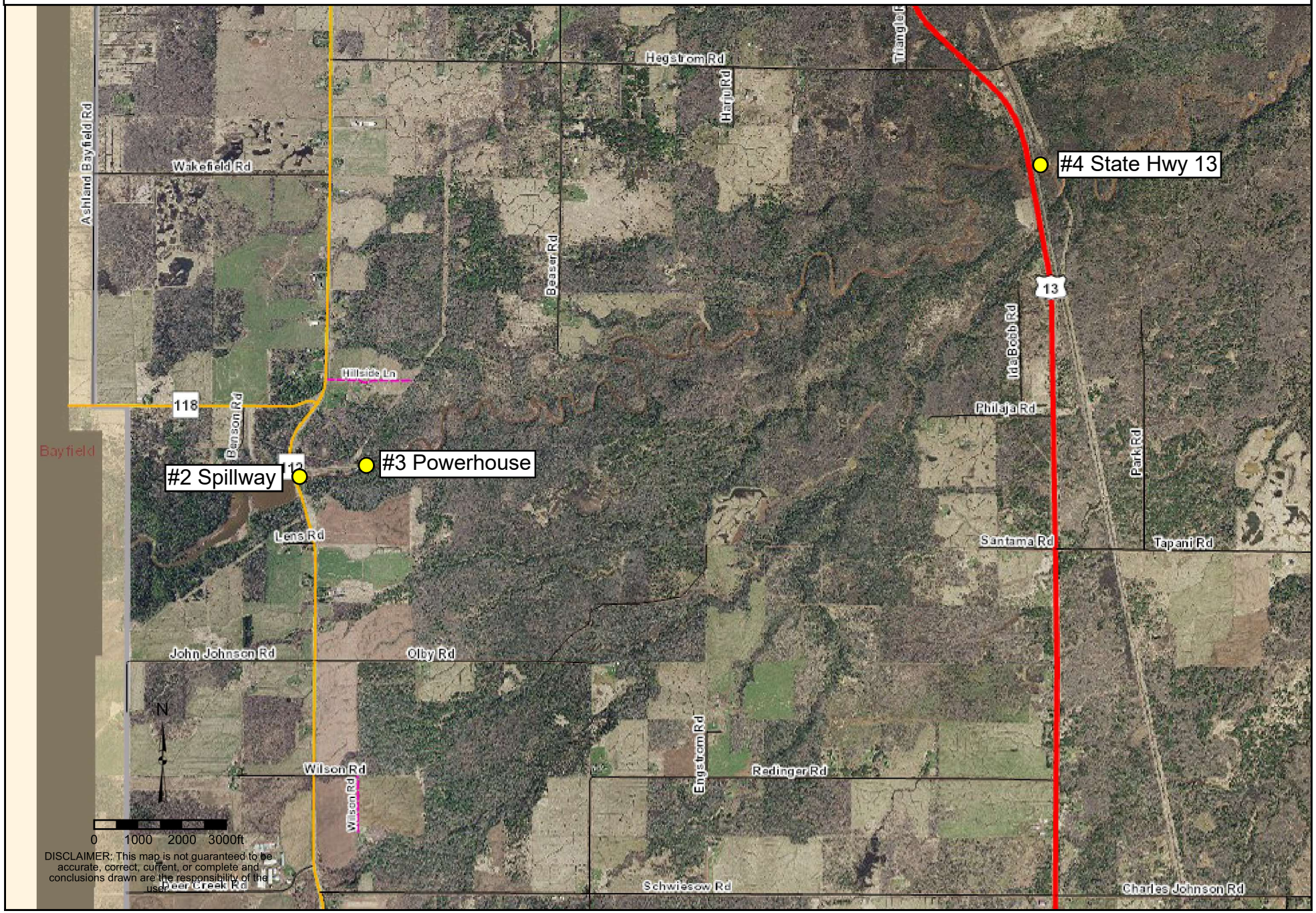
0 0.15 0.3 0.6 mi
0 0.25 0.5 1 km

Bayfield

Bayfield County Land Records Department
https://maps.bayfieldcounty.wi.gov/BayfieldWAB/

Document Accession #: 20221109-5140 Filed Date: 11/09/2022

Proposed Turbidity Monitoring Sites for the 2022 White River Flowage Drawdown



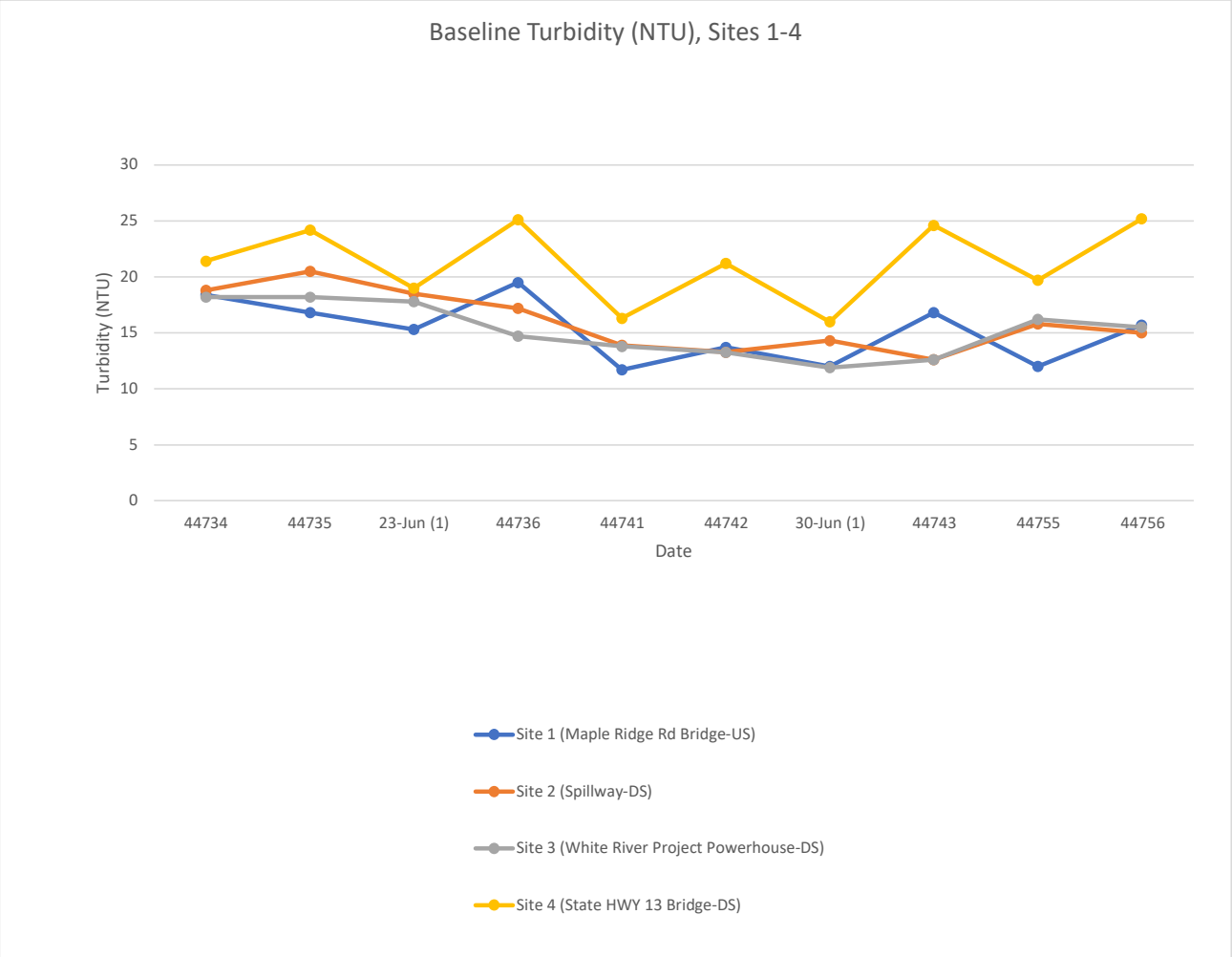
Attachment C

Baseline Turbidity Sampling

	Baseline Turbidity				
	Site 1 (Maple Ridge Rd)	Site 2 (Below Spillway)	Site 3 (Below Powerhouse)	Site 4 (State HWY 13)	
6/22/22	18.4	18.8	18.2	21.4	
6/23/22	16.8	20.5	18.2	24.2	
6/23/22 (1)	15.3	18.5	17.8	19.0	
6/24/22	19.5	17.2	14.7	25.1	
6/29/22	11.7	13.9	13.8	16.3	
6/30/22	13.7	13.27	13.25	21.2	
30-Jun (1)	12.0	14.3	11.9	16.0	
7/1/22	16.8	12.6	12.6	24.6	plant in operation
7/13/22	12.0	15.8	16.2	19.7	
7/14/22	15.7	15.0	15.5	25.2	
Average	**15.19**	**15.987**	**15.215**	**21.27**	

	Baseline Turbidity			
	Site 1	Site 2	Site 3	Site 4
Maximum	19.5	20.5	18.2	25.2
Minimum	11.7	12.6	11.9	16.0
Average	15.19	15.987	15.215	21.27

Baseline downstream ave = 17.5



Attachment D

Turbidity Monitoring Results

Document Accession #: 20221109-5140 Filed Date: 11/09/2022

White River 2022 Drawdown Turbidity Summary (Units = NTU)

Date	Sample Time*	Pond Elevation	Site 1 Maple Ridge Road	Site 2 Below Spillway	Site 3 Below Powerhouse	Site 4 Highway 13	Comments
8/31/2022	0600	711.40		21.1	16.7		begin drawdown
8/31/2022	1000	711.32	16.34	20.8	17.24	24.7	
8/31/2022	1400	711.22		21.3	18.51		
8/31/2022	1800	711.14		20.6	18.8		
9/1/2022	0600	710.89		21.5	18.25		
9/1/2022	1000	710.81	16.64	21.1	19.34	24	
9/1/2022	1400	710.72		20.6	19.05		
9/1/2022	1800	710.64		19.4	19		
9/2/2022	0600	710.39		22.4	18.14		
9/2/2022	1000	710.31	17.01	19.2	19.12	25	
9/2/2022	1400	710.22		22.9	15.2		
9/2/2022	1800	710.14		22.6	16.65		
9/3/2022	0600	709.89		23.4	19.7		
9/3/2022	1000	709.81	18.19	25.2	20.5	26.6	
9/3/2022	1400	709.72		25.7	22.5		
9/3/2022	1800	709.65		24.9	20.4		
9/4/2022	0600	709.39		26.9	23.1		
9/4/2022	1000	709.31	16	25	21.6	26.3	
9/4/2022	1400	709.22		23.4	20.7		
9/4/2022	1800	709.15		25	20.7		
9/5/2022	0600	708.90		26.3	21.3		
9/5/2022	1000	708.81	15.23	24.2	21	24.2	
9/5/2022	1400	708.73		23.1	20		
9/5/2022	1800	708.65		23.9	21.1		
9/6/2022	0600	708.40		24.5	20.3		
9/6/2022	1000	708.31	14.04	24.9	21.3	22.3	
9/6/2022	1400	708.22		22.8	19.2		
9/6/2022	1800	708.15		24.2	22.3		

Date	Sample Time*	Pond Elevation	Site 1 Maple Ridge Road	Site 2 Below Spillway	Site 3 Below Powerhouse	Site 4 Highway 13	Comments
9/7/2022	0600	707.90		26.2	22		
9/7/2022	1000	707.82	15.7	25.2	20.2	21.5	
9/7/2022	1400	707.73		23.2	20.9		
9/7/2022	1800	707.65		26.5	21.9		
9/8/2022	0600	707.40		29.7	22.2		
9/8/2022	1000	707.32		27.4	23.6		
9/8/2022	1400	707.23	14.8	29.7	20.9	18.6	
9/8/2022	1800	707.15		26.6	21.2		
9/9/2022	0600	706.90		31.6	24.4		
9/9/2022	1000	706.82	25.17	47	26.4	44.7	
9/9/2022**	1400	706.73	24.1	77.2	51.7		threshold reached***
9/9/2022	1800	706.65	23.8	80.7	57.3		
9/10/2022	0600	706.40	33.8	52.9	48.6	62.6	
9/10/2022	1000	706.32	26.2	46	41.8		
9/10/2022	1400	706.24		47.3	40.9		
9/10/2022	1800	706.15		49.1	45.8		
9/11/2022	0600	705.90		51	48.7		
9/11/2022	1000	705.82	25.3	51.3	46.3	39.3	
9/11/2022	1400	705.73		60.1	44.9		
9/11/2022	1800	705.65		58.2	49.4		
9/12/2022	0600	705.41		53.3	47.9		
9/12/2022	1000	705.32	19.6	51.9	44	50.1	
9/12/2022	1400	705.23	14.37	46.7	42.3		
9/12/2022	1800	705.15	14.63	51.3	42.6		
9/13/2022	0600	704.90	20	47.6	39.7		
9/13/2022	1000	704.82	18.9	45.3	39.2	38.1	
9/13/2022	1400	704.73	15.2	40.3	38		
9/13/2022	1800	704.65	14.98	44.6	38.9		
9/14/2022	0600	704.40	18.93	50.3	42.2		
9/14/2022	1000	704.32	16.63	47.1	40.3	37.2	
9/14/2022	1400	704.23	14.26	47.5	36.6		
9/14/2022	1800	704.15	15.28	53	39.6		

Date	Sample Time*	Pond Elevation	Site 1 Maple Ridge Road	Site 2 Below Spillway	Site 3 Below Powerhouse	Site 4 Highway 13	Comments
9/15/2022	0600	703.90	24	50.8	36.9	51.4	
9/15/2022	1000	703.82	19.2	49.7	42.4		
9/15/2022	1400	703.73	16.09	51.3	42.1		
9/15/2022	1800	703.65	14.9	50.2	46.4		
9/16/2022	0600	703.40	18.58	69	47.9		drawdown target reached
9/16/2022	1000	703.40	18.52	66.9	48.4	56.7	
9/16/2022	1200	703.50	x	x	x	x	reservoir refill begins

** Sample times are approximate-actual sample times can be found on daily field data logs.*

*** Rain occurred throughout much of the day totalling approximately 1 - 1.5" in the watershed over approximatley 12 hours*

*** threshold defined as when downstream grab results were greater than twice the corresponding upstream result (Site 1) and greater than twice the Baseline Range at two or more of the downstream sites (Sites 2, 3, and/or 4). The average baseline turbidities (NTU) were as follows: Site 1 = 15.19, Site 2 = 15.99, Site 3 = 15.22, Site 4= 21.27

Attachment E

Total Suspended Solids

White River Drawdown - Total Suspended Solids

			9/1/2022		9/6/2022		9/14/2022	
			Site 1 Maple Ridge Rd	**Site 4** State Hwy 13	**Site 1** Maple Ridge Rd	**Site 4** State Hwy 13	**Site 1** Maple Ridge Rd	**Site 4** State Hwy 13
Parameter	Method	Unit	500-221694-1	500-221694-2	500-221811-1	500-221811-2	500-222260-1	500-222260-2
Total Suspended Solids	SM 2540D	mg/L	12.0	15.6	9.8	14.4	16.2	30.3

Attachment F

Environmental Survey Results

2022 White River Drawdown Environmental Surveys

Inspection Date	Reservoir Elevation	Mussels	Fish	Photographs	Comments
9/3/2022		None	None	No	One area in the NW portion of the reservoir had some exposed flats with small pockets of water. No fish or mussels were found.
9/5/2022		25 live papershell mussels (likely Cylindrical Papershell)	None	Yes	All live mussels relocated to deeper water. Four dead shells kept for identification if needed. No stranded fish found
9/7/2022		27 live papershell mussels (likely Cylindrical Papershell)	2 Northern brook lamprey (dead) (identification confirmed)	Yes	25 of the 27 mussels were discovered in upper reach of reservoir, the other two were found in newly exposed area of the main reservoir. All mussels were relocated to deeper water. The 2 dead lamprey were found on a newly exposed flat in the upper reservoir and were kept and preserved for identification purposes.
9/9/2022		77 live papershell mussels (likely Cylindrical Papershell)	1 Central Mudminnow (live)	Yes	All mussels and the mudminnow were relocated to deeper water. Observed runoff from upland areas and exposed flats from rainfall this morning in few of the photographs but no channel scouring within the reservoir was observed during the environmental survey
9/11/2022		29 live papershell mussels (likely Cylindrical Papershell)	None	Yes	Most mussels found on the flat across the water from the intake. North and west areas are starting to drop into the channel and the banks are steeper.
9/13/2022		17 live papershell mussels (likely Cylindrical Papershell)	1 Northern brook lamprey (live)	Yes	All mussels and the brook lamprey were relocated to deeper water.
9/15/2022		29 live papershell mussels (likely Cylindrical Papershell)	1 live young-of-year black bullhead	Yes	All mussels and the bullhead were relocated to deeper water.
9/16/2022		None	None	Yes	The reservoir level was basically the same elevation as 9/15 as the refill was in progress during the time in which the survey was conducted. No mussels or fish were found.

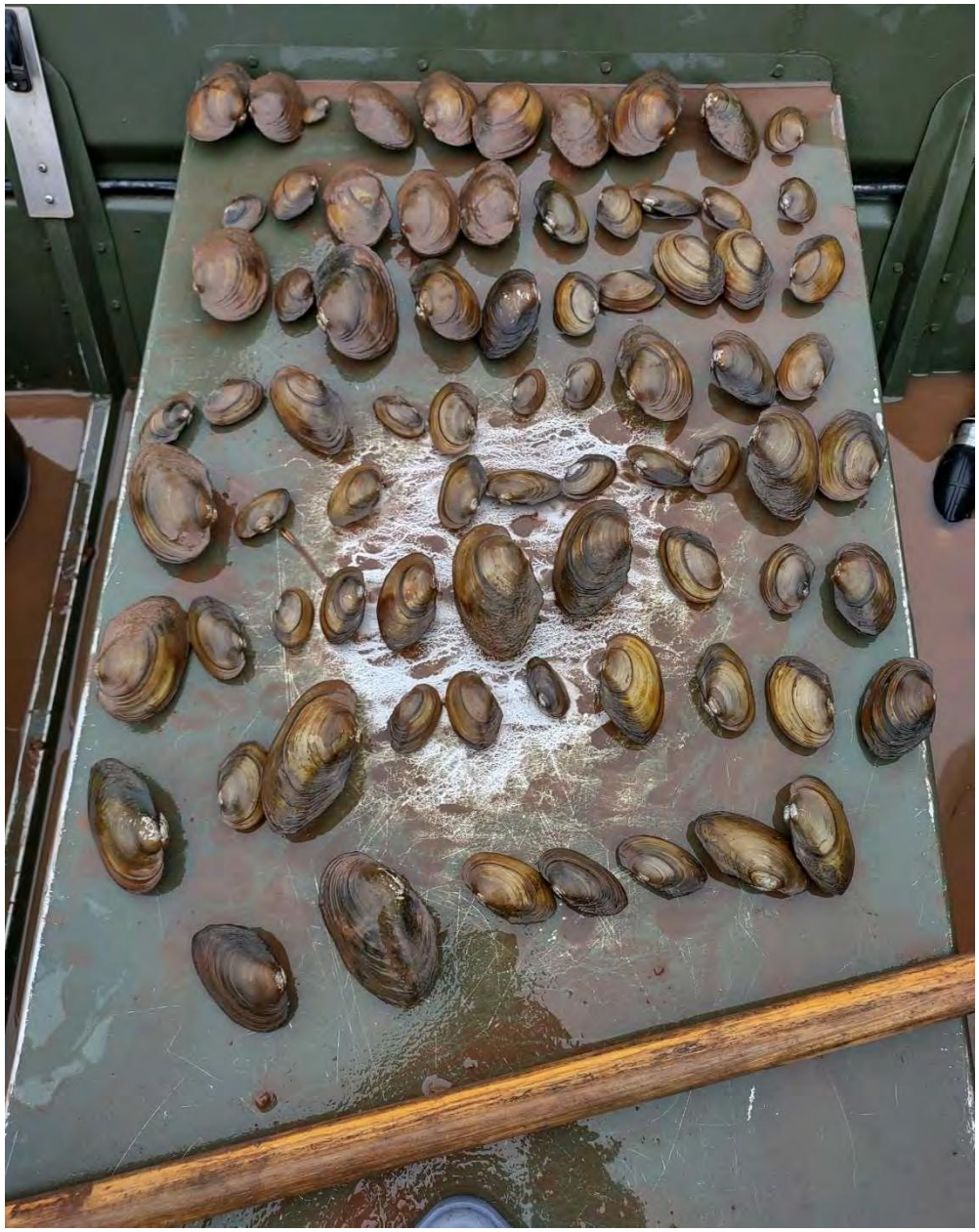
Attachment G

Photographs of Reservoir Drawdown and Environmental Monitoring

Papershell Mussels – September 5, 2022

Papershell Mussels – September 5, 2022

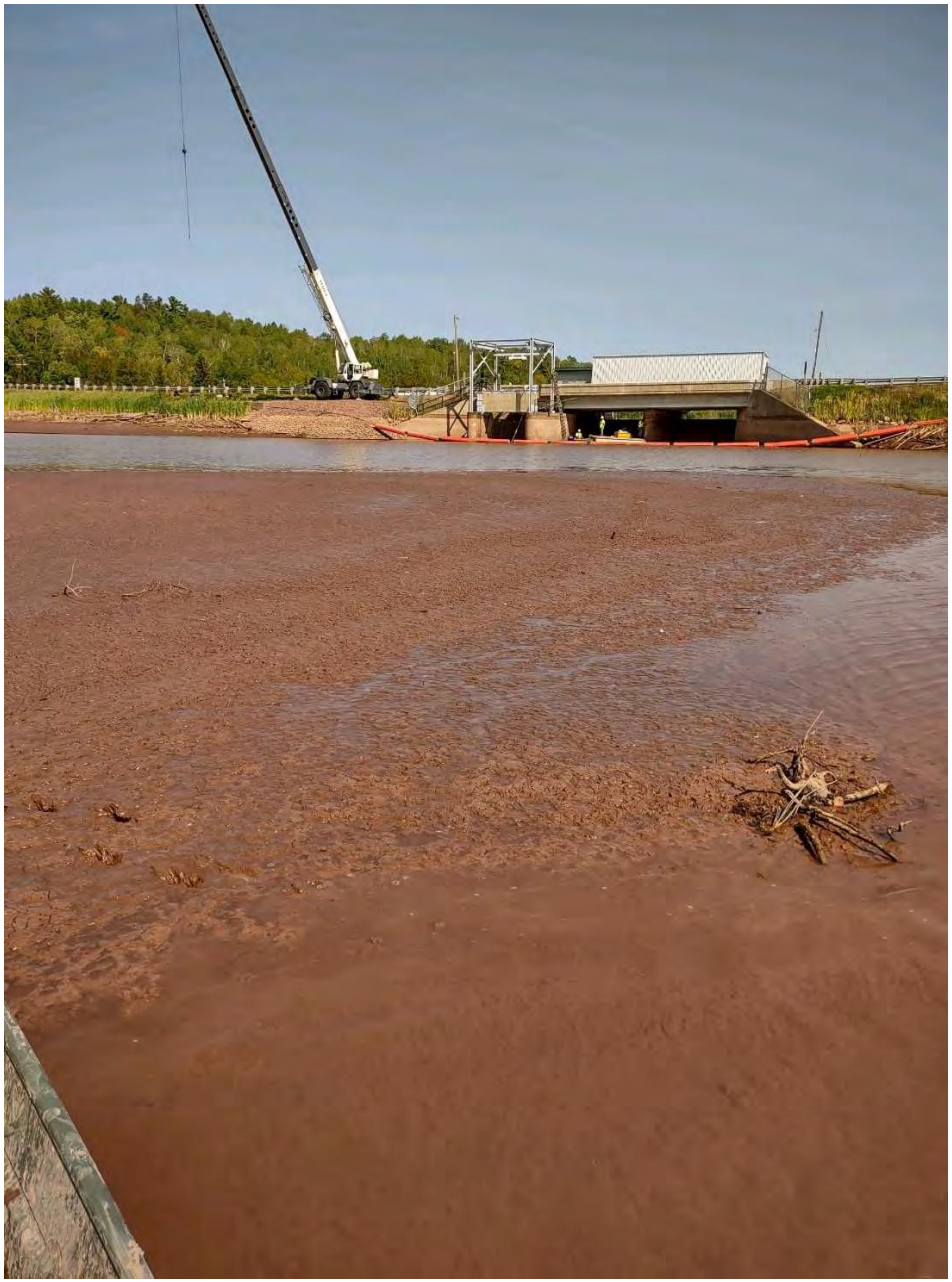
Northern Brook Lamprey (dead) and Papershell Mussels – September 7, 2022



Papershell Mussels and view facing east towards dam – September 9, 2022

Papershell Mussels – September 11, 2022

View from dam facing west – September 13, 2022 @ reservoir elevation 705.2’



View from reservoir facing west upstream and facing east towards dam - @ reservoir elevation 705.2’ September 13, 2022 September 13, 2022

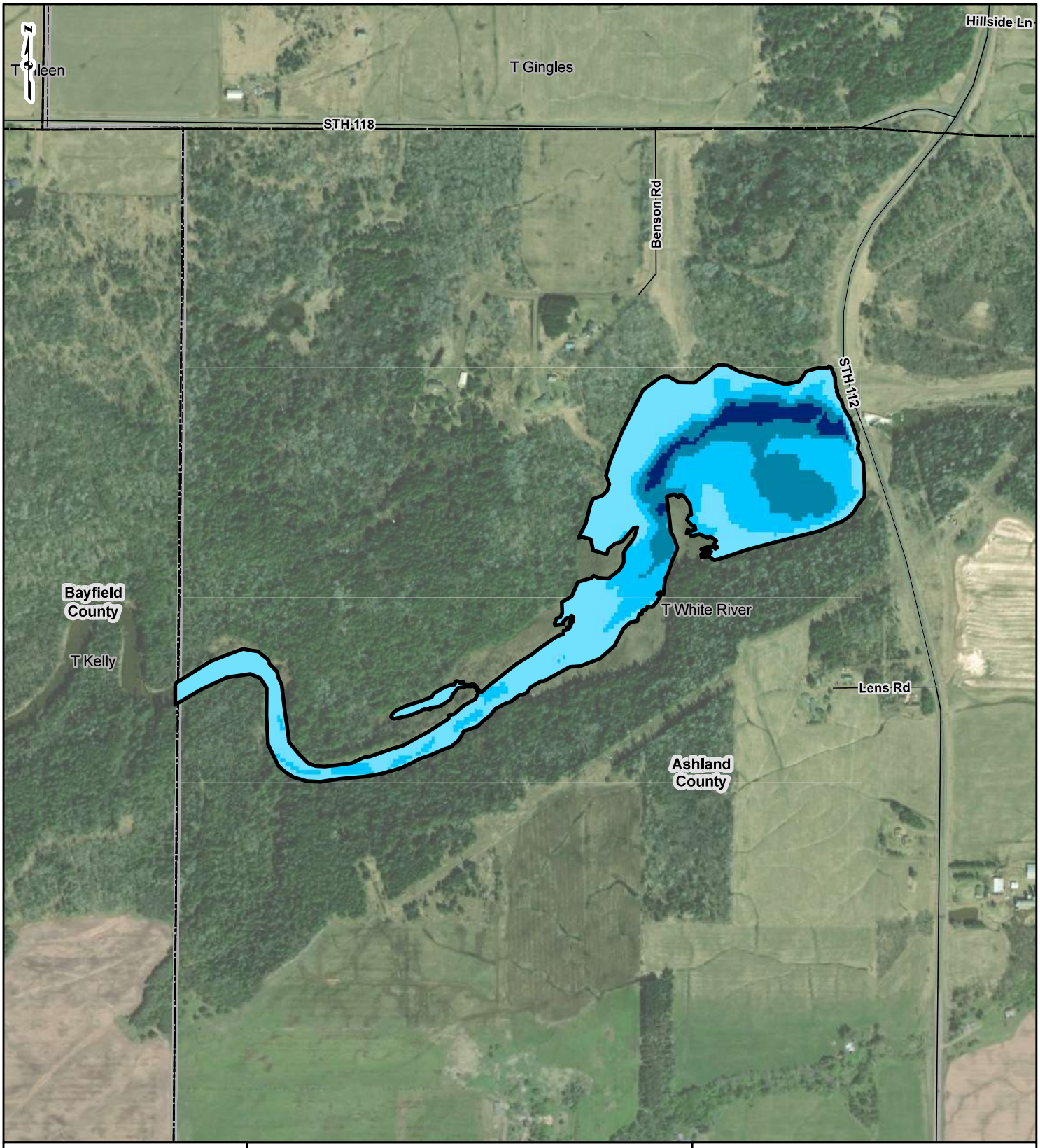
Papershell Mussels – September 15, 2022

View from upstream of dam facing west @ reservoir elevation 703.8’ – September 15, 2022

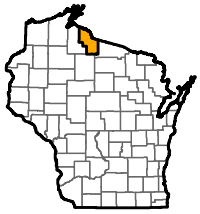
View from upstream of dam facing west after refill began – September 16, 2022

Document Content(s)

APPENDIX E-12 White River Project Bathymetric Map



PROJECT LOCATION



ASHLAND COUNTY, WISCONSIN

LEGEND

Depth
- 0- 5 ft
- 5 - 10 ft
- 10 - 15 ft
- >15 ft

- Road Centerline
- Community Boundary
- County Boundary
- Project Boundary

0 375 750 1,500 Feet

FIGURE 10
BATHYMETRIC MAP

WHITE RIVER FLOWAGE
BATHYMETRIC SURVEY
2022 SURVEY

gai consultants

Mead & Hunt

DRAWN BY: EMW
CHECKED: TDB
DATE: 10/17/22
APPROVED: LLS

REFERENCE: ESRI WORLD IMAGERY 2021, Accessed 10/17/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

G:_2022\R220323.00 - GIS\AGP\Depth_Mapping\R220323_00_White_River_Depth_Mapping\R220323_00_White_River_Depth_Mapping.aprx

APPENDIX E-13 WDNR 1989-1990 Fish Study Results

UMMARY FISHING RECORD
orm 3600-63

Department of Natural Resources

County	Waters
Ashland	White River Flowage
Sampling Objective	**Number and Location of Stations (Habitat)**
FERC Fishery Survey	Once around entire flowage and up river approximately ¼ mile. 2 men dipping. DC Boom shocker 415 volts, pulsed.
Period Fished (Dates)	
Sept. 25, 1989	

GEAR

Boom Shocker (Hours)	Time
1.5 hrs. total (.75 hrs. Suckers & Minnows)	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

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Northern Pike	9	11.0, 18.5	8.5 - 29.4	6.0/hr.
Largemouth Bass	9	2.8	2.5 - 15.4	6.0/hr.
Brown Trout	7	7.0	6.0 - 8.4	4.7/hr.
White Sucker	152	5.9, 8.4, 14.5	2.2 - 17.9	202.7/hr.
Northern Redhorse	4	-	10.0 - 16.9	5.3/hr.
Warmouth	1	-	6.7	.7/hr.
Black Crappie	1	-	11.3	.7/hr.
Black Bullhead	11	7.0	5.5 - 9.4	7.3/hr.
Yellow Perch	2	-	5.5 - 8.4	1.3/hr.
Bluegill	9	2.8	2.4 - 5.4	6.0/hr.
Pumpkinseed	5	-	2.3 - 5.4	3.3/hr.

Observations

Other species and abundance include: Creek chub present, Common shiner abundant, Bluntnose minnow present. Brown trout were all caught in river upstream of flowage, were river flow was present.

Turbid water - suckers and minnows netted for first half of flowage only.

Signed (Compiler)	Date
J. Cox	11/28/89

Rev. 10-70

Department of Natural Resources

FORM 3600-65 REV. 3-80

INCHES

1.5 hours (Game fish and panfish)
.75 hours (Suckers and minnows)

COUNTY	WATER	DATE	GEAR
Ashland COUNTY CODE — —	White River Flowage WATER CODE — — — —	Sept. 25, 1989	DC Boom Shocker 415 volts

SIZE RANGE — INCHES	SPECIES				SIZE RANGE — INCHES	SPECIES		
	Northern Pike	Largemouth Bass	Brown Trout	White Sucker		Northern Pike		
<3.0		4		8	27.0-27.4			
3.0- 3.4		1		2	27.5-27.9			
3.5- 3.9				3	28.0-28.4			
4.0- 4.4		2		8	28.5-28.9			
4.5- 4.9		1		13	29.0-29.4	1		
5.0- 5.4				8	29.5-29.9			
5.5- 5.9				12	30.0-30.4			
6.0- 6.4			2	14	30.5-30.9			
6.5- 6.9			1	10	31.0-31.4			
7.0- 7.4			3	2	31.5-31.9			
7.5- 7.9				7	32.0-32.4			
8.0- 8.4			1	10	32.5-32.9			
8.5- 8.9	1			4	33.0-33.4			
9.0- 9.4				4	33.5-33.9			
9.5- 9.9				2	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			2	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				1	37.0-37.4			
13.0-13.4	1			4	37.5-37.9			
13.5-13.9				4	38.0-38.4			
14.0-14.4				6	38.5-38.9			
14.5-14.9				7	39.0-39.4			
15.0-15.4		1		7	39.5-39.9			
15.5-15.9				4	40.0-40.9			
16.0-16.4				3	41.0-41.9			
16.5-16.9				2	42.0-42.9			
17.0-17.4				1	43.0-43.9			
17.5-17.9				2	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	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					60.0+			
26.0-26.4								
26.5-26.9								
TOTAL	9	9	7	152	TOTAL			

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES

COUNTY	WATER	DATE	GEAR
Ashland COUNTY CODE — —	White River Flowage WATER CODE — — — —	Sept. 25, 1989	DC Boom Shocker

SIZE RANGE — INCHES	SPECIES			
	Northern Redhorse	Warmouth	Black Crappie	Black Bullhead
<3.0				
3.0- 3.4				
3.5- 3.9				
4.0- 4.4				
4.5- 4.9				
5.0- 5.4				1
5.5- 5.9				
6.0- 6.4				11
6.5- 6.9		1		11111 1
7.0- 7.4				1
7.5- 7.9				
8.0- 8.4				
8.5- 8.9				1
9.0- 9.4				
9.5- 9.9				
10.0-10.4	1			
10.5-10.9			1	
11.0-11.4				
11.5-11.9				
12.0-12.4	1			
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	1			
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				
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	4	1	1	11

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			
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			

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES

COUNTY	WATER	DATE	GEAR
Ashland COUNTY CODE — —	White River Flowage WATER CODE — — — —	Sept. 25, 1989	DC Boom Shocker

SIZE RANGE — INCHES	SPECIES			
	Yellow Perch	Bluegill	Pumpkinseed	
<3.0		11111 11	11	
3.0- 3.4				
3.5- 3.9			11	
4.0- 4.4				
4.5- 4.9				
5.0- 5.4		11	1	
5.5- 5.9	1			
6.0- 6.4				
6.5- 6.9				
7.0- 7.4				
7.5- 7.9				
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				
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	2	9	5	

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	Other Species:		
30.0-30.4			
30.5-30.9	Creek Chub	–	Present
31.0-31.4	Common Shiner	–	Abundant
31.5-31.9	Bluntnose Minnow	–	Present
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			
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			

SUMMARY FISHING RECORD
Form 3600-63

Department of Natural Resources

County: Ashland	Waters: White River Flowage
Sampling Objective: FERC Fishery Survey	Number and Location of Stations (Habitat): All available spawning habitat See attached map
Period Fished (Dates): April 13-16, 1990	

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): 17	Mesh: 1"	Depth: 4' & 5' nets
Minnow Seine (No. Hauls)	Area Covered	Gill Net (No. of Feet x No. of Lifts)	Mesh Size	Depth

Other (Hours or Lifts) | Characteristics

FISHING RESULTS

Species	No.	Modal Size(s)	Size Range	Catch/Unit
Northern pike	266	19.0,23.5,31.5	13.5 - 36.9	15.6/net/day
White sucker	61	16.0	9.0 - 19.4	3.6/net/day
Shorthead redhorse	95	13.0	12.0 - 19.9	5.6/net/day
Bullhead (Black)	272	6.0, 7.0, 9.5	6.0 - 10.4	16.0/net/day
Pumpkinseed	3	4.5	4.4 - 4.6	.176/net/day
Bluegill	6	7.4	5.6 - 7.6	.352/net/day
Crappie	4	12.0	11.6 - 12.6	.235/net/day
Largemouth bass	1	14.5	14.5	.058/net/day

Observations

Signed (Compiler): J. Cox | Date: 6/90

Rev. 10-70

State of Wisconsin
Department of Natural Resources

GAME FISH LENGTH FREQUENCY

FORM 3600-65 REV. 3-80

INCHES

COUNTY	WATER	DATE	GEAR
Ashland COUNTY CODE — —	White River Flowage WATER CODE — — — —	April 13-16, 1990	Fyke Nets

SIZE RANGE — INCHES	SPECIES				SIZE RANGE — INCHES	SPECIES		
	Northern pike	White sucker	Shorthead redhorse	LM bass		Northern pike		
<3.0					27.0-27.4	4		
3.0- 3.4					27.5-27.9	3		
3.5- 3.9					28.0-28.4	3		
4.0- 4.4					28.5-28.9	3		
4.5- 4.9					29.0-29.4	3		
5.0- 5.4					29.5-29.9	2		
5.5- 5.9					30.0-30.4	1		
6.0- 6.4					30.5-30.9			
6.5- 6.9					31.0-31.4	1		
7.0- 7.4					31.5-31.9	5		
7.5- 7.9					32.0-32.4	1		
8.0- 8.4					32.5-32.9	1		
8.5- 8.9					33.0-33.4	2		
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					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		2	9		36.5-36.9	1		
12.5-12.9		3	22		37.0-37.4			
13.0-13.4		3	23		37.5-37.9			
13.5-13.9	2	4	12		38.0-38.4			
14.0-14.4		5	9		38.5-38.9			
14.5-14.9	1	4	4	1	39.0-39.4			
15.0-15.4	4	4	3		39.5-39.9			
15.5-15.9		8			40.0-40.9			
16.0-16.4	3	9	4		41.0-41.9			
16.5-16.9	1	5	1		42.0-42.9			
17.0-17.4	7	2	1		43.0-43.9			
17.5-17.9	10	1	2		44.0-44.9			
18.0-18.4	8	3	2		45.0-45.9			
18.5-18.9	15	3			46.0-46.9			
19.0-19.4	20	1	2		47.0-47.9			
19.5-19.9	13		1		48.0-48.9			
20.0-20.4	13				49.0-49.9			
20.5-20.9	16				50.0-50.9			
21.0-21.4	11				51.0-51.9			
21.5-21.9	16				52.0-52.9			
22.0-22.4	17				53.0-53.9			
22.5-22.9	9				54.0-54.9			
23.0-23.4	13				55.0-55.9			
23.5-23.9	20				56.0-56.9			
24.0-24.4	14				57.0-57.9			
24.5-24.9	7				58.0-58.9			
25.0-25.4	2				59.0-59.9			
25.5-25.9	5				60.0+			
26.0-26.4	4							
26.5-26.9	5							
TOTAL	266	61	95	1	TOTAL			

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PANFISH LENGTH FREQUENCY

FORM 3600-64 REV. 3-81

INCHES

COUNTY: Ashland (COUNTY CODE — —)

WATER: White River Flowage (WATER CODE — — — —)

DATE: April 13-16, 1990

GEAR: Fyke Nets

SIZE RANGE INCHES	SPECIES: Bullhead	Pumpkinseed	Bluegill	Crappie
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		1		
4.5		1		
4.6		1		
4.7				
4.8				
4.9				
5.0				
5.1				
5.2				
5.3				
5.4				
5.5				
5.6			1	
5.7				
5.8				
5.9				
6.0	3			
6.1				
6.2				
6.3				
6.4				
6.5				
6.6				
6.7				
6.8				
6.9				
TOTALS	272	3	6	4

SIZE RANGE INCHES	SPECIES: Crappie	Bluegill	Bullhead
7.0			5
7.1		1	
7.2		1	
7.3			
7.4		1	
7.5		1	
7.6		1	
7.7			
7.8			
7.9			
8.0			
8.1			
8.2			
8.3			+257 Count
8.4			
8.5			
8.6			
8.7			
8.8			
8.9			
9.0			7
9.1			
9.2			
9.3			
9.4			
9.5			
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	1		
11.8			
12.0	1		
12.2	1		
12.4			
12.6			
12.8	1		
13.0			
13.2			
13.4			
13.6			
13.8			
14.0+			
TOTALS			

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM: White River	Survey Station No.: 3	POINT OF EXAMINATION: Powerhouse to approximately ¼ mile downstream	
COUNTY: Ashland			
Township: 46N	Range: 4W	Section: 5, 6	Distance Sampled (ft.): ~1500 ft.
GEAR USED: 230 volt DC Stream shocker, 2 electrodes			

Avg. Width (ft.)	Avg. Depth (ft.)	Vol. of Flow (c.f.s.)	VELOCITY	Max. Flood Crest (ft.)
			☐ Sluggish ☐ Moderate ☒ Rapid	

WATER	CONDUCTANCE	TEMPERATURE	pH	M.P.A.
☐ Clear ☐ Stained ☒ Clay Dirty	..... C_f ..... C_{77}	65° Water 75° Air 2 PM Time		..... ppm

WATER LEVEL CONDITIONS	PRIOR WEATHER CONDITIONS
..... In. Below X Normal ..... In. Above	Cool very light rain (mist) fog

POLLUTION: None other than suspended clay

STREAM BOTTOM TYPES (%): 50 Bedrock ..... Hardpan 25 Boulder 10 Rubble 10 Gravel 5 Sand ..... Silt ..... Marl ..... Detritus

POOL GRADE: B

POOL-RIFFLE RATIO: 0/90/10

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
green algae					

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X			X		Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

..... % Cultivated 70 % Upland Hardwood ..... % Swamp Conifer

..... % Firm Pasture 30 % Upland Conifer ..... % Shrub Marsh

..... % Meadow Pasture ..... % Swamp Hardwood ..... % Open Marsh

STREAM COVER: ☐ Dense ☐ Partly Open ☒ Open

FISHABILITY: ☒ Excellent ☐ Good ☐ Fair ☐ Poor

BANK EROSION: ☐ Heavy ☐ Medium ☒ Light ☐ None

BANK HEIGHTS

NEED FOR INSTREAM DEVICES: ☐ Heavy ☐ Medium ☐ Light ☒ None

DAMS	Number	Height	Pool Area Above
Man-made	0		
Beaver (active)	0		
Beaver (inactive)	0		

REMARKS

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
8/15/89	Scholl, Cox, Zarzycki

REV. 5-74

Department of Natural Resources

Form 3600-57

STREAM: White River

INVESTIGATOR: Scholl, Cox, Zarzycki

Area Sampled: LENGTH | WIDTH | AREA (ACRES)

STATION NO.: 3

NO. PER ACRE:

DATE: 8/15/89

SIZE RANGE	SPECIES: Brown Trout	Northern Pike	SM Bass
1			
1.0 - 1.4			
1.5 - 1.9			
2.0 - 2.4			
2.5 - 2.9			1
3.0 - 3.4			
3.5 - 3.9			
4.0 - 4.4			
4.5 - 4.9			
5.0 - 5.4			1
5.5 - 5.9			
6.0 - 6.4			
6.5 - 6.9	1		
7.0 - 7.4			
7.5 - 7.9			
8.0 - 8.4			
8.5 - 8.9			
9.0 - 9.4	11		
9.5 - 9.9			
10.0 - 10.4	11		
10.5 - 10.9	11		
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			
15.0 - 15.4			
15.5 - 15.9			
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		1	
22.5 - 22.9		1	
23.0 - 23.4			
23.5 - 23.9			
24.0 - 24.4			
24.5 - 24.9			
25 + (give actual size)			
TOTAL	9	2	2

Other Species	Abundance	Size Range
Rock bass	P	3.2
Pumpkinseed	P	2.9 - 4.0
Hornyhead chub	P	2.5 - 5.5
Burbot	P	5.0 - 7.0
Common shiner	A	2.0 - 5.0
Sand shiner	P	2.0 - 3.0
Log perch	C	2.5 - 4.5
Longnose dace	A	1.5 - 3.5
Blacknose dace	C	1.0 - 2.5
Trout perch	C	2.5 - 3.5
Shorthead redhorse	A	5.0 - 14.0
White sucker	A	2.5 - 10.0
Black bullhead	P	5.5
Bluntnose minnow	P	2.5 - 3.5
Creek chub	P	3.0 - 6.0

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM: White River	Survey Station No.: 3	POINT OF EXAMINATION: Powerhouse to approximately ½ mile downstream	
COUNTY: Ashland			
Township: 46N	Range: 4W	Section: 5 & 6	Distance Sampled (ft.): ~1500'
GEAR USED: 230 volt DC Stream shocker, 2 electrodes			
Avg. Width (ft.):	Avg. Depth (ft.):	Vol. of Flow (c.f.s.):	VELOCITY: [ ] Sluggish [X] Moderate [ ] Rapid
Max. Flood Crest (ft.):			
WATER: [ ] Clear [ ] Stained [X] Dirty — Clay	CONDUCTANCE: ..... C_f ..... C_{77}	TEMPERATURE: 57° Water 65° Air 1 PM Time	pH:	M.P.A.: ..... ppm
WATER LEVEL CONDITIONS: 6 In. Below ..... Normal ..... In Above	PRIOR WEATHER CONDITIONS: Dry, clear		
POLLUTION: None			

STREAM BOTTOM TYPES (%): 50 Bedrock ..... Hardpan 25 Boulder 10 Rubble 10 Gravel 5 Sand ..... Silt ..... Marl ..... Detritus

POOL GRADE: B

POOL-RIFFLE RATIO: 0/90/10

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
green algae	S				

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X			X		Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

..... % Cultivated ..... 70 % Upland Hardwood ..... % Swamp Conifer

..... % Firm Pasture ..... 30 % Upland Conifer ..... % Shrub Marsh

..... % Meadow Pasture ..... % Swamp Hardwood ..... % Open Marsh

STREAM COVER: [ ] Dense [ ] Partly Open [X] Open

FISHABILITY: [X] Excellent [ ] Good [ ] Fair [ ] Poor

BANK EROSION: [ ] Heavy [ ] Medium [X] Light [ ] None

BANK HEIGHTS

NEED FOR INSTREAM DEVICES: [ ] Heavy [ ] Medium [ ] Light [X] None

DAMS	Number	Height	Pool Area Above
Man-made	0		
Beaver (active)	0		
Beaver (inactive)	0		

REMARKS

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
9/15/89	Cox, Scholl, Cawest

REV. 5-74

Department of Natural Resources

Form 3600-57

STREAM				INVESTIGATOR		
White River				Cox, Scholl, Cawest		
Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO. 3	NO. PER ACRE	DATE 9/15/89

SIZE RANGE	SPECIES					
	Brown Trout	Northern Pike	SM Bass	B. Bullhead		
1						
1.0 - 1.4						
1.5 - 1.9						
2.0 - 2.4						
2.5 - 2.9						
3.0 - 3.4			1			
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	1					
7.0 - 7.4	1					
7.5 - 7.9	1			1		
8.0 - 8.4						
8.5 - 8.9						
9.0 - 9.4	1					
9.5 - 9.9						
10.0 - 10.4						
10.5 - 10.9	1					
11.0 - 11.4	11				Same minnow and sucker species and abundance as on 8/15/89	
11.5 - 11.9						
12.0 - 12.4						
12.5 - 12.9						
13.0 - 13.4						
13.5 - 13.9						
14.0 - 14.4	Saw 6 other trout between 6-10 inches					
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		1				
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	7	1	1	1		

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM	Survey Station No.	POINT OF EXAMINATION
White River	3	Powerhouse to approximately ¼ mile downstream
COUNTY		
Ashland		

Township	Range	Section	Distance Sampled (ft.)	GEAR USED
46N	4W	6	1500	230 volt DC stream shocker, 2 electrodes, 2 men dipping

Avg. Width (ft.)	Avg. Depth (ft.)	Vol. of Flow (c.f.s.)	VELOCITY	Max. Flood Crest (ft.)
			☐ Sluggish ☐ Moderate ☒ Rapid	

WATER	CONDUCTANCE	TEMPERATURE	pH	M.P.A.
☐ Clear ☒ Stained ☐ Dirty	..... C_f ..... C_{77}	44° Water 34° Air .....Time		..... ppm

WATER LEVEL CONDITIONS	PRIOR WEATHER CONDITIONS
...In Below ..X Normal ...In Above	Clear - sunny - cool

POLLUTION
None apparent

STREAM BOTTOM TYPES (%)

50 Bedrock	Hardpan	25 Boulder	10 Rubble	10 Gravel
5 Sand	Silt	Marl	Detritus	

POOL GRADE
B

POOL-RIFFLE RATIO
0 90 10

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
None					

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X			X		Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

.....% Cultivated	70 % Upland Hardwood	.....% Swamp Conifer
.....% Firm Pasture	39 % Upland Conifer	.....% Shrub Marsh
.....% Meadow Pasture	.....% Swamp Hardwood	.....% Open Marsh

STREAM COVER
☐ Dense ☐ Partly Open ☒ Open

FISHABILITY
☐ Excellent ☐ Good ☐ Fair ☐ Poor

BANK EROSION
☐ Heavy ☐ Medium ☒ Light ☐ None

BANK HEIGHTS

NEED FOR INSTREAM DEVICES
☐ Heavy ☐ Medium ☐ Light ☒ None

DAMS	Number	Height	Pool Area Above
Man-made			
Beaver (active)			
Beaver (inactive)			

REMARKS

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
4-17-90	J. Cox - J. Wilson - B. Olson

Department of Natural Resources

Form 3600-57

Air Temp 34°F, Water Temp 44°F

STREAM				INVESTIGATOR		
White River				J. Cox - J. Wilson - B. Olson		
Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO. 3	NO. PER ACRE	DATE 4-17-90

SIZE RANGE	SPECIES					
	Brown Trout	Walleye				
1						
1.0 - 1.4						
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						
7.0 - 7.4	1					
7.5 - 7.9	1					
8.0 - 8.4						
8.5 - 8.9	1					
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		saw approx. 6 other walleye from 16-25"				
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		11				
18.0 - 18.4						
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		1				
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						
24.5 - 24.9						
25 + (give actual size)		25.5, 26.2				
TOTAL	3	7				

Creek Chub - Present
White Sucker - Present
Longnose Dace - Present

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM	Survey Station No.	POINT OF EXAMINATION
White River	2 A	Plunge-pool below dam. (Bypassed channel)
COUNTY: Ashland		

Township	Range	Section	Distance Sampled (ft.)	GEAR USED
46N	4W	6	~150'	2 electrodes, 1 man dipping Boat-mounted stream shocker 230 volts DC

Avg. Width (ft.)	Avg. Depth (ft.)	Vol. of Flow (c.f.s.)	VELOCITY	Max. Flood Crest (ft.)
~100'	~5'		[X] Sluggish [ ] Moderate [ ] Rapid	

WATER	CONDUCTANCE	TEMPERATURE	pH	M.P.A.
[ ] Clear [ ] Stained [X] Clay Dirty	..... C_f ..... C_{77}	65° Water 60° Air 10 AM Time		..... ppm

WATER LEVEL CONDITIONS	PRIOR WEATHER CONDITIONS
....In. Below ..X.Normal ....In Above	Cool, very light rain (mist) fog

POLLUTION: None other than suspended clay

STREAM BOTTOM TYPES (%)					POOL GRADE
80 Bedrock	Hardpan	10 Boulder	Rubble	10 Gravel	A
Sand	Silt	Marl	Detritus		POOL-RIFFLE RATIO: 100/0/0

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
green algae	S				

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X					Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

.....% Cultivated	.....% Upland Hardwood	.....% Swamp Conifer
100 % Firm Pasture	.....% Upland Conifer	.....% Shrub Marsh
.....% Meadow Pasture	.....% Swamp Hardwood	.....% Open Marsh

STREAM COVER	FISHABILITY
[ ] Dense [ ] Partly Open [X] Open	[X] Excellent [ ] Good [ ] Fair [ ] Poor

BANK EROSION	DAMS	Number	Height	Pool Area Above
[ ] Heavy [ ] Medium [ ] Light [X] None	Man-made			
BANK HEIGHTS: ~50 ft.	Beaver (active)			
NEED FOR INSTREAM DEVICES: [ ] Heavy [ ] Medium [ ] Light [X] None	Beaver (inactive)			

REMARKS

This portion of station 2, the plunge-pool, was electrofished in a different manner than the downstream portion. Fish data were recorded separately for this reason.

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
8/14/89	Scholl, Cox, Zarzycki

RE 7.5-74

Department of Natural Resources

STATION FISH SAMPLING SUMMARY
Form 3600-57

STREAM				INVESTIGATOR		
White River				Scholl, Cox, Zarzycki		
Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO. 2A	NO. PER ACRE	DATE 8/14/89

SIZE RANGE	SPECIES: Brown Trout	Shorthead Redhorse
1		
1.0 - 1.4		
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	1	1
7.0 - 7.4		
7.5 - 7.9		
8.0 - 8.4	1	
8.5 - 8.9	1	
9.0 - 9.4		
9.5 - 9.9	11	
10.0 - 10.4		1
10.5 - 10.9		1
11.0 - 11.4		11
11.5 - 11.9	1	
12.0 - 12.4		
12.5 - 12.9		
13.0 - 13.4		
13.5 - 13.9		1
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 + (give actual size)		
TOTAL	6	6

Other Species	Abundance	Size Range
Longnose Dace	P	2.3 - 3.0
Common shiner	A	1.9 - 5.0
White sucker	C	2.5 - 7.4
Trout perch	P	2.8 - 3.2
Bluntnose minnow	P	2.5 - 3.5
Fathead minnow	P	2.0 - 3.0
Sand shiner	P	2.0 - 3.0
Hornyhead chub	P	2.5 - 5.0
Creek chub	P	2.5 - 3.5
Log perch	P	2.5 - 4.0
Black bullhead	P	5.6

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM: White River	Survey Station No.: 2B	POINT OF EXAMINATION: Powerhouse to lower end of plunge-pool below dam	
COUNTY: Ashland			
Township: 46N	Range: 4W	Section: 6	Distance Sampled (ft.):	GEAR USED: 230 volt DC Stream shocker, 2 electrodes
Avg. Width (ft.):	Avg. Depth (ft.): 8 inches	Vol. of Flow (c.f.s.):	VELOCITY: [ ] Sluggish [X] Moderate [ ] Rapid	Max. Flood Crest (ft.):

WATER: [ ] Clear [ ] Stained [X] Dirty — Clay	CONDUCTANCE: ..... C_f ..... C_{77}	TEMPERATURE: 65° Water 65° Air 2 PM Time	pH	M.P.A.: ..... ppm
WATER LEVEL CONDITIONS: ..In Below ..X..Normal ..In Above	PRIOR WEATHER CONDITIONS: Cool, very light rain (mist) fog			

POLLUTION: None other than suspended clay

STREAM BOTTOM TYPES (%)

80 Bedrock ..... Hardpan 10 Boulder ..... Rubble 10 Gravel

..... Sand ..... Silt ..... Marl ..... Detritus

POOL GRADE: B

POOL-RIFFLE RATIO: 60/30/10

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
green algae	S				

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X					Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

..... % Cultivated ..... 70 % Upland Hardwood ..... % Swamp Conifer

..... % Firm Pasture ..... 30 % Upland Conifer ..... % Shrub Marsh

..... % Meadow Pasture ..... % Swamp Hardwood ..... % Open Marsh

STREAM COVER: [ ] Dense [ ] Partly Open [X] Open

FISHABILITY: [X] Excellent [ ] Good [ ] Fair [ ] Poor

BANK EROSION: [ ] Heavy [ ] Medium [ ] Light [X] None

BANK HEIGHTS

NEED FOR INSTREAM DEVICES: [ ] Heavy [ ] Medium [ ] Light [X] None

DAMS	Number	Height	Pool Area Above
Man-made	0		
Beaver (active)	0		
Beaver (inactive)	0		

REMARKS

This portion of station 2 was electrofished in a different manner than the plunge-pool. Fish data were recorded separately for this reason.

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
8/14/89	Scholl, Cox, Zarzycki

Department of Natural Resources

STATION FISH
Form 3600-57

STREAM: White River

INVESTIGATOR: Scholl, Cox, Zarzycki

Area Sampled: LENGTH | WIDTH | AREA (ACRES)

STATION NO.: 2 B

NO. PER ACRE:

DATE: 8/14/89

SIZE RANGE	SPECIES					
	Rainbow Trout	Largemouth Bass	N. Pike	Y. Perch	Pumpkinseed	
1						
1.0 - 1.4						
1.5 - 1.9		1				
2.0 - 2.4		1			111	
2.5 - 2.9	11				11111 1	
3.0 - 3.4					111	
3.5 - 3.9				111		
4.0 - 4.4				111		
4.5 - 4.9				1		
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						
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			1			
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	2	2	1	7	12	

Other Species	Abundance	Size Range
Bluntnose minnow	P	2.5 - 3.5
Common shiner	A	2.0 - 5.0
White sucker	A	2.5 - 7.0
Shorthead redhorse	C	5.0 - 13.5
Longnose dace	A	2.3 - 3.5
Log perch	P	2.5 - 4.0
Trout perch	P	2.5 - 3.5
Burbot	P	5.3 - 6.5
Hornyhead chub	C	2.5 - 5.0
Creek chub	C	3.0 - 7.7
Blacknose dace	P	1.0 - 2.5
Sand shiner	P	2.0 - 3.0
Fathead minnow	C	2.0 - 3.0
Johnny darter	P	1.5 - 2.5
Black bullhead	P	5.7

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM	Survey Station No.	POINT OF EXAMINATION
White River	2A	Plunge-pool below dam. (Bypassed channel)
COUNTY		
Ashland		

Township	Range	Section	Distance Sampled (ft.)	GEAR USED
46N	4W	6	~150'	Boat-mounted 230 volt DC Stream shocker

Avg. Width (ft.)	Avg. Depth (ft.)	Vol. of Flow (c.f.s.)	VELOCITY	Max. Flood Crest (ft.)
			[X] Sluggish [ ] Moderate [ ] Rapid	

WATER	CONDUCTANCE	TEMPERATURE	pH	M.P.A.
[ ] Clear [ ] Stained [X] Clay Dirty	..... C_f ..... C_{77}	57° Water 64° Air 11AM Time		..... ppm

WATER LEVEL CONDITIONS	PRIOR WEATHER CONDITIONS
..6..In. Below .....Normal .....In Above	Dry, clear

POLLUTION

None

STREAM BOTTOM TYPES (%)

..80..Bedrock .....Hardpan ..10..Boulder .....Rubble ..10..Gravel

.....Sand .....Silt .....Marl .....Detritus

POOL GRADE A

POOL-RIFFLE RATIO 100/0/0

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
green algae (sparse)	S				

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X					Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

.....% Cultivated	.....% Upland Hardwood	.....% Swamp Conifer
.100..% Firm Pasture	.....% Upland Conifer	.....% Shrub Marsh
.....% Meadow Pasture	.....% Swamp Hardwood	.....% Open Marsh

STREAM COVER [ ] Dense [ ] Partly Open [X] Open

FISHABILITY [X] Excellent [ ] Good [ ] Fair [ ] Poor

BANK EROSION [ ] Heavy [ ] Medium [ ] Light [X] None

BANK HEIGHTS ~50'

NEED FOR INSTREAM DEVICES [ ] Heavy [ ] Medium [ ] Light [X] None

DAMS	Number	Height	Pool Area Above
Man-made	1	~24'	47 acres
Beaver (active)			
Beaver (inactive)			

REMARKS

This was the only portion of station 2 that was electrofished on this date.

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
9/15/89	Cox, Scholl, Cawest

REV. 5-74

Department of Natural Resources

Form 3600-57

STREAM: White River

INVESTIGATOR: Cox, Scholl, Cawest

Area Sampled: LENGTH | WIDTH | AREA (ACRES)

STATION NO.: 2A

NO. PER ACRE:

DATE: 9/15/89

SIZE RANGE	SPECIES					
1						
1.0 - 1.4						
1.5 - 1.9	No game fish or panfish observed					
2.0 - 2.4						
2.5 - 2.9						
3.0 - 3.4	Same minnow species and abundance as on 8/14/89					
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						
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 + (give actual size)						
TOTAL						

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM: White River	Survey Station No.: 2A	POINT OF EXAMINATION: Plunge-pool below dam (Bypassed channel)	
COUNTY: Ashland			
Township: 46N / Range: 4W / Section: 6	Distance Sampled (ft.): 150'	GEAR USED: 2 electrodes, 1 man dipping; Boat-mounted stream shocker, 230 DC volts	
Avg. Width (ft.): 100'	Avg. Depth (ft.): 5'	Vol. of Flow (c.f.s.):	VELOCITY: [X] Sluggish [ ] Moderate [ ] Rapid
Max. Flood Crest (ft.):			

WATER: [ ] Clear [X] Stained [ ] Dirty	CONDUCTANCE: ..... C_f ..... C_{77}	TEMPERATURE: 44° Water 34° Air 10 AM Time	pH	M.P.A.: ..... ppm
WATER LEVEL CONDITIONS: ..In. Below X Normal ..In Above	PRIOR WEATHER CONDITIONS: Clear - sunny - cool			

POLLUTION: None

STREAM BOTTOM TYPES (%): 80 Bedrock; Hardpan; 10 Boulder; 10 Rubble; Gravel; Sand; Silt; Marl; Detritus

POOL GRADE: A

POOL-RIFFLE RATIO: 100/0/0

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
None					

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable
Undercut banks	X				
Rocks, boulders			X	X	
Logs, trees	X				
Debris	X				
Aquatic Vegetation	X				

AQUATIC LIFE	Scarce	Common	Abundant
Stonefly			
Mayfly			
Caddisfly			
Shrimp			
Crayfish			

STREAM BANK VEGETATION

..% Cultivated	..% Upland Hardwood	..% Swamp Conifer
100 % Firm Pasture	..% Upland Conifer	..% Shrub Marsh
..% Meadow Pasture	..% Swamp Hardwood	..% Open Marsh

STREAM COVER: [ ] Dense [ ] Partly Open [X] Open

FISHABILITY: [X] Excellent [ ] Good [ ] Fair [ ] Poor

BANK EROSION: [ ] Heavy [ ] Medium [ ] Light [X] None

BANK HEIGHTS: 50 ft.

NEED FOR INSTREAM DEVICES: [ ] Heavy [ ] Medium [ ] Light [X] None

DAMS	Number	Height	Pool Area Above
Man-made			
Beaver (active)			
Beaver (inactive)			

REMARKS

This portion of station 2 (plunge-pool below dam) was sampled in a different manner than the remainder of station 2, so fish data were recorded separately.

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
4-17-90	J. Cox, J. Wilson, B. Olson

REV. 5-74

Department of Natural Resources

STATION FISH SAMPLING SUMMARY
Form 3600-57

Air Temp 34°F, Water Temp 44°F

STREAM				INVESTIGATOR		
White River				J. Cox - J. Wilson - B. Olson		
Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO. 2A	NO. PER ACRE	DATE 4-17-90

SIZE RANGE	SPECIES: Brown Trout
1	
1.0 - 1.4	
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	1
7.0 - 7.4	
7.5 - 7.9	
8.0 - 8.4	11
8.5 - 8.9	1
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 + (give actual size)	
TOTAL	4

Only species observed in this area

Rev. 3-75

STREAM SURVEY STATION REPORT

DEPARTMENT OF NATURAL RESOURCES

FORM 3600-39

NAME OF STREAM	Survey Station No.	POINT OF EXAMINATION
White River	2B	Lower end of plunge-pool to powerhouse (Bypassed channel)

COUNTY	Township	Range	Section	Distance Sampled (ft.)	GEAR USED
Ashland	46N	4W	6		230 volt DC stream shocker, 2 men dipping

Avg. Width (ft.)	Avg. Depth (ft.)	Vol. of Flow (c.f.s.)	VELOCITY	Max. Flood Crest (ft.)
	8 inches		☐ Sluggish ☒ Moderate ☐ Rapid	

WATER	CONDUCTANCE	TEMPERATURE	pH	M.P.A.
☒ Clear ☐ Stained ☐ Dirty	..... C_f ..... C_{77}	44° Water 34° Air 1 PM Time		..... ppm

WATER LEVEL CONDITIONS	PRIOR WEATHER CONDITIONS
..In. Below X Normal ..In Above	Clear - sunny - cool

POLLUTION: None

STREAM BOTTOM TYPES (%)					POOL GRADE
80 Bedrock	Hardpan	10 Boulder	Rubble	10 Gravel	B
Sand	Silt	Marl	Detritus		POOL-RIFFLE RATIO 60 30 10

AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.	AQUATIC VEGETATION (Species)	Abund.
None					

INSTREAM COVER	Scarce	Common	Abundant	Stable	Unstable	AQUATIC LIFE	Scarce	Common	Abundant
Undercut banks	X					Stonefly			
Rocks, boulders			X	X		Mayfly			
Logs, trees	X					Caddisfly			
Debris	X					Shrimp			
Aquatic Vegetation	X					Crayfish			

STREAM BANK VEGETATION

..% Cultivated	70 % Upland Hardwood	..% Swamp Conifer
..% Firm Pasture	30 % Upland Conifer	..% Shrub Marsh
..% Meadow Pasture	..% Swamp Hardwood	..% Open Marsh

STREAM COVER	FISHABILITY
☐ Dense ☐ Partly Open ☒ Open	☒ Excellent ☐ Good ☐ Fair ☐ Poor

BANK EROSION	DAMS	Number	Height	Pool Area Above
☐ Heavy ☐ Medium ☐ Light ☒ None	Man-made	0		
BANK HEIGHTS	Beaver (active)	0		
NEED FOR INSTREAM DEVICES ☐ Heavy ☐ Medium ☐ Light ☒ None	Beaver (inactive)	0		

REMARKS

This portion of station 2 was sampled in a different manner than the plunge-pool immediately below the dam, so fish data were recorded separately.

(use back of sheet for additional remarks)

DATE OF SURVEY	INVESTIGATOR
4-17-90	J. Cox - J. Wilson - B. Olson

REV. 5-74

Department of Natural Resources

STATION FISH SAMPLING SUMMARY
Form 3600-57

Air Temp 34°F, Water Temp 44°F

STREAM				INVESTIGATOR		
White River				J. Cox - J. Wilson - B. Olson		
Area Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO.	NO. PER ACRE	DATE
				2B		4-17-90

SIZE RANGE	SPECIES					
	Rainbow Trout					
1						
1.0 - 1.4						
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				Creek Chub - Present		
6.5 - 6.9				White Sucker - Present		
7.0 - 7.4				Trout Perch - Present		
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	1					
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						
[illegible] (give actual size)	25.5					
TOTAL	2					

Rev. 3-75

APPENDIX E-14 WDNR 2015 White River Flowage Fyke Netting Data

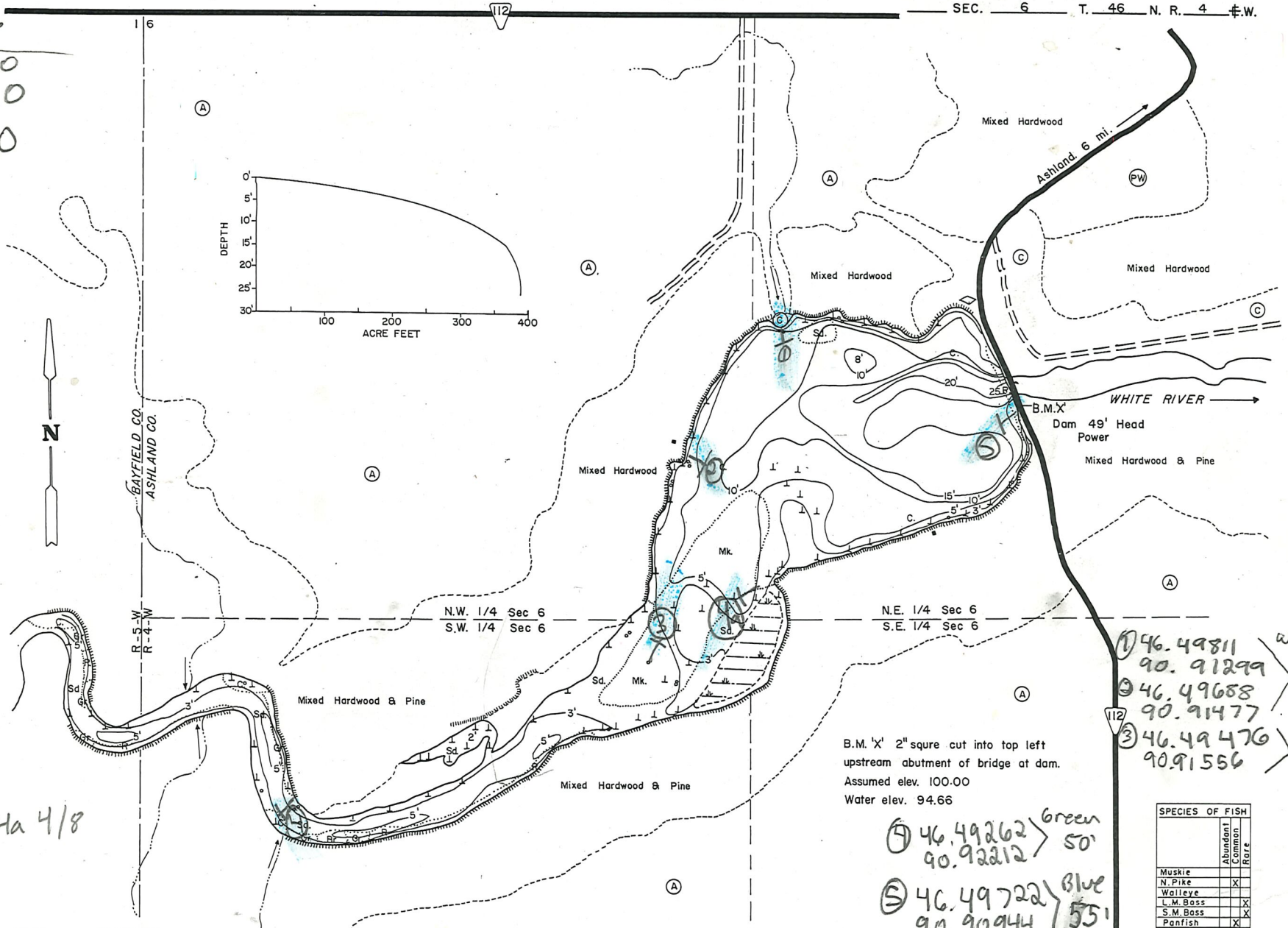
WISCONSIN CONSERVATION DEPARTMENT

LAKE SURVEY MAP

WHITE RIVER LAKE — ASHLAND COUNTY

SEC. 6 T. 46 N. R. 4 E.W.

T°
4/7 | 40.0
4/8 | 39.0
4/10 | 43.0



Set 4/7
moved 4 → 4a 4/8

① 46.49811 / 90.91299 } white 50'
② 46.49688 / 90.91477
③ 46.49476 / 90.91556 } Blue 75'

④ 46.49262 / 90.92212 } Green 50'

⑤ 46.49722 / 90.90944 } Blue 55'

④a 46.49838 / 90.91014

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

EQUIPMENT RECORDING SONAR MAPPED SEPT MO. 1966 YR.

WATER ELEV. 94.66

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

◇ Access ◆ Access with Parking ◆ Boat Livery

Field work by C. Busch, L. Sather, N. Porkorny Drawn by: C. Holt

AREA 56.1 ACRES
UNDER 3FT. 28.2 %
OVER 20FT. 1.4 %
VOLUME 390.7 ACRE FT.
TOTAL ALK. 99 P.P.M.
SHORELINE 2.7 MILES
MAX. DEPTH 26 FEET

WDNR COMMENT

SW1

WDNR COMMENT

Sheet ____ of ____ Survey ID = 515077684 Station ID = 123718

WALLEYE NETTING DATA COLLECTION SHEET (3600-186-W/N) **WALLEYE** Wisconsin Department of Natural Resources

Waterbody Name: White River Flowage
MWB Code/WBIC:
Waterbody Type:
County:
Date (MM/DD/YY): 4/7/15 - 4/10/15
Station:
Start Time:
End Time:
Collectors: Folsted, Lawson, Hulin

Target Fish: ~~Walleye~~ Walleye Pike
Mark Given:
Survey Type: Population Estimate
Gear Type: Fyke Net
Weather: Cloudy
Adverse Conditions:
Water Temperature: 39.0°
Water Level: [HI] [NORM] [LOW]
Water Clarity:

Number of Nets: 5
Number of Nights: 3
Net Frame Height:
Net Frame Width:
Lead Length:
Largest Bar Mesh Size:
Smallest Bar Mesh Size:
Mesh Color:
Mesh Material:

15 net nights

4/8 4/10

inches	NP MALE Unclipped	Clipped	inches	NP FEMALE Unclipped	Clipped	inches	NP UNKNOWN Unclipped	Clipped
<3.0			<3.0			<3.0		
3.0-3.4			3.0-3.4			3.0-3.4		
3.5-3.9			3.5-3.9			3.5-3.9		
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		
12.5-12.9			12.5-12.9			12.5-12.9		
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			14.0-14.4			14.0-14.4		
14.5-14.9			14.5-14.9			14.5-14.9		
15.0-15.4			15.0-15.4			15.0-15.4		
15.5-15.9			15.5-15.9			15.5-15.9		
16.0-16.4			16.0-16.4			16.0-16.4		
16.5-16.9			16.5-16.9			16.5-16.9		
17.0-17.4			17.0-17.4			17.0-17.4		
17.5-17.9			17.5-17.9			17.5-17.9		
18.0-18.4			18.0-18.4			18.0-18.4		
18.5-18.9			18.5-18.9			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			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			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:			TOTALS:			TOTALS:		

4/8 4/10 — 4/8 4/10 — 4/8 4/10

NO CLIP

1- Pad

14 — 5 — 2 5 — .21 total

WALLEYE / NETTING

Wisconsin
Department of Natural Resources

WDNR COMMENT

NETTING DATA COLLECTION SHEET (4.0 in. - 40+ in.)
Form 3600-188 Rev. 4-94

Lake LRF MWB Code: _____ Date: 4/8/15 County: _____ Collector: _____

Target Fish: _____ Survey Type: _____ Mark Given: _____ H_2O Temp: _____ Time _____ : _____

Adverse Conditions: _____ Station: _____

Net Type: _____ Length/Frame: _____ Bar Mesh: _____

Color: _____ Mesh Type: _____ Net Nights: _____

Inches	BLG	BKC	LSD	BRT	Inches			NET 1		
4.0 - 4.4	6.8	6.7	4.5	8.6	30.0 - 30.4			Species		
4.5 - 4.9	6.3	5.9			30.5 - 30.9			Count		
5.0 - 5.4	6.3	8.0			31.0 - 31.4					
5.5 - 5.9	7.2	6.0		BRT	31.5 - 31.9			Species		
6.0 - 6.4	7.3			21.8	32.0 - 32.4			Count		
6.5 - 6.9	6.8	5.7	5.5		32.5 - 32.9					
7.0 - 7.9	6.6		5.4		33.0 - 33.4			Species		
7.5 - 7.9	6.2		5.3		33.5 - 33.9			Count		
8.0 - 8.4	5.6		4.7		34.0 - 34.4					
8.5 - 8.9	6.7		4.9		34.5 - 34.9			NET 2		
9.0 - 9.4	6.3				35.0 - 35.4			Species		
9.5 - 9.9	6.5				35.5 - 35.9			Count		
10.0-10.4	6.5				36.0 - 36.4					
10.5-10.9					36.5 - 36.9			Species		
11.0-11.4	7.6				37.0 - 37.4			Count		
11.5-11.9	4.9				37.5 - 37.9					
12.0-12.4	6.3				38.0 - 38.4			Species		
12.5-12.9	7.3				38.5 - 39.9			Count		
13.0-13.4	6.9				39.0 - 39.4					
13.5-13.9	7.5				39.5 - 39.9			NET 3		
14.0-14.4	7.3				40 +			Species		
14.5-14.9	6.2							Count		
15.0-15.4	6.3									
15.5-15.9	6.7							Species		
16.0-16.4								Count		
16.5-16.9										
17.0-17.4								Species		
17.5-17.9								Count		
18.0-18.4										
18.5-18.9								NET 4		
19.0-19.4								Species		
19.5-19.9								Count		
20.0-20.4										
20.5-20.9								Species		
21.0-21.4								Count		
21.5-21.9										
22.0-22.4								Species		
22.5-22.9								Count		
23.0-23.4										
23.5-23.9								NET 5		
24.0-24.4								Species		
24.5-24.9								Count		
25.0-25.4										
25.5-25.9								Species		
26.0-26.4								Count		
26.5-26.9										
27.0-27.4								Species		
27.5-27.9								Count		
28.0-28.4										
28.5-28.9										
29.0-29.4										
29.5-29.9										

Sheet____of____ **WDNR COMMENT**

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

Wisconsin Department of Natural Resources

Waterbody Name: White River Flowage
MWB Code/WBIC: _____
Waterbody Type: _____
County: _____
Date (MM/DD/YY): 4/8/15
Station: _____
Start Time: _____
End Time: _____
Collectors: Folstad, Lauser, Hulin

Target Fish: Pike
Mark Given: _____
Survey Type: Population Estimate
Gear Type: Fyke Net
Weather: _____
Adverse Conditions: _____
Water Temperature: 39
Water Level: [HI] [NORM] [LOW]
Water Clarity: _____

Number of Nets: 5
Number of Nights: 1 (5 net nights)
Net Frame Height: _____
Net Frame Width: _____
Lead Length: _____
Largest Bar Mesh Size: _____
Smallest Bar Mesh Size: _____
Mesh Color: _____
Mesh Material: _____

SPECIES	Net # 1	Net # 2	Net # 3	Net # 4	Net # 5	Net #	Net #	Net #	Net #	Net #	Net #	Net #	TOTALS
WP	3	3	3	–	1								10
Redhorse	20	–	–	6	20								46
White Sucker	10	6	10	–	5								31
Black Crappie	1	2	–	–	1								4
Bluegill	2	5	4	–	2								13
Brown Bullhead	3	1	–	–	3								7
PKSD	–	1	–	–	–								1

WDNR COMMENT

Sheet____of____

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

CPE

Wisconsin Department of Natural Resources

Waterbody Name: White River Flowage
MWB Code/WBIC:
Waterbody Type:
County:
Date (MM/DD/YY): 4/10/15
Station:
Start Time:
End Time:
Collectors: Folstad, Lawson, Hallo

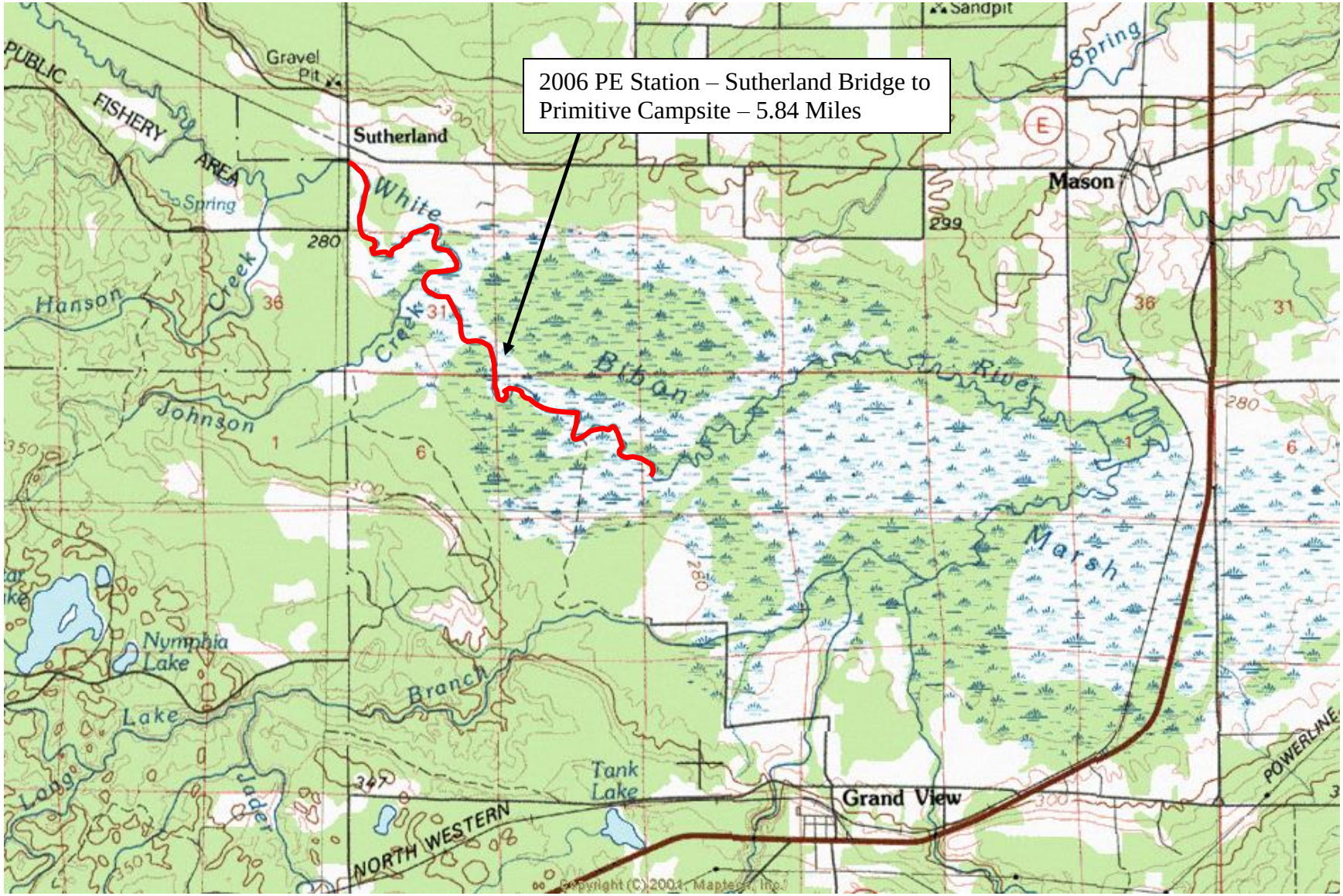
Target Fish:
Mark Given:
Survey Type: Population Estimate
Gear Type: Fyke Net
Weather: Sunny, 52°
Adverse Conditions:
Water Temperature: 43
Water Level: [HI] [NORM] [LOW]
Water Clarity:

Number of Nets: 5
Number of Nights: 2 (10 net nights)
Net Frame Height:
Net Frame Width:
Lead Length:
Largest Bar Mesh Size:
Smallest Bar Mesh Size:
Mesh Color:
Mesh Material:

SPECIES	Net # 1	Net # 2	Net # 3	Net # 4a	Net # 5	Net # 6	Net #	Net #	Net #	Net #	Net #	Net #	TOTALS
NP	2	2	5	—	2	1							11
BLG	3	3	1	—	3								10
BC	—	1	—	—	—								1
Redhorse	37	3	6	14	17								77
White Sucker	19	4	8	13	5								49
PMSD	1	1	—	—	3								5
Brown bull	—	3	3	—	—								6
BRT	—	—	—	—	1								1
BKT	—	—	1	—	—								1

APPENDIX E-15 WDNR 2006-2019 Trend Monitoring Data

WDNR COMMENT



WDNR COMMENT

Waterbody	Survey Type	Date	Common species name	Scientific species name	Count of individuals		
WHITE RIVER	Mini-boom electrofishing	05/17/06	BROOK TROUT	Salvelinus fontinalis	12		
WHITE RIVER	Mini-boom electrofishing	04/17/07	BROOK TROUT	Salvelinus fontinalis	1		
WHITE RIVER	Mini-boom electrofishing	05/09/08	BROOK TROUT	Salvelinus fontinalis	2		
WHITE RIVER	Mini-boom electrofishing	04/13/09	BROOK TROUT	Salvelinus fontinalis	1		
WHITE RIVER	Mini-boom electrofishing	03/30/11	BROOK TROUT	Salvelinus fontinalis	5		
WHITE RIVER	Mini-boom electrofishing	04/12/12	BROOK TROUT	Salvelinus fontinalis	4		
WHITE RIVER	Mini-boom electrofishing	03/28/17	BROOK TROUT	Salvelinus fontinalis	5		
WHITE RIVER	Mini-boom electrofishing	04/04/19	BROOK TROUT	Salvelinus fontinalis	1	31	0.70%
WHITE RIVER	Mini-boom electrofishing	05/17/06	BROWN TROUT	Salmo trutta	974		
WHITE RIVER	Mini-boom electrofishing	04/17/07	BROWN TROUT	Salmo trutta	541		
WHITE RIVER	Mini-boom electrofishing	05/09/08	BROWN TROUT	Salmo trutta	381		
WHITE RIVER	Mini-boom electrofishing	04/13/09	BROWN TROUT	Salmo trutta	325		
WHITE RIVER	Mini-boom electrofishing	03/28/10	BROWN TROUT	Salmo trutta	385		
WHITE RIVER	Mini-boom electrofishing	03/30/11	BROWN TROUT	Salmo trutta	374		
WHITE RIVER	Mini-boom electrofishing	04/12/12	BROWN TROUT	Salmo trutta	622		
WHITE RIVER	Mini-boom electrofishing	03/28/17	BROWN TROUT	Salmo trutta	227		
WHITE RIVER	Mini-boom electrofishing	04/04/19	BROWN TROUT	Salmo trutta	202	4031	93.20%
WHITE RIVER	Mini-boom electrofishing	04/12/12	CREEK CHUB	Semotilus atromaculatus	1	1	0.02%
WHITE RIVER	Mini-boom electrofishing	05/17/06	NORTHERN PIKE	Esox lucious	2		
WHITE RIVER	Mini-boom electrofishing	04/17/07	NORTHERN PIKE	Esox lucious	1	3	0.07%
WHITE RIVER	Mini-boom electrofishing	03/30/11	TIGER TROUT	Salmo trutta × Salvelinus fontinali	1		
WHITE RIVER	Mini-boom electrofishing	04/12/12	TIGER TROUT	Salmo trutta × Salvelinus fontinali	1	2	0.05%
WHITE RIVER	Mini-boom electrofishing	04/17/07	WHITE SUCKER	Semotilus atromaculatus	44		
WHITE RIVER	Mini-boom electrofishing	05/09/08	WHITE SUCKER	Semotilus atromaculatus	38		
WHITE RIVER	Mini-boom electrofishing	04/13/09	WHITE SUCKER	Semotilus atromaculatus	43		
WHITE RIVER	Mini-boom electrofishing	03/28/10	WHITE SUCKER	Semotilus atromaculatus	1		
WHITE RIVER	Mini-boom electrofishing	03/30/11	WHITE SUCKER	Semotilus atromaculatus	3		
WHITE RIVER	Mini-boom electrofishing	04/12/12	WHITE SUCKER	Semotilus atromaculatus	91		
WHITE RIVER	Mini-boom electrofishing	03/28/17	WHITE SUCKER	Semotilus atromaculatus	26		
WHITE RIVER	Mini-boom electrofishing	04/04/19	WHITE SUCKER	Semotilus atromaculatus	9	255	5.90%
						4323	

APPENDIX E-16 Fisheries and Riverine Habitat Assessment Study Report

FINAL STUDY REPORT

FOR

White River Hydroelectric Project (FERC Project No. 2444)

Fisheries Study and Riverine Aquatic Habitat Assessment

Prepared for:

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November 28, 2022

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1.0 BACKGROUND

Northern States Power Company – Wisconsin (NSPW or Licensee), currently holds a license issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the White River Hydroelectric Project (Project). The Project is owned, operated, and maintained by the Licensee. The current license, which designates the Project as FERC No. 2444, expires on July 31, 2025. To obtain a subsequent license, the Licensee must submit a final license application to FERC no later than July 31, 2023. The final license application, in part, must include an evaluation of the existing fishery associated with the Project.

There is existing fisheries information for the White River Flowage from a 2015 fyke netting survey; however, there is a lack of recent fisheries information downstream of the Project dam. The first goal of this study was to conduct seasonal catch per unit effort (CPUE) surveys in spring, summer, and fall below the dam within the bypassed reach and downstream of the powerhouse for approximately ¼ mile. These surveys would quantify fish population relative abundance and document the composition of the general fish community.

In addition to the above-described surveys, the Wisconsin Department of Natural Resources (WDNR) also requested that riverine habitat be assessed using the WDNR Guidelines for Evaluating Habitat of Wadable Streams. The second goal of this study was to evaluate the riverine habitat of the same two downstream river reaches where the fishery surveys were completed.

2.0 STUDY AREA

The White River Dam is located on the White River approximately 5 miles south of the city of Ashland, in Ashland County, Wisconsin. The study area included approximately 1,350 feet of bypassed river channel extending from the dam at State Highway 112 downstream to the powerhouse, and an approximately 1,320 foot stretch of river (tailrace) from the powerhouse downstream (Figure 1).

In order to compare the fish community between the bypass channel and tailrace, fish collection data was recorded separately for both areas. Similarly, in order to compare the habitat between the river reaches, one-half of the habitat assessment transects were established in the bypass channel and the other half were established in the tailrace.

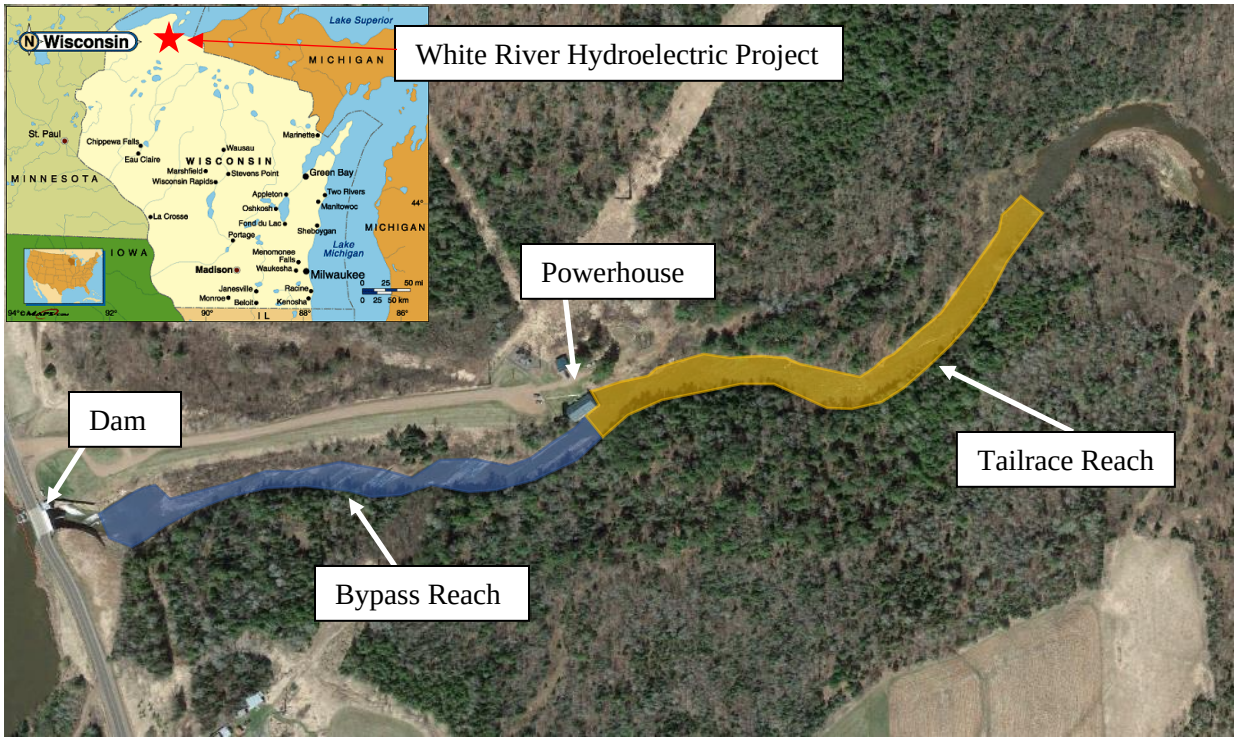

Figure 1. Study Area for the White River Fisheries Study and Riverine Aquatic Habitat Assessment, 2022

3.0 SURVEY METHODS

3.1 Electrofishing

Stream electrofishing surveys were conducted seasonally in the spring (late May), summer (late July), and fall (late September) of 2022. One electrofishing pass was conducted per season. Each electrofishing pass was distributed across the stream channel and throughout various habitats as conditions dictated. Electrofishing was conducted via a towed barge with a Pulsed DC-current set up controlled by a Smith-Root Generator Powered Pulser (GPP) running to a hand-held netted anode and powered by a 12-volt AC generator. Output was set according to conditions but was generally 600 volts, 120 pulses per second DC and limited to produce 3-4 amps. Time fished was recorded in seconds for catch per unit effort (CPUE) calculations. CPUE is calculated as individuals captured per second of button time.

Collected fish were held in a live-well until the end of each electrofishing pass whereby they were counted and identified to species. After the fish were processed, they were released in area where the risk of recapture was minimized. Larger fish were individually measured to the nearest millimeter (mm) and weighed to the nearest gram (gm). For smaller fish, a length range was obtained (smallest and largest individuals of each species) and the fish were batch weighed in order to register a valid weight on the scale.

3.2 Habitat Assessment

The habitat assessment was conducted following WDNR Guidelines for Evaluating Habitat of Wadable Streams (2002), with the objective of evaluating the quality of the habitat in the White River downstream of the dam. To allow sufficient coverage throughout the study reach, a total of 14 transects were

established and spaced at a distance of 45 meters (m) apart or three times the mean wetted width (Figure 2). The following data was collected at each transect:

- Distance from start of study reach
- Wetted width
- Habitat type
- Depth at deepest point along transect (thalweg)
- Length of each transect containing various types of cover for adult fish
- Amount of bank erosion
- Riparian land use within 5 meters of stream edge
- Riparian buffer width

Along each transect, four equally spaced sampling points were established, effectively dividing each transect into five equal segments. Within a 0.3 m x 0.3 m quadrate located on the stream bottom, centered on the transect point, the following data was collected:

- Water depth (if a boulder was directly on the transect point, depth was measured next to the boulder)
- Depth of fines and water
- Embeddedness of coarse gravel and rubble/cobble
- Percent of the stream bottom covered by various substrate types, algae, and macrophytes
- Percent of the transect shaded by canopy

Using the habitat data collected, and the Fish Habitat Rating system (Table 1) developed by WDNR (Simonson, Lyons, and Kanehl, 1993.), an overall fish habitat score was calculated for each study reach. The score, which can range from zero to 100, is designed to provide a qualitative rating of fish habitat and is divided into the following categories.

- Excellent ≥ 80
- Good 60-80
- Fair 20-60
- Poor < 20

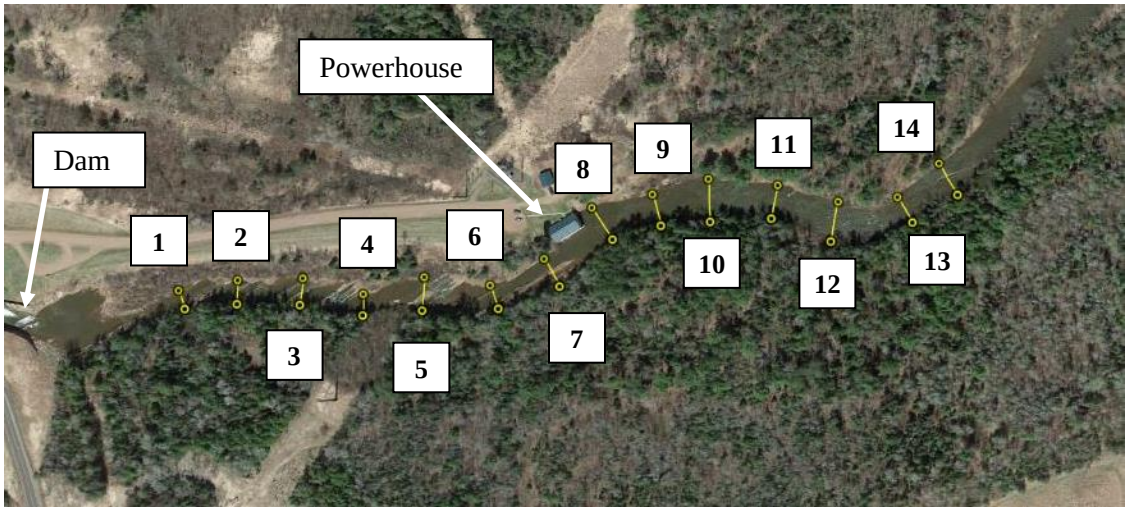

Figure 2. Transects Established for the White River Habitat Assessment, 2022.

Table 1. Fish Habitat Rating system (FHR) developed by WDNR (Simonson, Lyons, and Kanehl, 1993.)

RATING ITEM	EXCELLENT	GOOD	FAIR	POOR
Bank Stability (% of bank protected by rock or vegetation)	No significant bank erosion; ≥ 90% of bank protected; ≤ 10% bare soil **(12)**	Limited erosion; 70 to 90% of bank protected; 10 to 30% bare soil **(8)**	Moderate erosion; 50 to 60% of bank protected; 10 to 30% bare soil **(4)**	Extensive erosion; < 50% of bank protected; > 50% bare soil **(0)**
Maximum Thalweg Depth (average of the four deepest depths recorded)	Stream very deep; ≥ 1.5 meters **(25)**	Stream relatively deep; 1 to 1.5 meters **(16)**	Stream moderately deep; 0.6 to 0.9 meters **(8)**	Stream relatively shallow; < 0.6 meters **(0)**
Riffle:Riffle or Bend:Bend Ratio (average distance between riffles or bends divided by average stream width)	Diverse habitats; meandering stream with deep bends and riffles common; ratio ≤ 10 **(12)**	Diverse habitats;bends and riffles present but not abundant; ratio 10 to 14 **(8)**	Habitat diversity low; occasional riffles or bends; ration 15 to 25 **(4)**	Habitat monotonous; riffles or bends rare; generally continuous run habitat; ratio > 25 **(0)**
Rocky Substrate (% of the substrate, by area, that is bedrock, boulder, rubble/cobble, or gravel)	Extensive rocky substrate; ≥ 65% of stream bed **(25)**	Moderate rocky substrate; 45 to 65% of stream bed **(16)**	Limited rocky substrate; 15 to 44% of stream bed **(8)**	Rocky substrate uncommon; < 15% of stream bed **(0)**
Cover for Fish (% of the stream area with cover)	Cover/shelter for fish abundant; ≥ 12% of stream **(25)**	Cover common, but not extensive; 7 to 12% of stream **(16)**	Occasional cover, limited to one or two areas; 2 to 6% of stream **(8)**	Cover rare or absent; limited to , 2% of stream **(0)**

4.0 SURVEY RESULTS

Ideally, fish sampling was to be conducted when flows were low to allow ease of access to the river and the collection of fish. Spring rains made low-flow sampling during May impossible; however, both the summer and fall events were conducted during low flow conditions (Table 2). The habitat assessment was completed at the same time as the fall fish sampling effort and was conducted when only the minimum flow was being released into the bypass channel.

Table 2. Streamflow during Fish and Habitat Sampling Events at the White River Hydroelectric Project.

SAMPLING EVENT	DATE	DATA COLLECTED	BYPASS FLOW (cfs)	POWER HOUSE FLOW (cfs)	TOTAL FLOW (cfs)
Spring	5-26-22	Fish	130	270	400
Spring	5-27-22	Fish	145	270	415
Summer	7-25-22	Fish	40	150	190
Fall	9-27-22	Fish / Habitat	20*	190	210
Fall	9-28-22	Fish / Habitat	20*	185	205

** Minimum flow from the dam (16 cfs) plus an estimated 4 cfs leakage flow from gate 2*

4.1 Fish Collections

GLEC field staff collected 2,389 individual fish, representing 26 species and nine families, during all sampling events. Catch per unit effort (CPUE) was calculated for each fish species collected by dividing the number of individuals collected by the number of seconds of "button" time on the electrofishing unit. Common shiner had the highest CPUE, followed by shorthead redhorse, longnose dace, and trout-perch (Figure 3). Table 3 shows the total number of individuals for each species collected, relative abundance (% of total), and catch per unit effort (CPUE).

Common shiner (*Luxilus cornutus*) was the most abundant species collected and represented over 40% of all individuals captured during the study. The next most abundant species were Shorthead Redhorse (*Moxostoma macrolepidotum*) and Longnose Dace (*Rhinichthys cataractae*), representing approximately 15 and 11 percent of the fish collected, respectively. Trout-perch (*Percopsis omiscomaycus*) represented approximately nine percent of the collection while Hornyhead Chub (*Nocomis biguttatus*) and Smallmouth Bass (*Micropterus dolomieu*) each represented approximately five percent. All other species each represented less than five percent of the total fish collected.

Cyprinids were the most commonly collected family of fish, representing over 62 percent of the total number of fish collected (Figure 4), while Catostomidae represented approximately 18 percent of the total. The families Percopsidae and Centrarchidae represented approximately nine and six percent of the fish collected, respectively; while all other families each comprised less than five percent of the total.

The summer sampling event conducted in July resulted in the largest number of fish collected (1,371 or 57% of the total number of fish collected). The fall sampling event in September represented 27 percent of the total while the spring event in May represented 16 percent. Figure 5 shows a graphical representation of the number of each fish species collected during each of the three sampling events. Of the 2,389 fish collected during the study, 1,598 (66.9%) were collected from the bypass reach (Figure 6).

Fish collected during the study ranged from 28 mm to 647 mm in length. Length-frequency distributions for each species, grouped by family, are presented in Figure 7. Length to weight relationships of the fish collected are presented in Figure 8.

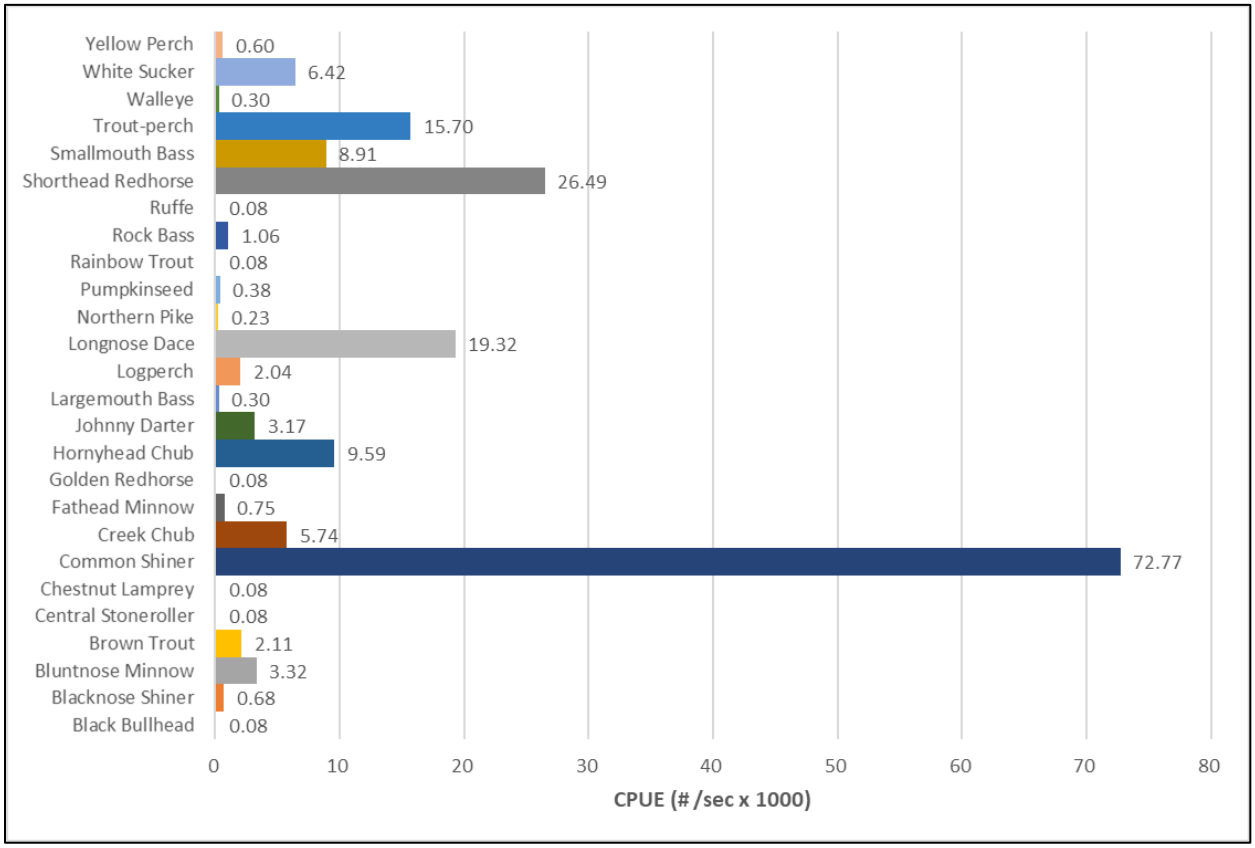

Figure 3. Catch per Unit Effort (CPUE) of Fish Species Collected during the White River Fisheries Study, 2022

Table 3. Summary of Species Collected from the fisheries study at the White River Hydroelectric Project (May, July, and September 2022).

Common Name	Scientific Name	Total Collected	Relative Abundance (%)†	CPUE (#/sec.)
Black Bullhead	*Ameiurus melas*	1	0.04%	7.54831E-05
Blacknose Shiner	*Notropis heterolepis*	9	0.38%	0.000679348
Bluntnose Minnow	*Pimephales notatus*	44	1.84%	0.003321256
Brown Trout	*Salmo trutta*	28	1.17%	0.002113527
Central Stoneroller	*Campostoma anomalum*	1	0.04%	7.54831E-05
Chestnut Lamprey	*Ichthyomyzon castaneus*	1	0.04%	7.54831E-05
Common Shiner	*Luxilus cornutus*	964	40.35%	0.0727657
Creek Chub	*Semotilus atromaculatus*	76	3.18%	0.005736715
Fathead Minnow	*Pimephales promelas*	10	0.42%	0.000754831
Golden Redhorse	*Moxostoma erythrurum*	1	0.04%	7.54831E-05
Hornyhead Chub	*Nocomis biguttatus*	127	5.32%	0.009586353
Johnny Darter	*Etheostoma nigrum*	42	1.76%	0.00317029
Largemouth Bass	*Micropterus salmoides*	4	0.17%	0.000301932
Logperch	*Percina caprodes*	27	1.13%	0.002038043
Longnose Dace	*Rhinichthys cataractae*	256	10.72%	0.019323671
Northern Pike	*Esox lucius*	3	0.13%	0.000226449
Pumpkinseed	*Lepomis gibbosus*	5	0.21%	0.000377415
Rainbow Trout	*Oncorhynchus mykiss*	1	0.04%	7.54831E-05
Rock Bass	*Ambloplites rupestris*	14	0.59%	0.001056763
Ruffe	*Gymnocephalus cernuus*	1	0.04%	7.54831E-05
Shorthead Redhorse	*Moxostoma macrolepidotum*	351	14.69%	0.026494565
Smallmouth Bass	*Micropterus dolomieu*	118	4.94%	0.008907005
Trout-perch	*Percopsis omiscomaycus*	208	8.71%	0.015700483
Walleye	*Sander vitreus*	4	0.17%	0.000301932
White Sucker	*Catostomus commersonii*	85	3.56%	0.006416063
Yellow Perch	*Perca flavescens*	8	0.33%	0.000603865
TOTAL NUMBER OF SPECIES		**26**		
TOTAL NUMBER OF INDIVIDUALS		**2389**		

† *Percent Total Fish Collected*

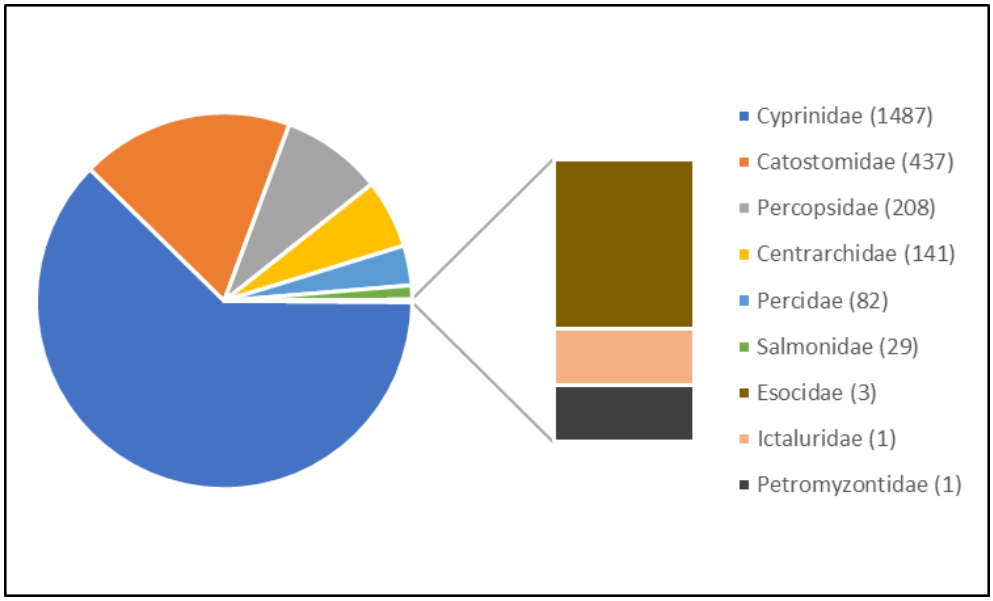

Figure 4. Number of Fish Collected by Family - White River Fisheries Study, 2022

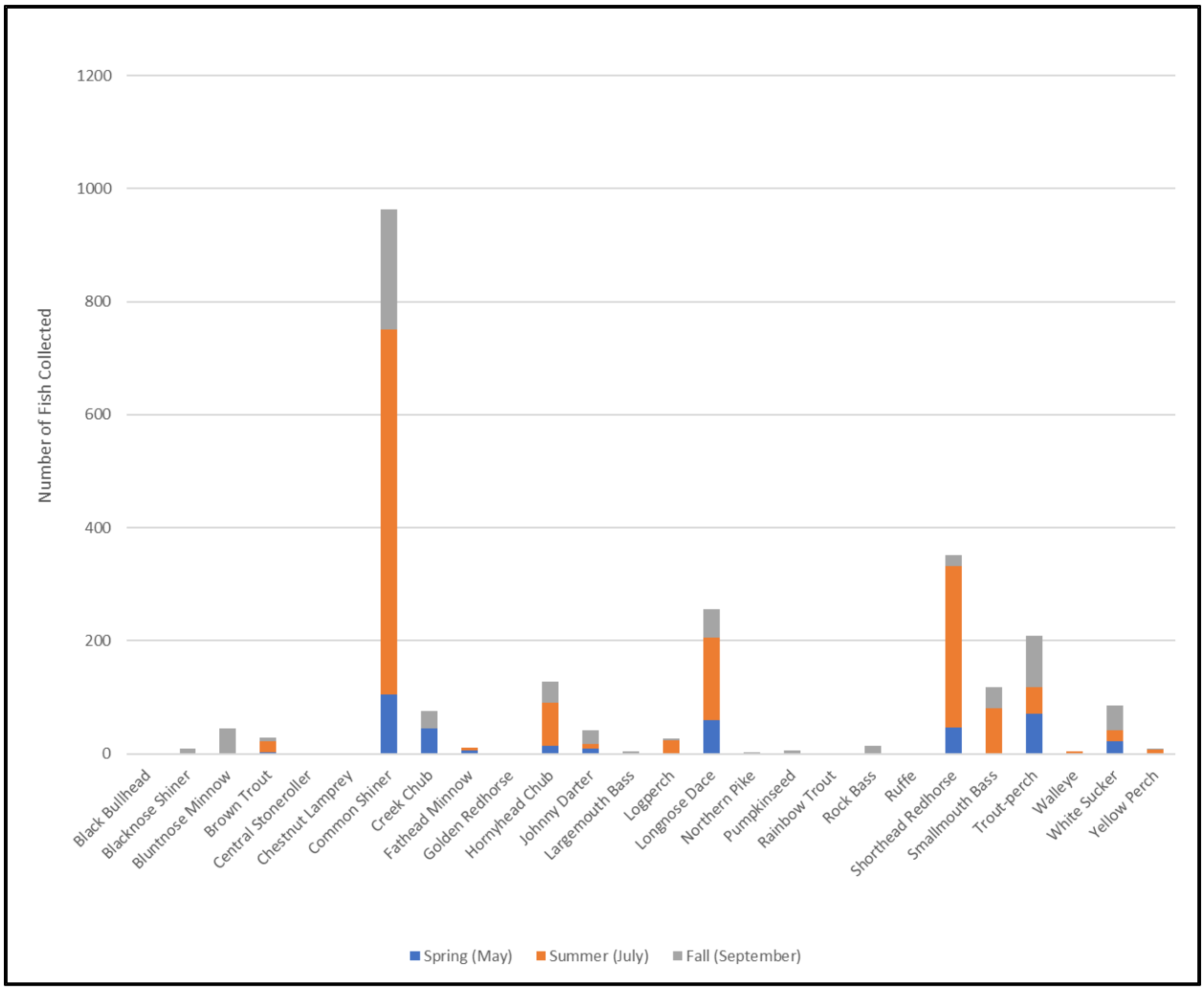

Figure 5. Number of Fish Collected by Species and Sampling Event; White River Fisheries Study, 2022

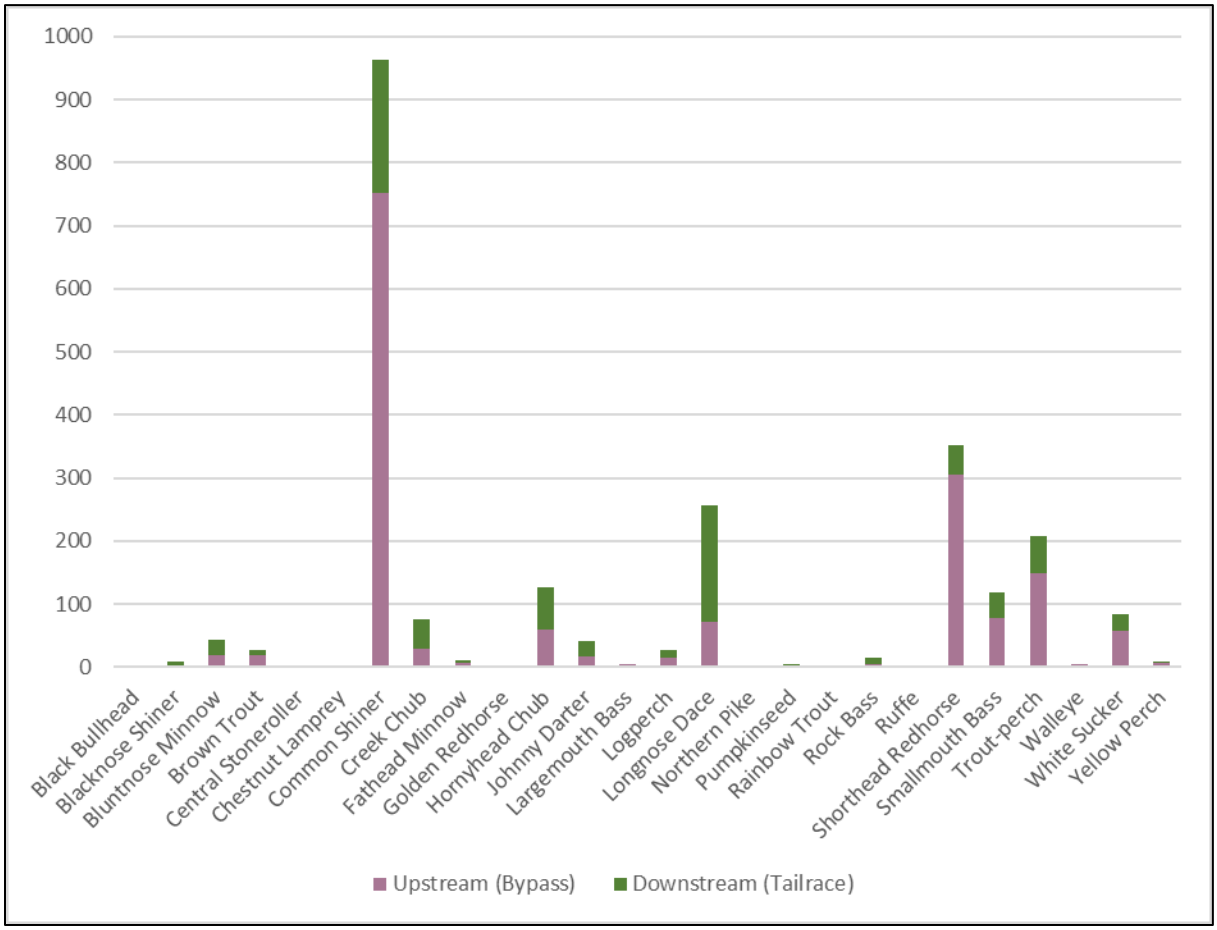

Figure 6. Number of Fish Collected by Species and Sampling Location; White River Fisheries Study, 2022

Figure 7. Length-Frequency Distribution of Fish Collected During the White River Fisheries Study, 2022

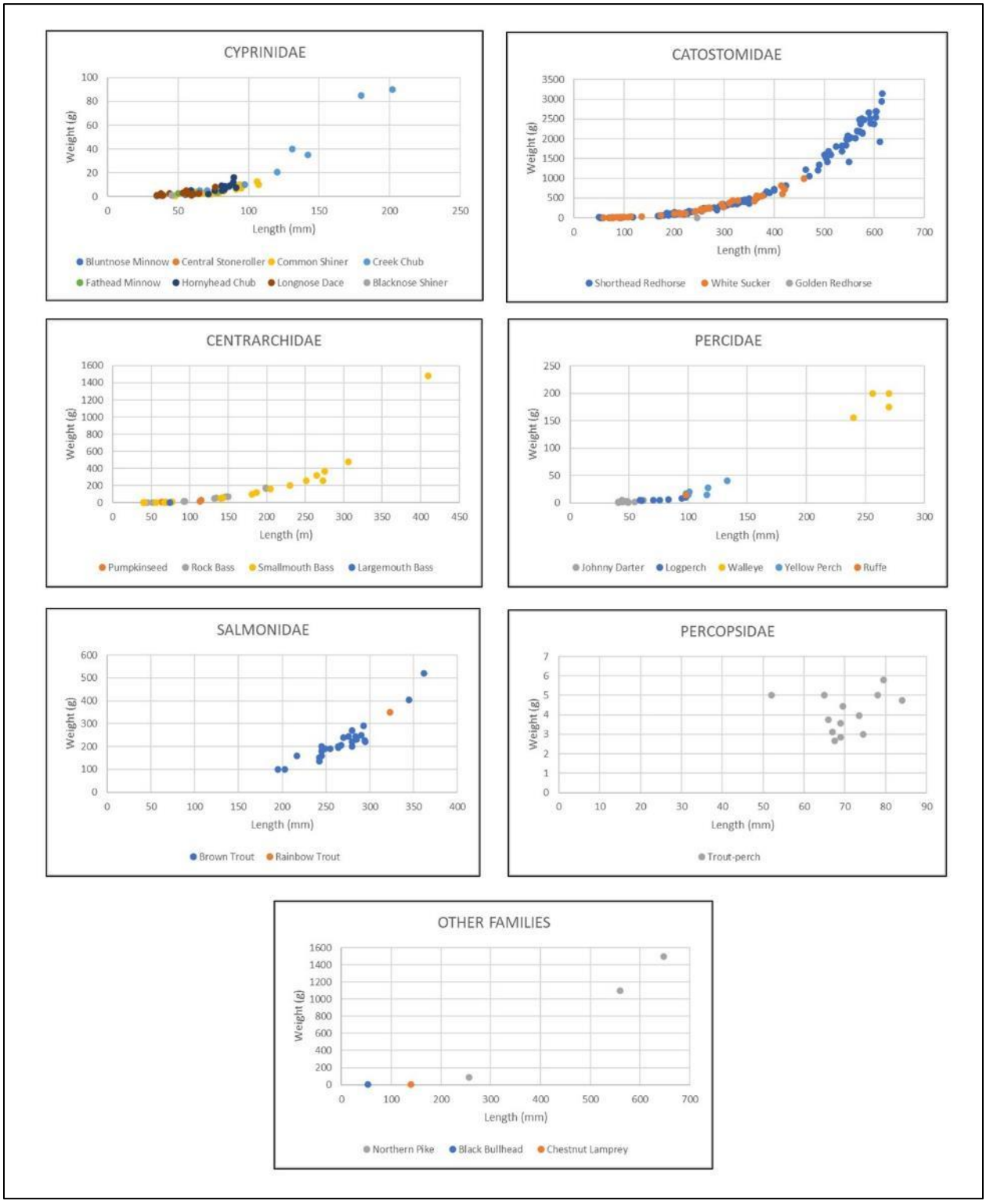

Figure 8. Length-Weight Relationships of Fish Collected During the White River Fisheries Study, 2022

4.2 Fish Habitat Rating Score

The habitat study reach as a whole contained a mix of riffle, run, and pool habitat dominated by hard substrate. The upper portion of the reach (bypass channel) was primarily bedrock while the lower half (below the powerhouse) was a mix of bedrock, boulder, cobble, and gravel. Shallow water and areas of soft substrates were rare in either portion of the study reach. Cover for adult gamefish, which includes boulders, aquatic macrophytes, overhanging vegetation, undercut banks, woody debris, ledges, etc. in at least 20 cm of water was somewhat sparse throughout the study reach. A comparison of the physical parameters of the study reach (as a whole and for each half) are presented in Table 4.

Table 4. Physical Parameters of the Habitat Study Reach

Study Area	Entire Reach *(Transects 1-14)*	Bypass Area *(Transects 1-7)*	Tailrace Area *(Transects 8-14)*
Wetted Width Range (m)	7 - 32	7 - 27	17 - 32
Average Wetted Width (m)	20.9	17.6	24.3
Thalweg Depth Range (cm)	43 - 120	43 - 75	65 - 120
Average Thalweg Depth (cm)	77.4	60.6	94.1
Amount of Fish Cover Range (m)	0 - 3	0.5 - 1	0 - 3
Average Amount of Fish Cover (m)	1.3	0.7	1.8
Amount of Fish Cover Range (%)	0 – 13.6	2.2 - 12.9	0 – 13.6
Average Amount of Fish Cover (%)	6.7	5.2	8.2
Percent Rocky Substrate Range (%)	78.8 - 100	100	78.8 - 100
Average Percent Rocky Substrate (%)	96.2	100	92.3

When the habitat data was entered into the WDNR fish habitat scoring worksheet for streams greater than 10 meters wide (Table 5), the study reach as a whole (including both the bypass reach and tailrace) scored in the “good” range with an overall score of 69. Deductions from the top score of 100 were due primarily to moderate depths, relatively low amounts of fish cover, and a lack of bends or other stream complexes which add to the overall diversity of the stream structure.

Table 5. Fish Habitat Rating Scores for Entire Habitat Study Reach

RATING ITEM	STUDY REACH RATING/SCORE
Bank Stability	Excellent (12)
Maximum Thalweg Depth	Good (16)
Riffle:Riffle or Bend:Bend Ratio	Good (8)
Rocky Substrate	Excellent (25)
Cover for Fish	Fair (8)
TOTAL SCORE	**69**

When evaluating data from the bypass reach and tailrace separately (Table 6 and Table 7), both portions of the reach still scored in the “good” range, but the bypass scored on the very low end of the range (61) while the area below the powerhouse scored on the upper end of the range (77). The differences between the two portions of the study reach were found to be thalweg depths, which are generally shallower in the bypass portion of the reach and therefore received a lower score than the study reach as a whole; and fish cover which was slightly more prevalent in the lower portion of the reach and received a higher score than the study reach as a whole.

Table 6. Fish Habitat Rating Scores for Bypass Area (Transects 1-7)

RATING ITEM	STUDY REACH RATING/SCORE
Bank Stability	Excellent (12)
Maximum Thalweg Depth	Fair (8)
Riffle:Riffle or Bend:Bend Ratio	Good (8)
Rocky Substrate	Excellent (25)
Cover for Fish	Fair (8)
TOTAL SCORE	**61**

Table 7. Fish Habitat Rating Scores for Tailrace Area (Transects 8-14)

RATING ITEM	STUDY REACH RATING/SCORE
Bank Stability	Excellent (12)
Maximum Thalweg Depth	Good (16)
Riffle:Riffle or Bend:Bend Ratio	Good (8)
Rocky Substrate	Excellent (25)
Cover for Fish	Good (16)
TOTAL SCORE	**77**

5.0 REFERENCES

Simonson, Timothy D.; Lyons, John; Kanehl, Paul D. 1993. Guidelines for evaluating fish habitat in Wisconsin streams. General Technical Report NC-164. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central Forest Experiment Station

WDNR. 2002. Guidelines for Evaluating Habitat of Wadable Streams. Wisconsin Department of Natural Resources, Madison, WI.

Appendix A

Fish Collection Datasheets

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 05/27/22
Stream Name: White River	County: Ashland
Location: White River - Upstream Site	Crew: Stricko / Turner
Gear Type: Backpack Sportyak Boat (Circle One)	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	

Distance (m):	Time Fished (sec):	Identified By: Stricko

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher	
1	SRH	510	1640	1			
2	SRH	600	2380	1			
3	SRH	615	2950	1			
4	SRH	501	1600	1			
5	SRH	611	1920	1			
6	TRP	53-96	120	40			
7	WTS	93	10	1			
8	HHC	89	12	1			
9	LND	37-44	-	5			
10	LND	42-46	-	3			
11	FHM	48-52	5	2			
12	COS	52-74	10	4			
13	COS	45-80	45	11			
14	SRH	509	1680	1			
15	SRH	616	3140	1			Ripe female
16	SRH	573	2380	1			
17	SRH	593	2400	1			
18	SRH	488	1200	1			
19	SRH	536	1680	1			
20	SRH	566	2200	1			
21	WTS	419	760	1			
22	WTS	460	1000	1			
23	WTS	317	440	1			
24	SMB	410	1480	1			
25	WTS	201	105	1			
26	WTS	90	10	1			
27	CRC	61-70	10	2			

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

Pg 2 of 2

ID Number:	Date (mm/dd/yyyy): 05/26/22
Stream Name: White River	County:
Location: Downstream Reach	Crew: Stricko / Turner
Gear Type: (Circle One) Backpack Sportyak Boat	
Channel Position: (Circle one if Boat Electrofishing) Right Bank Mid-channel Left Bank	
Distance (m):	Time Fished (sec): 1229 / Identified By: Stricko

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	SRH	550	2000	1		
2	~~SRH~~	~~542~~		1		
3	SRH	544	1840	1		
4	SRH	549	1420	1		
5	SRH	580	2480	1		
6	SRH	547	2080	1		
7	SRH	589	2660	1		
8	SRH	524	1800	1		
9	SHR	385	660	1		
10	SRH	592	2520	1		
11	SRH	562	2020	1		
12	SRH	545	1980	1		
13	SRH	535	1820	1		
14	SHR	400	720	1		
15	BRT	264	200	1		
16	FHM	74 - 81	7	2		
17	HHC	47 - 120	60	7		
18	TRP	51 - 87	940	14		
19	CRC	47 - 80	20	7		
20	COS	49 - 87	20	7		
21	JND	42 - 50	5	2		
22	LND	34 - 42	5	45		
23	WTS	72 - 98	20	2		
24						
25						
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD 2457 total scores

ID Number:	Date (mm/dd/yyyy): 05/26/2022
Stream Name: White River	County:
Location: Downstream Reach	Crew: Stricks / Tulres
Gear Type: Backpack Sportyak Boat (Circle One)	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 1229 / Identified By: Stricks

Visibility poor - moderately high flow

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	SRH	576	2160	1		
2	SRH	490	1340	1		
3	SRH	553	2040	1		
4	SRH	571	2180	1		
5	SRH	506	1420	1		
6	SRH	423	820	1		
7	SRH	576	2140	1		
8	BRT	175	—	1		
9	LND	41 - 76	75	35		
10	CRC	60 - 81	15	3	B	
11	COS	80	5	1		
12	TRP	65	5	1		
13	IND	44	5	1		
14	SHR	400	700	1		
15	COS	41 - 106	185	30		
16	CRC	42 - 83	72	29	B	
17	TRP	52 - 83	40	15		
18	HHC	49 - 94	12	5		
19	WTS	65 - 81	20	5		
20	LND	31 - 39	5	4		
21	IND	42 - 47	5	3		
22	FHM	62 - 66	5	2		
23	SRH	571	2480	1		
24	SRH	504	1500	1		
25	SRH	604	2700	1		
26	SRH	603	2700	1		
27	SRH	603	2540	1		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 05/27/22
Stream Name: White Rive	County: Ashland
Location: Upstream Bypass	Crew: Stricker / Turner
Gear Type: Backpack Sportyak Boat (Circle One)	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	

Distance (m):	Time Fished (sec): 1228	Identified By: Stricker

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	~~BR~~ TRP	78	[illegible]5	1		
2	LND	33-46	5	5		
3	COS	90-92	12	2		
4	CHL Anacele	140	5	1		
5	WTS	414	820	1		
6	WTS	360	420	1		
7	SHR	391	640	1		
8	SHR	336	440	1		
9	SHR	463	1220	1		
10	WTS	174	63	1		
11	WTS	135	35	1		
12	CRC	180	85	1		
13	CRC	52-70	5	2		
14	LND	38-38	5	2		
15	SRH	572	2180	1		
16	SRH	513	1600	1		
17	SRH	575	2520	1		
18	SRH	470	1060	1		
19	SHR	344	400	1		
20	WTS	363	500	1		
21	WTS	416	600	1		
22	WTS	421	720	1		
23	WTS	377	560	1		
24	WTS	365	560	1		
25	LND	37-57	—	4		
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 7-25-22
Stream Name:	County:
Location: White River Upstream	Crew:
Gear Type: Backpack Sportyak Boat (Circle One)	Canoe barge
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	

Distance (m):	Time Fished (sec):	Identified By: Tuned

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Northern Pike	560	1100	1		
2	White Sucker	373	540?	1		
3	S.h.r.h.	206	100	1		
4	S. M. Bass	140	50	1		
5	Yellow Perch	133	40	1		
6	Yellow Perch	98	17	1		
7	Yellow Perch	117	28	1		
8	~~Sauger~~ Ruffe	98	15	1		
9	S.h.r.h	97	15	1		
10	Yellow Perch	100	15	1		
11	Yellow Perch	98	15	1		
12	S. M. Bass	36 - 47	30	17		
13	Trout Perch	62 - 85	155	39		
14	S.h.r.h.	30 - 82	150	119		
15	Longnose dace	37-40	—	3		
16	Log Perch	37 - 84	10	3		
17	Johnny darters	29-53	5	3		
18	Common Shiners	50 - 78	50	21		
19	S.h.rh	340	400	1		
20	Shrh	280	250	1		
21	Shrh	325	350	1		
22	Shrh	290	290	1		
23	Shrh	315	375	1		
24	Shrh	365	495	1		
25	Shrh	350	480	1		
26	Shrh	302	305	1		
27	Shrh	341	415	1		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 07/25/2022
Stream Name: White River Upstream	County:
Location:	Crew:
Gear Type: Backpack Sportyak Boat (Circle One)	Canoe barge
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	

Distance (m):	Time Fished (sec):	Identified By: Tuney

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Shrh	321	375			
2	Shrh	331	390			
3	Shrh	380	590			
4	Shrh	323	400			
5	Shrh	264	225			
6	White Sucker	328	440			
7	W.S.	310	375			
8	Walleye	270	200			
9	Walleye	270	175			
10	Brown Trout	280	200			
11	Brown Trout	290	250			
12	Brown Trout	362	520			
13	Brown Trout	242	150			
14	B. Trout	285	230			
15	S.M. Bass	265	320			
16	W. Sucker	265	240			
17	W. Sucker	295	350			
18	S.h.r.h	318	375			
19	S.h.r.h.	320	400			
20	S.h.r.h.	318	395			
21	S.h.r.h	320	390			
22	W. Sucker	272	235			
23	S.h.r.h.	315	350			
24	S.h.r.h.	328	395			
25	Shrh	310	355			
26	S.M. Bass	275	370			
27	S.h.r.h	336	425			

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 07/25/2024
Stream Name: White River Upstream	County:
Location:	Crew:
Gear Type: Backpack Sportyak Boat (Circle One) Canoe Large	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 2182 / Identified By: Tyler

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	W. Sucker	270	250			
2	W. Sucker	254	220			
3	Shrh	297	350			
4	Shrh	200	140			
5	W. Sucker	215	110			
6	B. Trout	267	205			
7	S.h.rh.	260	240			
8	Shrh	322	375			
9	S.M. Bass	306	475			
10	W. Sucker	270	240			
11	S.h.rh.	318	395			
12	Shrh	297	325			
13	Shrh	230	170			
14	Shrh	342	455			
15	Shrh	350	480			
16	B. Trout	284	245			
17	Shrh	320	390			
18	Shrh	310	350			
19	Walleye	240	155			
20	B. Trout	280	270			
21	B. Trout	245	200			
22	B. Trout	270	240			
23	S.M. Bass	230	205			
24	B. Trout	249	190			
25	Shrh	318	400			
26	Shrh	185	120			
27	Shrh	201	130			

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

150
100
100
100
81
531

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 07/25/2022
Stream Name: White River Upstream	County:
Location:	Crew:
Gear Type: (Circle One) Backpack Sportyak Boat	Canoe Barge
Channel Position: (Circle one if Boat Electrofishing) Right Bank Mid-channel Left Bank	
Distance (m):	Time Fished (sec):
	Identified By: Tuhe

*=of 100 chosen

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	B. Trout	255	190	1		
2	Walleye	256	200	1		
3	B. Trout	245	180	1		
4	Shrh	171	50	1		
5	Shrh	140	80	1		
6	S.M. Bass	28-55	47	40		
7	S.h.r.h	200	103	1		
8	W. Sucker	211	105	1		
9	Common shiner	*30-135	*475	531		
10	Trout Perch	62-76	25	16 +1		
11	longnose dace	37-83	100	43		
12	~~Fro~~ Hornyhead chub	32-130	340	38		
13	Creek Chub	131	40	1		
14	fathead minnows	50-59	10	4		
15	W. Sucker	45-111	30	4		
16	Yellow Perch	101	20	1		
17	log Perch	45-96	50	10		
18	Johnny darters	32-62	5	2		
19	S.h.r.h	30-109	230	112		
20						
21						
22						
23						
24						
25						
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD 4316 total secs

ID Number: White River Downstream	Date (mm/dd/yyyy): 7-25-22
Stream Name:	County:
Location:	Crew:
Gear Type: (Circle One) Backpack Sportyak Boat	Canoe barge
Channel Position: (Circle one if Boat Electrofishing) Right Bank Mid-channel Left Bank	

Distance (m):	Time Fished (sec): 2134	Identified By: Turner

Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1 Brown Trout	242	—	1		
2 Brown Trout	203	100	1		
3 Small Mouth Bass	187	120	1		
4 Golden Redhorse	246	160	1		
5 Horny head chub	66-100	25	4		
6 Short head redhorse	118	20	1		
7 Log pirch	75-114	25	3		
8 Small mouth bass	36	—	1		
9 Johnny Darter	50-59	5	2		
10 Long nose base	41-81	55	25		
11 common shiner	57-133	170	23		
12 Brown Trout	280	220	1		
13 Brown Trout	295	220	1		
14 small mouth bass	273	260	1		
15 shorthead redhorse	350	360	1		
16 Shorthead redhorse	326	360	1		
17 Shorthead redhorse	317	340	1		
18 Shorthead redhorse	322	380	1		
19 Shorthead redhorse	305	320	1		
20 Shorthead red	360	—	1		
21 brown trout	217	160	1		
22 brown trout	245	160	1		
23 S.h.r.h.	310	360	1		
24 b.t.	195	100	1		
25 S.h.r.h.	286	200	1		
26 S.h.r.h.	255	160	1		
27 S.h.r.h.	227	120	1		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 7.25.22
Stream Name:	County:
Location: White River Downstream	Crew:
Gear Type: Backpack Sportyak Boat (Circle One)	canoe barge
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 2134 / Identified By: Turner

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Yellow Perch	116	–	1		
2	S.M. Bass	251	260	1		
3	S.h.r.h.	192	100	1		
4	S.M. bass	144	–	1		
5	rock bass	92	20	1		
6	S.M bass	181	100	1		
7	S.M bass	205	160	1		
8	S.h.r.h.	210	120	1		
9	S.M. bass	141	50	1		
10	S.M. bass	143	60	1		
11	S.h.r.h.	205	100	1		
12	S.M. bass	32-48	10	8		
13	white sucker	50-104	410	4		
14	long nose dace	30-100	210	75		
15	longbirch	53-114	50	8		
16	hornyhead chub	112-140	270	35		
17	common shiner	30-120	225	71		
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

Pg 1 of 3

ID Number:	Date (mm/dd/yyyy): 09/27/22
Stream Name: White River - Bypass	County: Ashland
Location:	Crew: Turner / Stranko
Gear Type: Backpack Sportyak Canoe Boat (Circle One)	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 3685 / Identified By: Stranko

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Rainbow Trout	323	350	1		
2	Brown Trout	294	225	1		
3	"	276	245	1		
4	"	293	290	1		
5	"	264	195	1		
6	"	242	135	1		
7	White Sucker	241	150	1		
8	"	244	170	1		
9	"	299	275	1		
10	"	223	105	1		
11	Shorthead RH	224	130	1		
12	"	220	95	1		
13	"	179	55	1		
14	"	201	80	1		
15	"	168	45	1		
16	"	178	50	1		
17	"	190	75	1		
18	"	227	105	1		
19	Blacknose Minnow	35 - 79	25	8		
20	Shorthead RH	39 - 62	50	3		
21	Hornyhead Chub	40 - 139	145	9		
22	Longnose Dace	51 - 102	25	3		
23	Creek Chub	58 - 137	120	12	BS	
24	Common Shiner	61 - 151	825	66		
25	White Sucker	58 - 123	50	6		
26	Rock Bass	51 - 53	5	2		
27	Smallmouth Bass	61 - 72	35	8		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:		Date (mm/dd/yyyy): 09/27/22
Stream Name: White River - Bypass		County: Ashland
Location:		Crew: Turner / Strzlk
Gear Type: (Circle One) Backpack	Sportyak (Canoe)	Boat
Channel Position: (Circle one if Boat Electrofishing) Right Bank	Mid-channel	Left Bank
Distance (m):	Time Fished (sec): 3685	Identified By: Strzlk

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Trout Perch	49 - 83	30	8		
2	Johnny Darter	36 - 46	5	6		
3	Logperch	76	5	1		
4	Brown Trout	345	405	1		
5	White Sucker	213	105	1		
6	Shorthead RH	236	155	1		
7	Common Shiner	46 - 141	340	33		
8	Creek chub	79 - 162	145	7		
9	Hornyhead chub	46 - 117	45	9		
10	Trout perch	48 - 111	145	25		
11	White Sucker	~~[illegible]~~ - 151	~~125~~	64		
12	—	65	130	-		
13	Smallmouth bass	50 - 62	5	3		
14	Largemouth bass	57 - 91	10	4		
15	Bluntnose Minnow	28 - 42	5	11		
16	Longnose dace	42 - 46	5	2		
17	Rock Bass	199	170	1		
18	"	199	175	1		
19	White Sucker	257	175	1		
20	Shorthead RH	189	60	1		
21	Common Shiner	69 - 145	585	59		
22	White Sucker	57 - 168	195	4		
23	Creek chub	82 - 90	25	3		
24	Hornyhead chub	59	5	1		
25	Longnose dace	56	5	1		
26	Trout perch	49 - 90	40	9		
27	Johnny Darter	38 - 60	5	2		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 09/27/22
Stream Name: White River - Bypass	County: Ashland
Location:	Crew: Tuine/Strickland
Gear Type: Backpack Sportyak Boat (Circle One) Canoe	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 3685 / Identified By: Strickland

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Smallmouth bass	67 - 71	15	2		
2	"	75	10	1		
3	Hornyhead chub	50 - 102	10	32		
4	Creek chub	59	5	1		
5	Longnose dace	48 - 59	10	3		
6	White sucker	56 - 87	20	6		
7	Rock Bass	94	20	1		
8	Pumpkinseed	113	20	1		
9	Johnny Darter	62	5	1		
10	Trout Perch	53 - 115	90	19	P	
11	Common shiner	45 - 51	20	24		
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

Pg 1 of 2

ID Number:	Date (mm/dd/yyyy): 09/28/22
Stream Name: White River Tailrace	County: Ashland
Location:	Crew: Tuinu / Strick
Gear Type: Backpack Sportyak Boat (Circle One) — Canoe	
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 2790 / Identified By: Strick

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Northern Pike	647	1500	1		
2	"	256	90	1	B S	
3	Creek chub	202	90	1		
4	Rock Bass	147	75	1		
5	"	134	60	1		
6	"	40 - 50	5	2		
7	Pumpkinseed	115	30	1		
8	"	49	-	1		
9	Smallmouth Bass	58 - 97	60	7		
10	Bluntnose minnow	32 - 85	35	9		
11	common shiner	42 - 91	40	15		
12	white sucker	69 - 132	60	4		
13	Hornyhead chub	51 - 122	75	8		
14	Longnose Dace	46 - 73	25	19		
15	Shorthead Redhorse	48-57	5	3		
16	Trout perch	52	5	1		
17	Logperch	98	10	1		
18	Black Bullhead	53	5	1		
19	creek chub	142	35	1		
20	shorthead Redhorse	56- 131	25	3		
21	white sucker	44 - 75	30	12		
22	common shiner	39 - 109	40	16		
23	longnose dace	41 - 72	50	22		
24	Trout perch	52 - 82	90	29		
25	Bluntnose minnow	31 - 79	25	15		
26	smallmouth Bass	57 - 84	80	17		
27	Creek chub	51 - 105	25	6		

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

FISH SURVEY RECORD

ID Number:	Date (mm/dd/yyyy): 09/28/22
Stream Name: White River - Tailrace	County: Ashland
Location:	Crew: Turner / Stricko
Gear Type: Backpack Sportyak Boat (Circle One)	Canoe
Channel Position: Right Bank Mid-channel Left Bank (Circle one if Boat Electrofishing)	
Distance (m):	Time Fished (sec): 2790 / Identified By: Stricko

	Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies	Voucher
1	Central stoneroller	97	10	1		
2	hornyhead chub	34 - 44	10	8		
3	Blacknose shiner	42 - 50	10	9		
4	Yellow perch	116	15	1		
5	Logperch	59	5	1		
6	Stripey Darter	39 - 60	15	16		
7	Rumpkinseed	35 - 93	15	2		
8	Rockbass	41 "	5	1		
9	"	150	75	1		
10	"	132	50	1		
11	"	102	60	1		
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						

Anomalies: A-anchor worm; B-black spot; C-leeches; D-deformities; E-eroded fins; F-fungus; G-yellow grub; L-lesions; N-blind; P-parasite; PL-parasite lesion; Y-popeye; S-emaciated; W-whirled scales; T-tumors; Z-other. (Heavy (H) or Light (L) code may be combined with above codes)

Appendix B

Habitat Assessment Datasheets

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-		A1

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	7.0	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 1.4	2/5 2.8	3/5 4.2	4/5 5.6
Water Depth (m)	.43	.36 .20	~~.38~~ .26	.38	.36
Depth of Fines and Water (m)		.36 .20	~~.38~~ .26	.38	.36
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered				Section Total Must = 100%
Bedrock (solid slab)	100	~~85~~ 90	85	100
Boulder (261 mm - 4.1 m)	-	- 10	-	-
Rubble / Cobble (65 - 260 mm)	-	-	-	-
Gravel (2 - 64 mm)	-	~~5~~ -	5	-
Sand (0.062 - 1.9 mm)	-	~~10~~ -	10	-
Silt (0.004 - 0.061 mm)	-	-	-	-
Clay	-	-	-	-
Detritus	-	-		-
Other - Specify:				

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	~~20~~ -	~~80~~ 50	50	20
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	~~10~~ 0	0	0	10

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
0.3	-	0.0	-	0.6	-	-	-

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	50	-	-	50	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07) A space = 45 m

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
		09272022	AZ

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	17	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 3.4	2/5 6.8	3/5 10.2	4/5 13.6
Water Depth (m)	.65	.55	.20	.60	0
Depth of Fines and Water (m)		.55	.55	.60	0
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	40	100	100	100
Boulder (261 mm - 4.1 m)	-	-	-	-
Rubble / Cobble (65 - 260 mm)	60	-	-	-
Gravel (2 - 64 mm)	-	-	-	-
Sand (0.062 - 1.9 mm)	-	-	-	-
Silt (0.004 - 0.061 mm)	-	-	-	-
Clay	-	-	-	-
Detritus	-	-	-	-
Other - Specify:				

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	50	-	40
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	0	10	30	50

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
0.1	0.0	0.3	0.0	1.0	0.0	0.0	

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0.0 (m) Right: 0.8 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: _____ (%) Right: _____ (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	10	0	0	90	0

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Transect Data					
Stream Name		Waterbody ID Code	Date (MMDDYYYY)	Transect No.	
		–	092722	A3	
Distance from Start (m)	Stream Width (m)	Habitat Type: ☐ Riffle ☐ Pool ☑ Run	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)	
	20		–	–	

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 4.0	2/5 8.0	3/5 12.0	4/5 16.0
Water Depth (m)	.71	.40	.15	.29	.50
Depth of Fines and Water (m)		.40	.15	.29	.50
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered	Section Total Must = 100%			
Bedrock (solid slab)	100	100	100	100
Boulder (261 mm - 4.1 m)	–	–	–	–
Rubble / Cobble (65 - 260 mm)	–	–	–	–
Gravel (2 - 64 mm)	–	–	–	–
Sand (0.062 - 1.9 mm)	–	–	–	–
Silt (0.004 - 0.061 mm)	–	–	–	–
Clay	–	–	–	–
Detritus	–	–	–	–
Other - Specify:				

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	–	70	10	–
Macrophytes	–	–	–	–
Canopy / Shading (circle one)	0	0	10	30

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: Leaves
–	–	–	–	–	–	–	1.0

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0.0 (m) Right: 2.3 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 50 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	80	0	0	20	–

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
	–	092722	A4

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	17	☐ Riffle ☒ Pool ☐ Run	–	–

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 3.2	2/5 6.4	3/5 9.6	4/5 12.8
Water Depth (m)	.52	.18	.32	.50	.37
Depth of Fines and Water (m)		.18	.32	.50	.37
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	100	100	100	100
Boulder (261 mm - 4.1 m)	–	–	–	–
Rubble / Cobble (65 - 260 mm)	–	–	–	–
Gravel (2 - 64 mm)	–	–	–	–
Sand (0.062 - 1.9 mm)	–	–	–	–
Silt (0.004 - 0.061 mm)	–	–	–	–
Clay	–	–	–	–
Detritus	–	–	–	–
Other - Specify:_____	–	–	–	–
Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	–	0	0	0
Macrophytes	–	0	0	0
Canopy / Shading (circle one)	10	20	20	50

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: ledge
0	0	0	0	0	0	0	1.0

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	60	10	0	30	0

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	–	092722	A5

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	27	☐ Riffle ☐ Pool ☒ Run	–	–

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 5.2	2/5 10.4	3/5 15.6	4/5 20.8
Water Depth (m)	.75	.13	.02	0	.33
Depth of Fines and Water (m)		.13	.02	0	.33
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered					Section Total Must = 100%
Bedrock (solid slab)	100	100	100	100	
Boulder (261 mm - 4.1 m)	0	–	–	–	
Rubble / Cobble (65 - 260 mm)	0	–	–	–	
Gravel (2 - 64 mm)	0	–	–	–	
Sand (0.062 - 1.9 mm)	0	–	–	–	
Silt (0.004 - 0.061 mm)	0	–	–	–	
Clay	0	–	–	–	
Detritus	0	–	–	–	
Other - Specify: _____	–	–	–	–	

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	0	30	–	–
Macrophytes	0	–	–	–
Canopy / Shading (circle one)	0	0	0	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: ledge
–	–	–	–	–	–	–	0.6

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	50	0	0	50	0

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	—	092722	A6

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	13	☐ Riffle ☐ Pool ☒ Run	—	—

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 2.6	2/5 5.2	3/5 7.8	4/5 10.4
Water Depth (m)	.52	.39	.12	.33	.36
Depth of Fines and Water (m)		.39	.12	.33	.36
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	100	100	100	100
Boulder (261 mm - 4.1 m)	-	-	-	-
Rubble / Cobble (65 - 260 mm)	-	-	-	-
Gravel (2 - 64 mm)	-	-	-	-
Sand (0.062 - 1.9 mm)	-	-	-	-
Silt (0.004 - 0.061 mm)	-	-	-	-
Clay	-	-	-	-
Detritus	-	-	-	-
Other - Specify: _____	-	-	-	-

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	10	-	-
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	0	10	20	30

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: ledge
-	-	-	-	-	-	-	0.6

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	20	0	0	80	0

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-		A7

Distance from Start (m)	Stream Width (m)	Habitat Type: ☐ Riffle ☐ Pool ☐ Run	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	72		-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5	2/5	3/5	4/5
		4.4	8.8	13.2	17.6
Water Depth (m)	.66	.42 .55	.64 .13	.64 .01	0
Depth of Fines and Water (m)		.42 .55	.64 .13	.64 .01	0
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0 0	0 0	0 0	0

Percent (nearest 5%) of Stream Bottom Covered — **Section Total Must = 100%**					
Bedrock (solid slab)	100 100	100 100	100 100	100
Boulder (261 mm - 4.1 m)	- -	- -	-	-
Rubble / Cobble (65 - 260 mm)	- -	- -	-	-
Gravel (2 - 64 mm)	-	- -	-	-
Sand (0.062 - 1.9 mm)	- -	- -	-	-
Silt (0.004 - 0.061 mm)	- -	- -	-	-
Clay	- -	- -	-	-
Detritus	- -	- -	-	-
Other - Specify:_____	- -	-	-	-

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	10	60	-
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	4 20	2 0	0 10	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: Ledge
-	-	-	-	-	-	-	0.6

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0.6 (m) Right: 0.0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 50 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — **Section Total Must = 100%**

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	40	-	-	60	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	–	092822	A8

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	32	☐ Riffle ☐ Pool ☒ Run		–

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 6.4	2/5 12.8	3/5 19.2	4/5 25.6
Water Depth (m)	1.20	.65	.60	.57	.55
Depth of Fines and Water (m)		.65	.60	.57	.55
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	20	0

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	–	100	–	100
Boulder (261 mm - 4.1 m)	–	–	–	–
Rubble / Cobble (65 - 260 mm)	30	–	20	–
Gravel (2 - 64 mm)	70	–	60	–
Sand (0.062 - 1.9 mm)	–	–	20	–
Silt (0.004 - 0.061 mm)	–	–	–	–
Clay	–	–	–	–
Detritus	–	–	–	–
Other - Specify: _____	–	–	–	–

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	–	20	–	50
Macrophytes	–	–	–	–
Canopy / Shading (circle one)	10	0	10	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: Edge
–	–	–	–	0.5	–	–	1.0

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
0	0	0	0	0	30	50	–	20	–

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 90 (m) Right: 10.0 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-	092822	A9

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	22	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5	2/5	3/5	4/5
		4.4	8.8	13.2	17.6
Water Depth (m)	.81	.49	.65	.72	.42
Depth of Fines and Water (m)		.49	.65	.72	.42
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		40	30	0	30

Percent (nearest 5%) of Stream Bottom Covered					Section Total Must = 100%
Bedrock (solid slab)	-	-	-	-	
Boulder (261 mm - 4.1 m)	50	70	-	100	
Rubble / Cobble (65 - 260 mm)	25	-	70		
Gravel (2 - 64 mm)	25	-	30	-	
Sand (0.062 - 1.9 mm)	-	30	-	-	
Silt (0.004 - 0.061 mm)	-	-	-	-	
Clay	-	-	-	-	
Detritus	-	-	-	-	
Other - Specify:	-	-	-	-	
Percent (nearest 10%) of Stream Bottom Covered					
Algae (attached & fila.)	-	-	-	-	
Macrophytes	-	-	-	-	
Canopy / Shading (circle one)	0	0	20	20	

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
0.6	0.6	-	-	1.8	-	-	-

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	50	50	-	-	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-	092722	A10

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	30	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 6	2/5 12	3/5 18	4/5 24
Water Depth (m)	1.10	.25	.32	.32	.85
Depth of Fines and Water (m)		.25	.32	.32	.85
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		50	30	0	10

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	30	-	100	-
Boulder (261 mm - 4.1 m)	-	-	-	100
Rubble / Cobble (65 - 260 mm)	-	40	-	-
Gravel (2 - 64 mm)	20	25	-	-
Sand (0.062 - 1.9 mm)	50	35	-	-
Silt (0.004 - 0.061 mm)	-	-	-	-
Clay	-	-	-	-
Detritus	-	-	-	-
Other - Specify:	-	-	-	-
Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	10	10	-
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	10	0	0	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
-	0.3	1.0	-	2.0	-	-	-

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — **Section Total Must = 100%**

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	50	50	-	-	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-	09282021	A11

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	18	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 3.6	2/5 7.2	3/5 10.8	4/5 14.4
Water Depth (m)	1.18	.46	.95	1.16	.61
Depth of Fines and Water (m)		.46	.95	1.16	.61
Embeddedness (nearest 10% of Course Gravel and Rubble/Cobble		0	0	20	20

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	100	30	-	-
Boulder (261 mm - 4.1 m)	-	-	-	-
Rubble / Cobble (65 - 260 mm)	-	20	30	30
Gravel (2 - 64 mm)	-	50	50	50
Sand (0.062 - 1.9 mm)	-	-	20	20
Silt (0.004 - 0.061 mm)	-	-	-	-
Clay	-	-	-	-
Detritus	-	-	-	-
Other - Specify:_____	-	-	-	-
Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	-	-	-
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	30	10	10	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
-	0.3	0.1	-	1.5	-	-	-

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0.2 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 5 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — **Section Total Must = 100%**

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	30	40	-	30	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-	092722	A12

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	27	[X] Riffle [ ] Pool [ ] Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 5.4	2/5 10.8	3/5 16.2	4/5 21.6
Water Depth (m)	.65	.52	.44	.23	.25
Depth of Fines and Water (m)		.52	.44	.23	.25
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		10	20	0	0

Percent (nearest 5%) of Stream Bottom Covered					Section Total Must = 100%
Bedrock (solid slab)	-	-	-	-	
Boulder (261 mm - 4.1 m)	-	-	-	-	
Rubble / Cobble (65 - 260 mm)	80	30	100	50	
Gravel (2 - 64 mm)	20	50	-	50	
Sand (0.062 - 1.9 mm)	-	20	-	-	
Silt (0.004 - 0.061 mm)	-	-	-	-	
Clay	-	-	-	-	
Detritus	-	-	-	-	
Other - Specify:_____	-	-	-	-	

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	10	20	30
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	10	0	10	20

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify:
-	-	-	-		-	-	-

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	30	70	-	-	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	–	092722	13

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
	17	☐ Riffle ☐ Pool ☒ Run	–	–

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5 3.4	2/5 6.8	3/5 10.2	4/5 13.6
Water Depth (m)	.90	.34	.42	.57	.65
Depth of Fines and Water (m)		.34	.42	.57	.65
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		20	0	0	0

Percent (nearest 5%) of Stream Bottom Covered — Section Total Must = 100%				
Bedrock (solid slab)	–	100	100	100
Boulder (261 mm - 4.1 m)	–	–	–	–
Rubble / Cobble (65 - 260 mm)	50	–	–	–
Gravel (2 - 64 mm)	30	–	–	–
Sand (0.062 - 1.9 mm)	20	–	–	–
Silt (0.004 - 0.061 mm)	–	–	–	–
Clay	–	–	–	–
Detritus	–	–	–	–
Other - Specify:	–	–	–	–

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	50	20	20	10
Macrophytes	–	–	–	–
Canopy / Shading (circle one)	10	10	20	50

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: ledge
–	0.3	–	–	1.0	–	–	1.0

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream — Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge — Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — Section Total Must = 100%

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
–	–	–	–	–	30	60	–	10	–

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

Wadable Stream Quantitative Habitat Evaluation

Form 3600-228 (R 6/07)

Transect Data

Stream Name	Waterbody ID Code	Date (MMDDYYYY)	Transect No.
White River	-		A14

Distance from Start (m)	Stream Width (m)	Habitat Type:	Bankfull Depth (m) (optional)	Bankfull Width (m) (optional)
-	24	☐ Riffle ☐ Pool ☒ Run	-	-

	Deepest Point	Channel Position (Fifths of Current Stream Width) 1/5	2/5	3/5	4/5
		4.8	9.6	14.4	19.2
Water Depth (m)	.75	.63	.70	.25	.40
Depth of Fines and Water (m)		.63	.70	.25	.40
Embeddedness (nearest 10%) of Course Gravel and Rubble/Cobble		0	0	0	0

Percent (nearest 5%) of Stream Bottom Covered					Section Total Must = 100%
Bedrock (solid slab)	-	-	100	100	
Boulder (261 mm - 4.1 m)	-	-	-	-	
Rubble / Cobble (65 - 260 mm)	60	70	-	-	
Gravel (2 - 64 mm)	40	30	-	-	
Sand (0.062 - 1.9 mm)	-	-	-	-	
Silt (0.004 - 0.061 mm)	-	-	-	-	
Clay	-	-	-	-	
Detritus	-	-	-	-	
Other - Specify:	-	-	-	-	

Percent (nearest 10%) of Stream Bottom Covered				
Algae (attached & fila.)	-	0	50	30
Macrophytes	-	-	-	-
Canopy / Shading (circle one)	30	10	10	40

Cover for Adult Gamefish: Length (nearest 0.01 m) of transect within 0.15 m upstream or downstream in water at least 0.20 m in depth

Undercut Banks	Overhanging Vegetation at least 0.20 m overhang	Woody Debris	Other Debris	Boulder	Submerged Macrophytes	Emergent Macrophytes at least 0.20 m deep	Other - Specify: ledge
-	-	0.3	-	0.6	-	-	1.5

Bank Erosion: Length of Continuous Bare Soil (nearest 0.01 m) within 1 m of stream

Left: 0 (m) Right: 0 (m)

% of Eroded Bank to the crest or within 5 m of stream edge

Left: 0 (%) Right: 0 (%)

Riparian Land Use: Percent (nearest 10%) of Bank within 5 m of stream edge, along transect — **Section Total Must = 100%**

Cropland	Pasture	Barnyard	Developed	Meadow	Shrubs	Woodland	Wetland	Exposed Rock	Other - Specify:
-	-	-	-	-	20	80	-	-	-

Riparian Buffer Width: Length (nearest 1.0 m) of Undisturbed Land Uses along transect, within 10 m of stream

Left: 10 (m) Right: 10 (m)

APPENDIX E-17 White River Mussel Study Report

FRESHWATER MUSSEL STUDY FOR THE WHITE RIVER HYDROELECTRIC PROJECT

FERC No. 2444

Prepared for:

Mead & Hunt

1702 Lawrence Drive
De Pere, WI 54115

Project No.: 16082
Date: 11/29/2022

Prepared by:

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Excellence In Any Environment

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Freshwater Mussel Study for the White River Hydroelectric Project

Initial Study Report

Document Date: 11/29/2022
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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ACKNOWLEDGEMENTS

Northern States Power Company of Wisconsin 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 Northern States Power Company. 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 White River Hydroelectric Project (Project) on the White River in Ashland County, Wisconsin (Figure 1). Northern States Power Company – Wisconsin (Licensee or NSPW), operates and maintains the Project through a Federal Energy Regulatory Commission (FERC) license, which expires in July 2025. NSPW must submit a final license application no later than July 31, 2023, to obtain a subsequent license for continued operation of the Project (FERC Project No. 2444).

Freshwater mussels may be affected by operation and maintenance of the Project. Flow modification upstream or downstream of the Project may alter habitat for mussels, and mussels occurring in the reservoir may become stranded during drawdown events. No existing mussel data was available for the White River; however, some data was available for other streams in the basin. Five species, including Eastern Elliptio (*Elliptio complanata*), a species of special concern, were reported from the West Fork White River in Bayfield County, which is a tributary of the White River. Five species, including Eastern Elliptio, were also reported from Bad River Slough downstream of the Project in Ashland County (Table 1). The Bad River is the receiving waterbody for the White River; Bad River Slough is located at the confluence of the Bad River with Lake Superior.

The Wisconsin Department of Natural Resources (WDNR) requested that a mussel survey be completed as part of the federal relicensing process for the Project. 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 at the Project location. 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 approximately 1,200 meters (m) upstream of the Project dam and extended 1,000 m upstream. Reach 2 (downstream reach) began 35 m downstream of the Project powerhouse 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. A rapid visual search for signs of freshwater mussels (living or shell material) was performed within each segment. The rapid visual search 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. If

mussels were present in a segment, a semi-quantitative search was triggered, and the time was extended to 1 min/m^2. 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.

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. 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 21, 2022. River flow at the time was 242 cubic feet per second as recorded at the USGS gaging station (USGS 04027500) below the Project powerhouse. Maximum visibility was approximately 0.5 m, and the water temperature ranged from approximately 19.4° Celsius (C, 67° Fahrenheit [F]) downstream of the dam to 21.7° C (71° F) upstream of the dam. Photographs of sampling sites are provided in Appendix B.

3.1 REACH 1 (UPSTREAM)

Reach 1 encompassed a stretch of river upstream of the Project impoundment with slow current velocity. The surrounding land use was primarily forested (46%; USEPA, 2022a). Streambanks were gradually sloping in the downstream portion of the reach and somewhat steeper in the upstream portion. Fallen trees and deposits of large woody debris were present along the banks throughout much of the reach, and large patches of cattails (*Typha* spp.) were present along one or both banks at the downstream end of the reach.

Transects 1, 2, 3, 7, and 10 were randomly selected for sampling in Reach 1. The substrate in most transect segments was primarily sand and silt (Table 2; Figure 2). Some gravel was also present along Transects 7 and 10, as were exposed patches of bedrock/hardpan. Water depths ranged from 0.3 m (1 foot [ft]) to 1.5 m (5 ft; Table 2; Figure 2). No evidence of mussels, living or dead, was observed in Reach 1. The fine substrate and slow-flowing conditions do not provide high quality mussel habitat.

3.2 REACH 2 (DOWNSTREAM)

Reach 2 primarily consisted of riffle and run habitat with a few deeper pools. Current velocity, although not directly measured, was moderate to very swift. As in the upstream reach, the surrounding land was primarily forested (48%; USEPA, 2022b). There was visible erosion on the

banks along outside bends, particularly in the middle of the reach. Exposed cobble and gravel point bars were present along inside bends.

Transects 2, 5, 6, 9, and 10 were randomly selected for sampling in Reach 2. The substrate varied somewhat among the transects but was generally coarse throughout the reach. Cobble and gravel were the primary substrate constituents in the downstream three transects (Transects 2, 5, and 6), with small amounts of sand present in most segments (Table 2; Figure 3). Boulder became more prevalent in Transect 9, and fine material was absent. The substrate in Transect 10, closest to the Project powerhouse, was almost exclusively bedrock with small amounts of cobble. Rather than a flat horizontal surface, the bedrock formed long steep ridges extending diagonally across the width of the stream. Depths ranged from 0.3 m (1 ft) to 1.1 m (3.5 ft). No evidence of mussels, living or dead, was observed in Reach 2.

4.0 CONCLUSIONS

The study reaches near the Project location do not appear to provide quality mussel habitat. Reach 1, upstream of the dam, was characterized by fine substrate and slow current velocity, while Reach 2, downstream of the dam, was characterized by coarse substrate and swift current. Neither habitat type is particularly suitable for mussels. Many species are not tolerant of the impounded conditions upstream of the dam, while the coarse substrate and swift current downstream of the dam likely prevent mussels from burrowing and maintaining position in the substrate. No evidence of mussels was observed in either study reach, and few mussels are likely to be affected by operation and maintenance of the Project.

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Table 1. Mussel species reported from the Bad River basin, Ashland and Bayfield Counties, Wisconsin.

Species	Common Name	Status [1]	Year of Observation [2]	
			West Fork White R. Bayfield County	Bad River Slough Ashland County
Pleurobemini				
Elliptio complanata	Eastern Elliptio	SC/P	1994	1996
Lampsilini				
Lampsilis siliquoidea	Fatmucket		-	1996
Ligumia recta	Black Sandshell		-	1996
Anodontini				
Anodontoides ferussacianus	Cylindrical Papershell		1994	-
Lasmigona compressa	Creek Heelsplitter		1994	-
Lasmigona costata	Fluted Shell		1994	1996
Pyganodon cataracta	Eastern Floater		-	1996
Pyganodon grandis	Giant Floater		1994	-
Total No. Species			5	5

[1] SC/P = Wisconsin species of special concern (protected; WDNR, 2021)

[2] WDNR (2018)

Table 1. Habitat characteristics observed in White River riverine surveys, White River, 2022.

Reach	Transect/Segment		Depth (m)	Substrate Composition (%)										
				Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
Reach 1 (US)	T1	0-10	0.91	0	0	0	0	90	0	0	10	0	0	0
	T1	10-20	0.91	0	0	0	0	100	0	0	0	0	0	0
	T1	20-30	0.91	0	0	0	0	70	30	0	0	0	0	0
	T1	30-40	0.91	0	0	0	0	70	30	0	0	0	0	0
	T1	40-50	0.46	0	0	0	0	40	60	0	0	0	0	0
Reach 1 (US)	T2	0-10	1.52	0	0	0	0	100	0	0	0	0	0	0
	T2	10-20	1.52	0	0	0	0	80	20	0	0	0	0	0
	T2	20-30	1.52	0	0	0	0	80	20	0	0	0	0	0
	T2	30-38	1.52	0	0	0	0	30	70	0	0	0	0	0
Reach 1 (US)	T3	0-10	1.52	0	0	0	0	60	35	5	0	0	0	0
	T3	10-20	1.52	0	0	0	0	80	20	0	0	0	0	0
	T3	20-30	1.52	0	0	0	0	70	30	0	0	0	0	0
	T3	30-35	1.52	0	0	0	0	40	60	0	0	0	0	0
Reach 1 (US)	T7	0-10	1.52	0	0	0	20	60	20	0	0	0	0	0
	T7	10-20	1.52	50	0	0	50	0	0	0	0	0	0	0
	T7	20-25	0.91	50	0	0	0	0	30	0	20	0	0	0
Reach 1 (US)	T10	0-10	0.91	0	0	0	0	80	20	0	0	0	0	0
	T10	10-20	1.07	0	0	0	40	40	20	0	0	0	0	0
	T10	20-30	0.61	0	0	0	50	20	30	0	0	0	0	0
	T10	30-35	0.30	0	0	0	0	20	80	0	0	0	0	0
Reach 2 (DS)	T2	0-10	0.61	0	0	40	40	20	0	0	0	0	0	0
	T2	10-20	0.61	0	20	80	0	0	0	0	0	0	0	0
	T2	20-25	0.30	0	0	80	10	0	0	0	0	10	0	0
Reach 2 (DS)	T5	0-10	1.07	0	0	70	20	10	0	0	0	0	0	0
	T5	10-20	0.76	0	0	70	20	10	0	0	0	0	0	0

Table 1. Habitat characteristics observed in White River riverine surveys, White River, 2022.

				Substrate Composition (%)										
Reach	Transect/Segment		Depth (m)	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	LWD	Veg.	Shell	Detritus
	T6	0-10	0.61	0	50	30	10	10	0	0	0	0	0	0
Reach 2	T6	10-20	0.61	0	0	80	20	0	0	0	0	0	0	0
(DS)	T6	20-30	0.15	0	0	70	20	10	0	0	0	0	0	0
Reach 2	T9	0-10	0.61	0	30	20	50	0	0	0	0	0	0	0
(DS)	T9	10-20	0.61	0	70	20	10	0	0	0	0	0	0	0
	T10	0-10	0.91	80	0	20	0	0	0	0	0	0	0	0
Reach 2	T10	10-20	0.61	95	0	5	0	0	0	0	0	0	0	0
(DS)	T10	20-25	0.61	95	0	5	0	0	0	0	0	0	0	0

US = upstream; DS = downstream; LWD = large woody debris

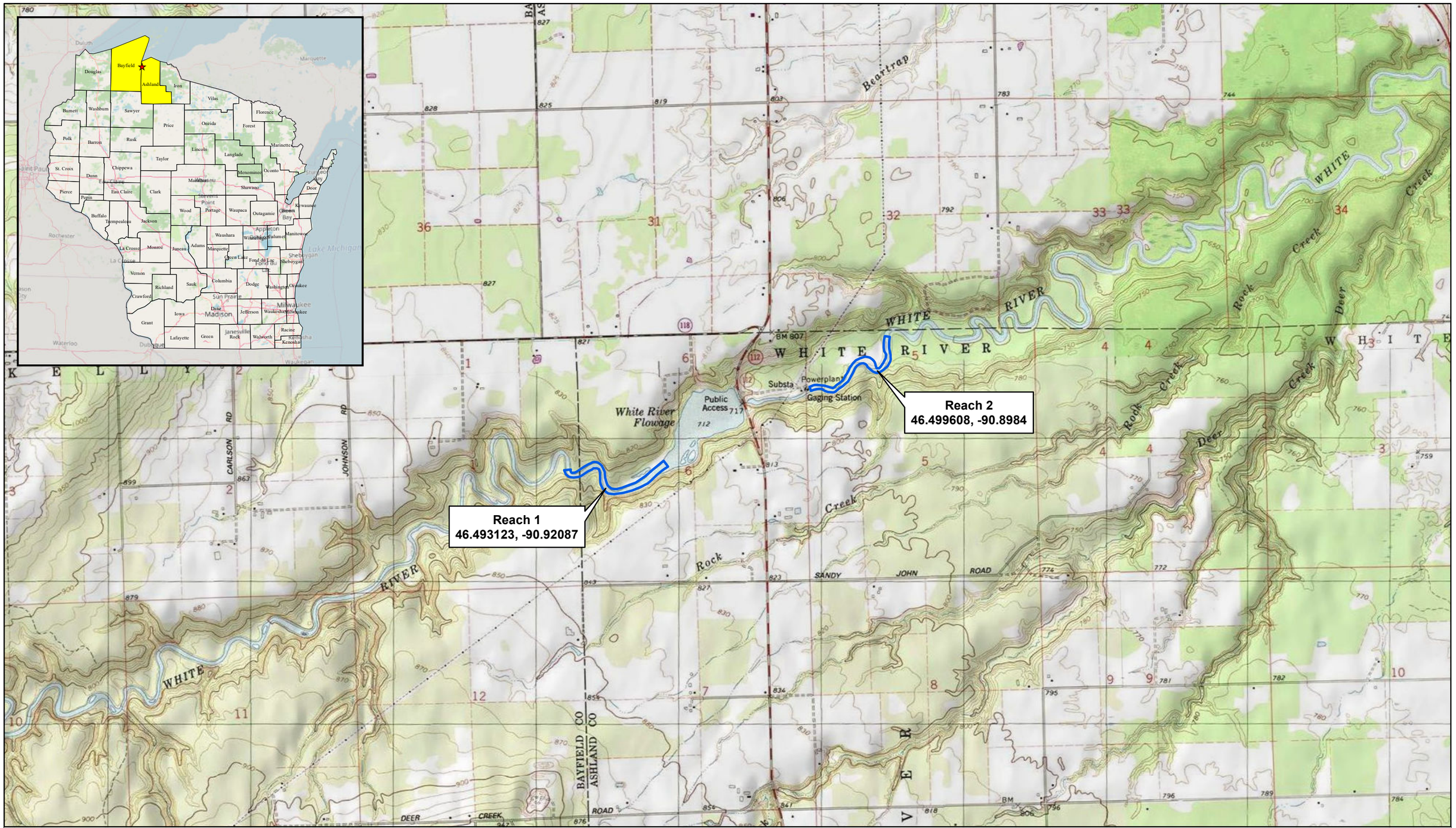

Figure 1. White River Project Location on USGS 7.5-minute Topographic Map of Ashland West and Sanborn Quadrangles. Ashland and Bayfield Counties, Wisconsin.

Survey Area

0 1,500 3,000 6,000 Feet

0 500 1,000 2,000 Meters

EnviroScience
Excellence In Any Environment

Basemap courtesy of National Geographic Society (2013).

Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\M\Mead-and-Hunt\16082_Wisconsin_Mussels\16082_GISMap1_Location_WhiteRiver.mxd

Date: 8/1/2022

Figure 2. Substrate and Depth for the White River Project Reach One on the White River. Ashland and Bayfield Counties, Wisconsin.

Basemap courtesy of Esri.

Date: 8/24/2022 Path: P:\10_Projects\MMead-and-Hunt\480M\16082_Wisconsin_Mussels\16082_GIS\Map2_Substrate_R1_WhiteRiver.mxd

Observed Substrate (%)

- Bedrock
- Boulder
- Clay
- Cobble
- Gravel
- Sand
- Silt
- Vegetation
- Wood

Depth (m)

- 0.15 - 0.30
- 0.31 - 0.61
- 0.62 - 0.91
- 0.92 - 1.07
- 1.08 - 1.52

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10

White River

Figure 3. Substrate and Depth for the White River Project Reach Two on the White River. Ashland and Bayfield Counties, 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_WhiteRiver.mxd

Basemap courtesy of Esri.

Appendix A

Scientific Collecting Permit 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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Excellence In Any Environment

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!

SURVEY PLAN:

FRESHWATER MUSSEL STUDY FOR THE WHITE RIVER HYDROELECTRIC PROJECT

(FERC No. 2444)

Prepared for:

WISCONSIN DEPT. OF NATURAL RESOURCES

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

TABLE OF CONTENTS

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 White River Hydroelectric Project (FERC Project No. 2444). 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 project is located on the White River near Ashland, Ashland County, Wisconsin.

2.0 MUSSEL SURVEY SCOPE OF WORK

TASK ONE: MUSSEL STUDY

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 the project location. One reach will be located upstream of the impoundment, and one will be downstream of the project powerhouse. The upstream reach will begin approximately 1,200 meters (m) above the dam and extend 1,000 m upstream. The downstream reach will begin approximately 35 m below the powerhouse and will 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. 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 the 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 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 a draft report for review within 30 days of completion of fieldwork or by October 31, 2022, whichever occurs first. A final draft report 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.

The 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. Field work is tentatively planned for mid-June 2022 in order to complete the study prior to the planned drawdown of the White River reservoir, which is scheduled for early July 2022.

3.0 LITERATURE CITED

Piette, R. R. (2015). Guidelines for sampling freshwater mussels in wadable streams. Wisconsin Department of Natural Resources. 50pp.

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, White River Mussel Survey, June 2022.

	Coordinates				
	UTM Zone 15N		NAD 1983		
Photo No.	Northing	Easting	Latitude	Longitude	View direction
Photo 1	5150974	659815	46.49337	-90.91745	Northeast
Photo 2	5150974	659815	46.49337	-90.91745	Southwest
Photo 3	5150976	659447	46.49348	-90.92224	South
Photo 4	5150976	659447	46.49348	-90.92224	East
Photo 5	5150994	659209	46.49370	-90.92534	Southeast
Photo 6	5151828	661431	46.50067	-90.89611	North
Photo 7	5151776	661307	46.50023	-90.89776	Southeast
Photo 8	5151776	661307	46.50023	-90.89776	West
Photo 9	5151753	661314	46.50002	-90.89767	North
Photo 10	5151737	661214	46.49990	-90.89898	Southwest
Photo 11	5151579	660996	46.49853	-90.90187	East
Photo 12	5151555	660910	46.49834	-90.90300	West

Photo 1. Reach 1, view looking downstream from Transect 2.

Photo 2. Reach 1, view looking upstream from Transect 2.

Photo 3. Reach 1, view looking downstream from Transect 7.

Photo 4. Reach 1, view of steep left descending bank at Transect 7.

Photo 5. Reach 1, view looking downstream from Transect 10.

Photo 6. Reach 2, view looking downstream from Transect 2.

Photo 7. Reach 2, view looking downstream near Transect 4 showing eroding left descending bank (outside bend) and cobble/gravel point bar (inside bend).

Photo 8. Reach 2, view looking upstream from Transect 5 showing eroded right descending bank.

Photo 9. Reach 2, view of large woody debris deposit near Transect 5.

Photo 10. Reach 2, view looking upstream from Transect 6.

Photo 11. Reach 2, view looking downstream from Transect 9.

Photo 12. Reach 2, view looking upstream at powerhouse from Transect 10.

APPENDIX E-18 WDNR Macroinvertebrate Sampling Data

Monitoring Station

Station ID 023127
Station Name White River Downstream Hwy 112 Near Ashland WI

Show specific parameter: <Show All>

Sample Results

Previous 1-25 of 316 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PLECOPTERA PERLIDAE ACRONEURIA		9			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPHEMEROPTERA BAETIDAE BAETIS		2			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPHEMEROPTERA HEPTAGENIIDAE		2			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPHEMEROPTERA LEPTOPHLEBIIDAE		23			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TRICHOPTERA HYDROPSYCHIDAE CHEUMATOPSYCHE		9			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TRICHOPTERA HYDROPSYCHIDAE CERATOPSYCHE		4			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TRICHOPTERA HYDROPSYCHIDAE CERATOPSYCHE MOROSA MOROSA FORM SCHMUDE, HILSENHOFF 1986		11			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TRICHOPTERA HYDROPTILIDAE HYDROPTILA		32			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TRICHOPTERA POLYCENTROPODIDAE NEURECLIPSIS		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA EMPIDIDAE HEMERODROMIA		3			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TIPULIDAE ANTOCHA		12			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMIDAE		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0		21			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0 CONCHAPELOPIA		53			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0 MEROPELOPIA		15			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0 NILOTANYPUS		9			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0 ZAVRELIMYIA		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1		6			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 PARAKIEFFERIELLA		15			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CORYNONEURA		6			

Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS (CRICOTOPUS) BICINCTUS GROUP CRANSTON ET AL. 1983	8
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS (CRICOTOPUS) TRIFASCIA GROUP CRANSTON ET AL. 1983	1
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS -- PUPA	3
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 NANOCLADIUS	13
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 ORTHOCLADIUS (ORTHOCLADIUS)	15

Monitoring Station

Station ID 023127
Station Name White River Downstream Hwy 112 Near Ashland WI

Show specific parameter: <Show All>

Sample Results

Previous 26-50 of 316 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 PARAKIEFFERIELLA -- PUPA		3			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 PARAMETRIOCNEMUS		11			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 ORTHOCLADIUS (SYMPOSIOCLADIUS) LIGNICOLA		2			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 THIENEMANNIELLA		2			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 THIENEMANNIELLA -- PUPA		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA ORTHOCLADIINAE 1 TVETENIA BAVARICA GROUP BODE 1983		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4		13			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 PARATANYTARSUS		21			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 PARATANYTARSUS SPECIES A HILSENHOFF, UNPUBL.		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 PARATANYTARSUS SPECIES B HILSENHOFF, UNPUBL.		41			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 RHEOTANYTARSUS		150			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 RHEOTANYTARSUS -- PUPA		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 TANYTARSUS		3			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 CRYPTOCHIRONOMUS		1			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 DICROTENDIPES		32			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 MICROTENDIPES PEDELLUS GROUP PINDER, REISS 1983		7			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 MICROTENDIPES RYDALENSIS GROUP PINDER, REISS 1983		5			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 NILOTHAUMA		7			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 SUBLETTEA		3			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA TANYPODINAE 0 ABLABESMYIA (ABLABESMYIA)		10			

Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 POLYPEDILUM	1
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 POLYPEDILUM (POLYPEDILUM) FALLAX GROUP EPLER 2001	3
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 POLYPEDILUM (URESIPEDILUM) FLAVUM	19
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	TROMBIDIFORMES HYGROBATIDAE HYGROBATES	1
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPHEMEROPTERA HEPTAGENIIDAE MACCAFFERTIUM VICARIUM/LUTEUM DIMICK, UNPUBL.	10

Monitoring Station

Station ID 023127
Station Name White River Downstream Hwy 112 Near Ashland WI

Show specific parameter: <Show All>

Sample Results

Previous 51-75 of 316 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DIPTERA CHIRONOMINAE 4 PARATANYTARSUS LONGISTYLUS		10			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	HILSENHOFF'S BIOTIC INDEX (HBI)		5.948			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	FAMILY-LEVEL BIOTIC INDEX (FBI)		6.006			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	HBI Max 10		5.304			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	SPECIES RICHNESS		40			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	GENERA RICHNESS		36			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT EPT INDIVIDUALS		16			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT EPT GENERA		22			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT CHIRONOMIDAE INDIVIDUALS		81			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	SHANNON'S DIVERSITY INDEX		4.078			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT SCRAPERS		2			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT FILTERER		35			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT SHREDDERS		6			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	PERCENT GATHERERS		28			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Family Rank 1		CHIRONOMIDAE			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Family Rank 2		HYDROPTILIDAE			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Family Rank 3		HYDROPSYCHIDAE			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Family Rank 4		LEPTOPHLEBIIDAE			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Family Rank 5		HEPTAGENIIDAE			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Genus Rank 1		RHEOTANYTARSUS			

Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Genus Rank 2	PARATANYTARSUS
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Genus Rank 3	CONCHAPELOPIA
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Genus Rank 4	HYDROPTILA
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Genus Rank 5	DICROTENDIPES
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Mean Pollution Tolerance Value	5.556

Monitoring Station

Station ID 023127
Station Name White River Downstream Hwy 112 Near Ashland WI

Show specific parameter: <Show All>

Sample Results

Previous 76-100 of 316 Next

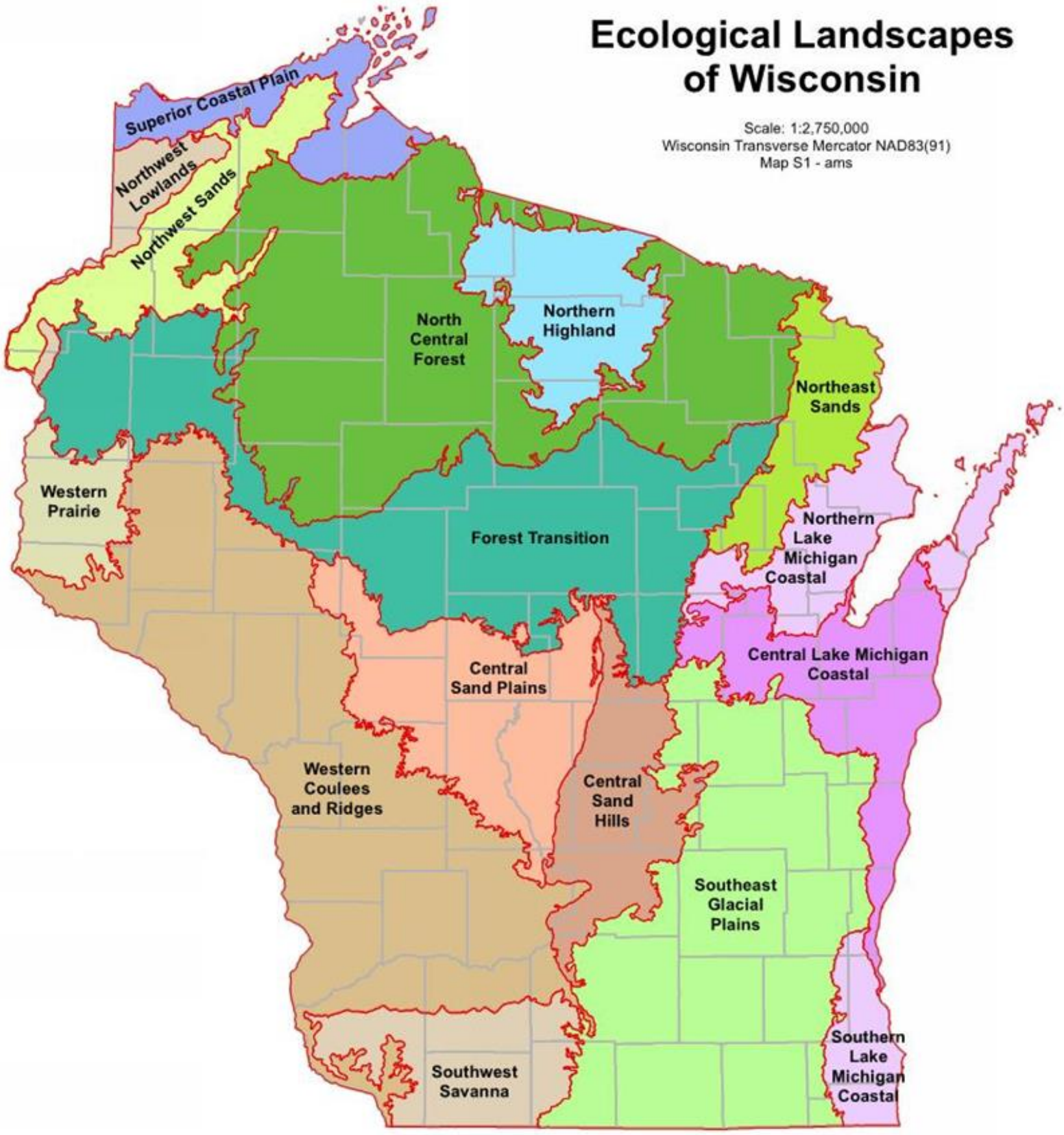
Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Macroinvertebrate Index of Biotic Integrity (IBI), Non-Wadable		70			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DEPO Percent Individuals (DEP_PC_CNT)		20.64			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DEPO Genera (DEPO_G)		13			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	DEPO, percent genera (DEP_PC_GEN)		33.333			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPT Genera (EPT_GENERA)		8			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPT Individuals (EPT_COUNT)		103			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPT Percent Individuals (EPT_PC_CNT)		16.48			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Amph Percent Individuals (AMP_PC_CNT)		0			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPT Percent Genera (EPT_PC_GEN)		22.857			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Isop Percent Individuals (ISO_PC_CNT)		0			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Isop Genera (ISOP_G)		0			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Isop Percent Genera (ISO_PC_GEN)		0			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Dipt Percent Genera (DIP_PC_GEN)		77.143			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Dipt Percent Individuals (DIP_PC_CNT)		83.52			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Chir Percent Individuals (CHI_PC_CNT)		81.12			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Chir Percent Genera (CHI_PC_GEN)		71.429			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Gatherers Percent Individuals (GAT_PC_CNT)		28.015			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Gatherers Percent Genera (GAT_PC_GEN)		35.484			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Scrapers Percent Individuals (SCR_PC_CNT)		2.226			
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Shredders Percent Individuals (SHR_PC_CNT)		5.937			

Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Insect Taxa (INSECT_T)	39
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Insect Percent Individuals (INSECT_PI)	99.84
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	EPT Taxa (EPT_T)	8
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Dominance 3 Percent Individuals (DOM3_PI)	38.978
Large River Macroinvertebrate Sampling	09/17/2015 12:00 AM	Intolerant EPT 2 Percent Individuals (INTOL_EPT2_PI)	4.792

APPENDIX E-19 Ecological Landscapes of Wisconsin

Ecological Landscapes of Wisconsin

Scale: 1:2,750,000
Wisconsin Transverse Mercator NAD83(91)
Map S1 - ams



Wisconsin was divided into 16 ecoregions with similar ecology and management opportunities. Each of these ecoregions is called an Ecological Landscape. The Ecological Landscapes are based on the National Hierarchical Framework of Ecological Units (NHFEU; Cleland et al. 1997). There were too many NHFEU Subsections and too few NHFEU Sections to be useful for management purposes. Ecological Landscapes use the same boundaries as NHFEU Sections or Subsections. However, some NHFEU Subsections were combined to reduce the number of geographical units in the state to a manageable number. Therefore, Ecological Landscapes are at a size (scale) between NHFEU Sections and Subsections.

Ecological Landscapes
County Boundaries

0 12.5 25 50 75 100
Miles
0 20 40 80 120 160
Kilometers

APPENDIX E-20 White River IPaC Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
4101 American Blvd E
Bloomington, MN 55425-1665
Phone: (952) 252-0092 Fax: (952) 646-2873

In Reply Refer To: July 20, 2022
Project Code: 2022-0065907
Project Name: White River Hydroelectric Project P-2444

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*).

Threatened and Endangered Species
The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance
Please refer to refer to our Section 7 website for guidance and technical assistance, including step-by-step instructions for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of "There are no listed species found within the vicinity of the project," then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats
Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

This species hibernates in caves or mines only during the winter. In Minnesota and Wisconsin, the hibernation season is considered to be November 1 to March 31. During the active season (April 1 to October 31) they roost in forest and woodland habitats. Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected.

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),

- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A stand of eastern red cedar shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:

- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

If any of the above activities are proposed, please use the northern long-eared bat determination key in IPaC. This tool streamlines consultation under the 2016 rangewide programmatic biological opinion for the 4(d) rule. The key helps to determine if prohibited take might occur and, if not, will generate an automated verification letter. No further review by us is necessary.

Please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the bat by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of northern long-eared bats after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

Whooping Crane

Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "Establishment of a Nonessential Experimental Population of

Whooping Cranes in the Eastern United States."

Other Trust Resources and Activities
Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination
While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.

Minnesota
Minnesota Department of Natural Resources - Endangered Resources Review Homepage
Email: Review.NHIS@state.mn.us

Wisconsin
Wisconsin Department of Natural Resources - Endangered Resources Review Homepage
Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Minnesota-Wisconsin Ecological Services Field Office
4101 American Blvd E
Bloomington, MN 55425-1665
(952) 252-0092

Project Summary

Project Code: 2022-0065907
Event Code: None
Project Name: White River Hydroelectric Project P-2444
Project Type: Power Gen - Hydropower - FERC
Project Description: White River Hydroelectric Project located in Town of White River, Wisconsin
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@46.4955893,-90.91407287893855,14z

Counties: Ashland County, Wisconsin

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf *Canis lupus* Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA. Mexico. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4488	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Great Lakes watershed DPS] - Great Lakes, watershed in States of IL, IN, MI, MN, NY, OH, PA, and WI and Canada (Ont.) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Common Tern *Sterna hirundo hirundo* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Aug 31
Connecticut Warbler *Oporornis agilis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 15 to Aug 10
Evening Grosbeak *Coccothraustes vespertinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

▪ probability of presence ▪ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of

certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

RIVERINE

- Riverine

FRESHWATER POND

- Palustrine

LAKE

- Lacustrine

IPaC User Contact Information

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Address: 2440 Deming Way
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State: WI
Zip: 53562
Email arianna.bres@gmail.com
Phone: 6084430316

APPENDIX E-21 White River NHI Review (Public)

The White River NHI review has been filed separately as privileged information.

APPENDIX E-22 White River Wood Turtle Nesting Habitat Study Report

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White River Wood Turtle Nesting Habitat Study Report

Northern States Power Company
White River Hydroelectric Project
White River, Wisconsin
GAI Project Number: R220323.02
| FERC No. 2444
November 2022

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

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Mary Rohde
Senior Environmental Manager / Associate

Table of Contents

1.0 Project Overview

The White River Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) No. 2444, is located on the White River in Ashland County, Wisconsin (Figure 1) and is owned, operated, and maintained by Northern States Power Company – Wisconsin (NSPW or Licensee). The current license expires on July 31, 2025, and as part of the relicensing process, the Wisconsin Department of Natural Resources (WDNR) requested the Licensee complete a wood turtle nesting habitat study to further knowledge of wood turtle distribution in the watershed. On behalf of Mead & Hunt, GAI is pleased to submit the results of a Wood Turtle Presence/Absence and Nesting Habitat Study conducted June 16 and 29, 2022 (Study) to fulfill this request. This Study report provides baseline data on available suitable nesting habitat in the following areas:

- Reservoir shoreline (surveyed by boat),
- Bypass channel and river downstream of the Project powerhouse (surveyed on foot),
- Upland shoreline owned by the Licensee (surveyed on foot), and
- Upland areas within 200 feet of the river's edge (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

The White River is a premier trout water fishery located in Bayfield and Ashland Counites. The river empties into the Bad River before flowing north into Lake Superior. The river provides spawning habitat for anadromous fish from Lake Superior in its lower reaches.

Much of the watershed remains undeveloped, though historically it was strongly influenced by logging in the area. Many of the small towns along the White River Valley were founded by lumber mills. The White River Hydroelectric dam was constructed in 1906 by L.E. Meyers Co. Forbes and Wixson (Wisconsin Historical Society), creating a 56-acre impoundment with maximum depth of 26 feet. Having a predominantly red clay bottom, the water clarity is highly variable and discolored a reddish-brown.

The wood turtle (G*lyptemys insculpta*) is a state threatened species known to be present within the White River watershed. Wood turtles prefer flowing rivers and streams with adjacent wetlands and upland deciduous forests. This 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 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 in open gravel or sandy areas. The young hatch the same summer and do not overwinter in the nest as do some Wisconsin turtle species (WDNR 2015).

While wood turtles are known to be present within the White River watershed and Project boundary, survey data is limited. As part of the federal relicensing process, the WDNR requested a wood turtle study to further the knowledge of wood turtle distribution within the White River watershed. This Study identifies areas of suitable wood turtle nesting habitat within 200 feet of the White River shoreline within the existing and proposed Project boundaries. Surveys for presence/absence of basking and nesting wood turtles on shorelines were conducted concurrently with the mapping effort. This report summarizes the results of the wood turtle presence/absence and nesting habitat study completed on June 16 and 29, 2022.

3.0 Methodology

Visual encounter surveys (VES) for presence/absence of basking and nesting wood turtles on shorelines were conducted approximating WDNR survey guidelines (WDNR PUB-ER-684). The presence/absence of suitable wood turtle nesting habitat was mapped in the month of June on sunny days when the temperature was between 50° - 80° degrees Fahrenheit (F). On June 16, 2022 (air temperature was 72° F) surveyors arrived onsite to find that the wind direction and speed made it unsafe to launch the canoe to complete the shoreline survey upstream of the dam, therefore the VES were completed using a terrestrial meander of the upland and shoreline portions downstream of the dam. Surveyors returned on June 29, 2022 (air temperature was 71° F) to complete the survey portion upstream of the dam via boat.

Property owned by the licensee within 200 feet of the water was meandered on foot (Figure 2). Within this area, two surveyors walked abreast at approximately 10-15 meters apart along the shoreline, adjusting the distance between themselves to accommodate for topography and vegetation restrictions. All suitable nesting habitat within 200 feet of the river's edge was recorded via GPS device (Figure 3). 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 200 feet of the river's edge. In addition to mapping the nesting habitat, the presence of any basking turtles or evidence of turtle nesting activity within the survey area was recorded.

Prior to performing the field work, GAI mapped a 200-foot buffer of the shoreline within the Project area. Topographic maps and parcel ownership were then reviewed for feasibility of terrestrial access. The flowage is accessible by launching a boat from the boat ramp located just north of the dam off State Highway 112. A portion of the flowage's north shore is private property; therefore, this area was sampled using a boat, moving slowing along the shore with the aid of binoculars to provide a good view into the upland understory. The area downstream of the dam is comprised of bedrock with shallow rapids whereby the launching of a boat is not feasible, therefore the shoreline in this area was surveyed on foot.

4.0 Results and Discussion

A total of 61,473 square feet (1.41 acre) of turtle nesting habitat was mapped within 200 feet of the shoreline within the Project area. The majority of the nesting habitat is comprised of the gravel access roads to the powerhouse and dam, a small portion of the road shoulders, and the gravel boat launch. A small area of naturally occurring nesting habitat was mapped upstream of the dam, but this area has steep slopes which may discourage nesting turtles.

High quality nesting habitat (naturally occurring suitable habitat areas not associated with roadways) was not readily available throughout the Project. Most of the shoreline above the dam was heavily vegetated down to the shore and comprised of either steep-sloped forested land or wetland marsh dominated by cattails, burr reed and reed canary grass. In a few areas, the banks have sloughed to such an extent that trees have fallen into the river. These landslide areas provide the only naturally occurring areas with open canopy and sandy substrates, however, they may not be suitable nesting habitat due to the steep slopes.

Below the dam, the south shoreline is dominated by bedrock and steep slopes. The nesting habitat observed on the north shoreline was comprised of gravel roads and areas where foot traffic and mowing has exposed the substrate.

Two turtle nests were observed at the boat launch, and they appeared to belong to painted turtles based on their size. A dead painted turtle hatchling was also found at the boat launch. No basking wood turtles were observed; the entirety of basking turtles observed were painted turtles.

5.0 References

Wisconsin Department of Natural Resources. 2015. Wisconsin Wood Turtle Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural Resources, Madison, Wisconsin. PUB-ER-684.

Wisconsin Historical Society, Wisconsin Architecture and History Inventory, “White River”, Ashland County, Wisconsin. Reference Number 26205

FIGURE 1
Project Location and Overview Map

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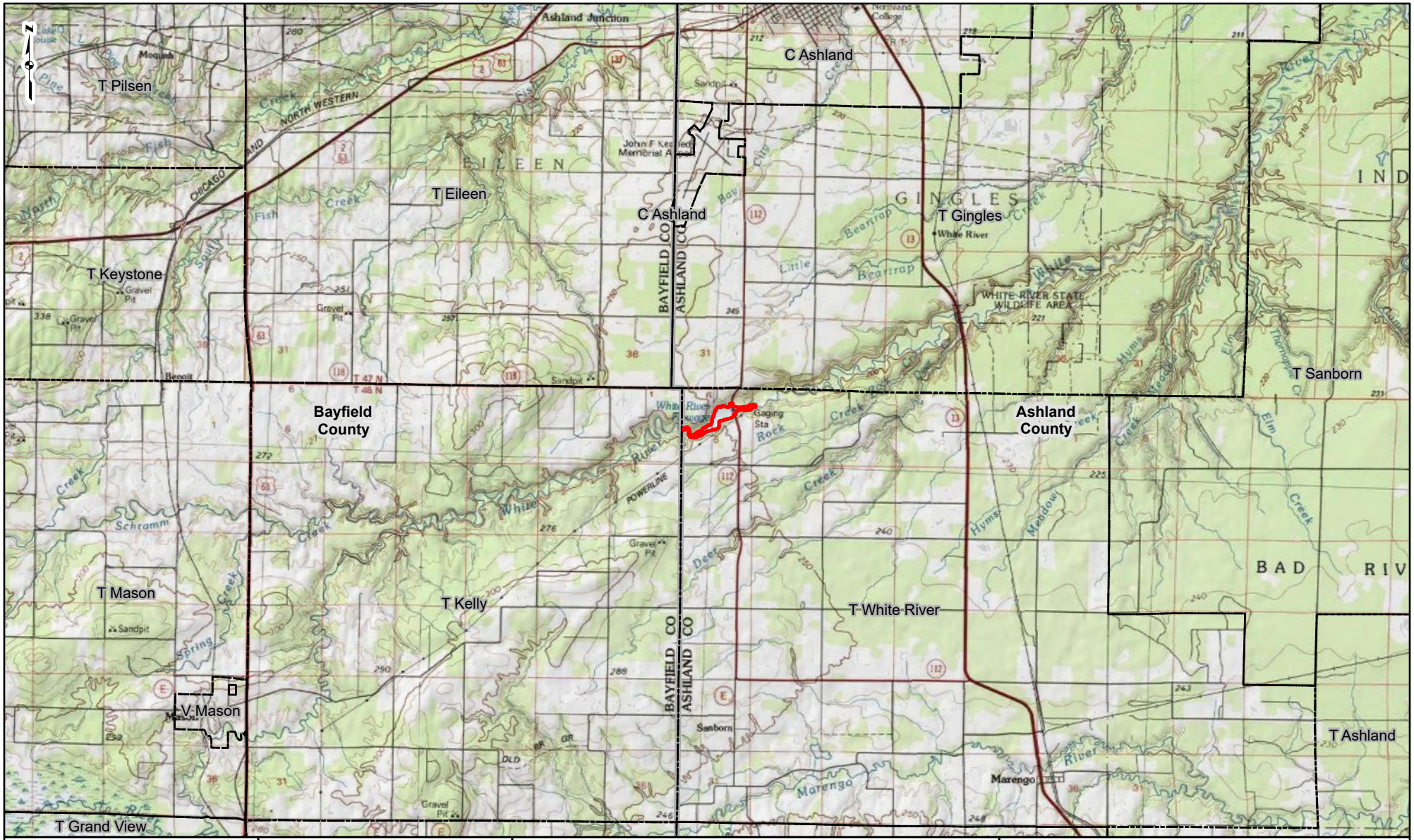
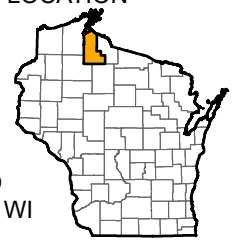


PROJECT LOCATION



ASHLAND COUNTY, WI

REFERENCE: ESRI USA TOPO Maps
100k Quadrangles: Ashland (1982), Ironwood (1982), Port Wing (1980), and Solon Springs (1981),
Accessed 7/25/2022. WDNR Counties, 2011.
WISLR Community Boundary 2021.

LEGEND

- Turtle Study Area
- Community Boundary
- County Boundary

0 5,000 10,000 20,000 Feet

FIGURE 1
PROJECT LOCATION and OVERVIEW MAP

WHITE RIVER HYDROELECTRIC PROJECT
(FERC # 2444)

gai consultants

Mead & Hunt

DRAWN BY: EMW DATE: 7/25/2022
CHECKED: TDB APPROVED: LLS

G:_2022\R220323.00 - GIS\AGP\Turtle_Mapping\White_River\R220323_00_White_River_Turtle_Mapping\R220323_00_White_River_Turtle_Mapping.aprx

FIGURE 2
Licensee Owned Property

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WHITE RIVER HYDROELECTRIC PROJECT (FERC # 2444)
FIGURE 2 LICENSEE OWNED PROPERTY

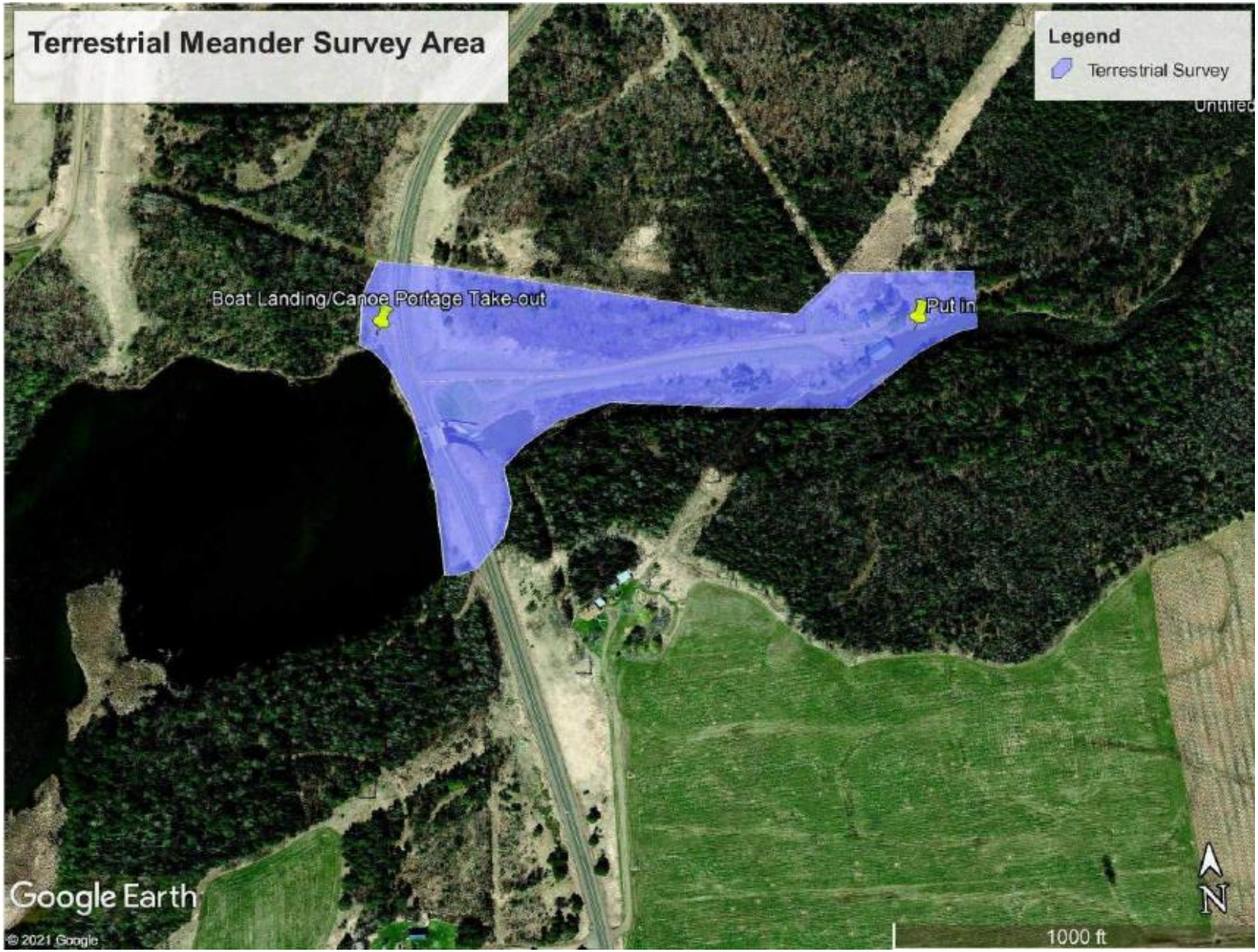
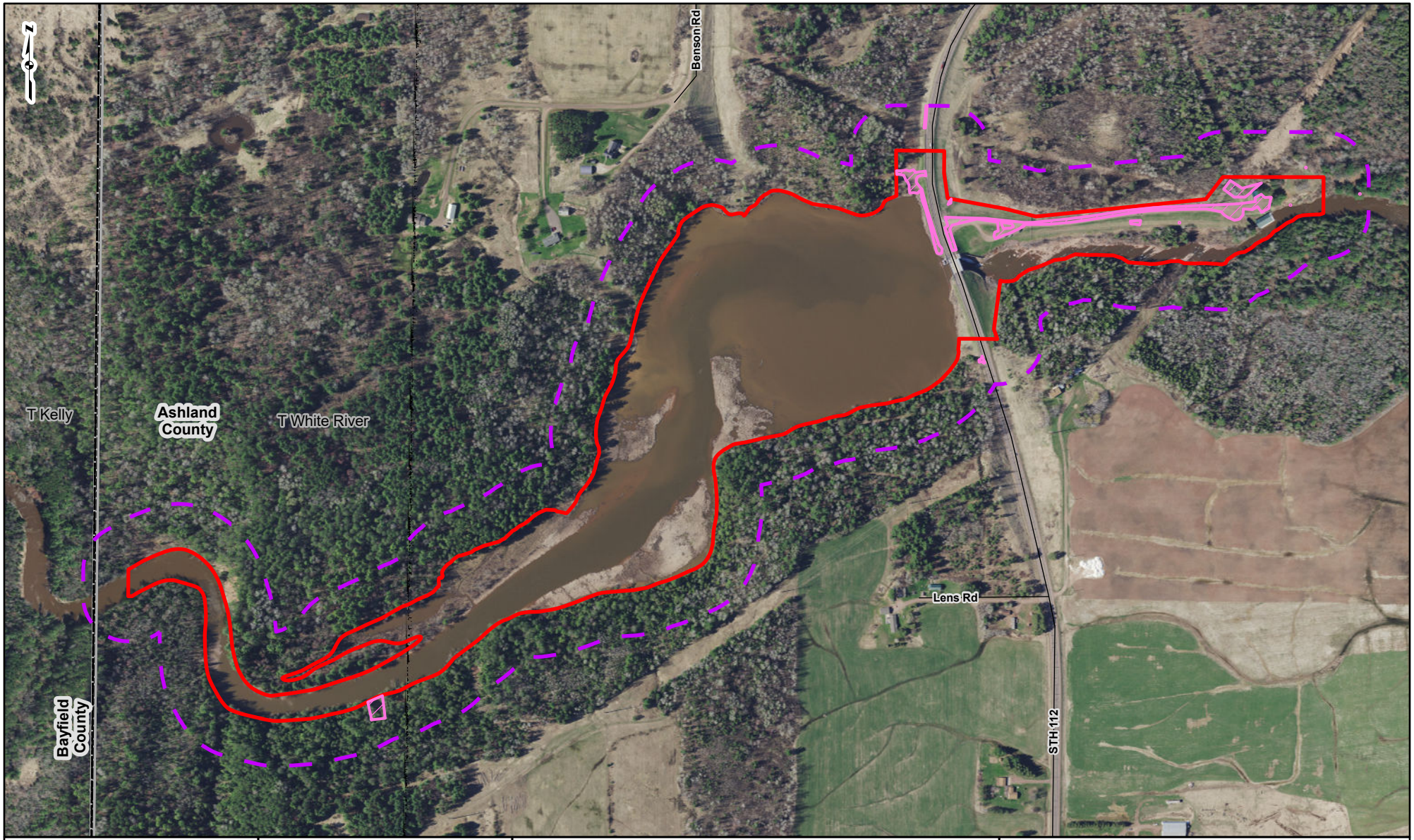
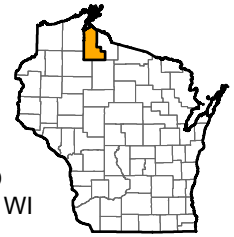


FIGURE 3
White River Available Wood Turtle Nesting Habitat



PROJECT LOCATION



ASHLAND COUNTY, WI

REFERENCE: WI DNR Leaf Off Imagery, Accessed 7/25/2022. WDNR Counties, 2011. WISLR Community Boundary 2021. WISDOT Road Centerlines, 2021.

LEGEND

- Road Centerline
- Turtle Nesting Habitat
- Turtle Study Area
- 200' Turtle Buffer
- Community Boundary
- County Boundary

0 300 600 1,200 Feet

FIGURE 3
WHITE RIVER AVAILABLE WOOD TURTLE NESTING HABITAT

WHITE RIVER HYDROELECTRIC PROJECT
(FERC # 2444)

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Mead & Hunt

DRAWN BY: EMW DATE: 7/25/2022
CHECKED: TDB APPROVED: LLS

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ATTACHMENT A
Photo Log

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White River Wood Turtle
Nesting Habitat Study
Report Photo Log

	
White River below the hydro dam Facing West, 46.509397, - 90.844114 June 16, 2021	White River above the hydro dam Facing West, 46.496961, - 90.909035 June 16, 2021
	
Small area of suitable nesting habitat Facing West, 46.498433, - 90.903934 June 16, 2021	Area of potential suitable nesting habitat, but steep slope. Facing South, 46.492235, -90.91959 June 29, 2021

APPENDIX E-23 BITP/A for Wisconsin Cave Bats

Broad Incidental Take Permit and Broad Incidental Take Authorization for Wisconsin Cave Bats

Conservation Plan - November 2022

During this COVID-19 pandemic, there is increasing concern that symptomatic or asymptomatic humans could inadvertently pass the virus that causes COVID-19 disease in humans to mammals, including bats, during handling. As a reminder, any handling of bats by a pest control operator requires an Endangered/Threatened (E/T) Species Permit (this is not required for a landowner). In addition, please be sure to continue following disinfection protocols for any equipment used during bat removals or exclusions (see Appendix 4).

The department has issued this broad incidental take authorization (used by state agencies) and broad incidental take permit (used by non-state agencies and individuals), as provided for under s. 29.604, Wis. Stats., to allow for the incidental taking of state listed cave bats in Wisconsin that may occur as a result of specific public health concerns, bat removals, building demolitions, tree cutting, bridge demolitions, miscellaneous building repairs and wind energy development projects.

This permit and authorization cover the above activities only if the associated minimization measures are followed and take is reported (where required). These measures must be followed when a bat is present or suspected to be present (e.g., evidence of bat presence, Endangered Resources Review). Please note that the northern long-eared bat is currently listed as threatened in Wisconsin and threatened with 4(d) rule at the federal level by the United States Fish and Wildlife Service (USFWS, http://www.fws.gov/Midwest/endangered/mammals/nleb/index.html). For the activities listed above, this Conservation Plan includes both state and federal requirements. The state cannot permit or authorize take of a federally listed species, however this Conservation Plan was written to incorporate both state and federal requirements.

For activities not listed above, contact the Wisconsin Department of Natural Resources' Endangered Resources Review Program (DNRERReview@wi.gov) for more information on state and federal requirements. Please note that building demolition, tree cutting, bridge projects, miscellaneous building projects and wind energy development typically require a full Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html to determine impacts to other wildlife species as well.

An incidental take permit or authorization is typically issued on a project-by-project basis, however a broad incidental take permit and broad incidental take authorization were created for this situation so that neither an application nor a permit fee are required. An individual following the minimization measures listed below is automatically covered by this broad incidental take permit/authorization. Take will be minimized by following specific minimization measures and the Department has concluded that the projects covered under this permit/authorization are not likely to jeopardize the continued existence and recovery of the state population of these bats or the whole plant-animal community of which they are a part; and has benefit to the public health, safety or welfare that justifies the action.

Project Location

Statewide

Project Information

This permit/authorization cover specific public health concerns, bat removals, building demolitions, forestry activities, bridge demolitions, miscellaneous building repairs and wind energy development projects as described in *Minimization Measures.*

Species Information

This permit/authorization cover all cave bats currently listed in Wisconsin (NR 27.07, Wis. Admin. Code):

- Big brown bat (*Eptesicus fuscus*) – State Threatened
  The big brown bat is a large insectivorous bat, weighing 15.0-26.0 grams. Fur color is russet to dark brown, and the muzzle is black and hairless. In summer, big brown bats commonly roost in artificial structures such as barns, but these bats will also use crevices in trees and rock faces. Big brown bats migrate short distances to caves and mines where they will hibernate for the winter.
- Tricolored bat (*Perimyotis subflavus*) – State Threatened
  The tricolored bat (formerly eastern pipistrelle) is Wisconsin's smallest bat weighing 4.0-8.0 grams. Fur color ranges from golden brown to reddish brown, and the wing membrane is black with red forearms. The tricolored bat is an insectivorous bat. In summer, these bats commonly roost in the branches of deciduous trees disguised as a leaf. This species migrates short distances to caves and mines in the fall where they hibernate over the winter.
- Little brown bat (*Myotis lucifugus*) – State Threatened
  The little brown bat is a medium-sized member of the genus *Myotis*. This insectivorous bat weighs 5.0-12.5 grams, and has tan, reddish-brown or dark brown fur. This species commonly uses artificial structures such as attics and barns as summer roosting sites, but will also roost in crevices and cavities of trees. In fall, little brown bats make local long-distance migrations of up to 279 miles to caves and mines where they will hibernate for the winter.
- Northern long-eared bat (*Myotis septentrionalis*) – State Threatened and Federally Threatened The northern long-eared bat is dark brown with a gray belly, weighing 5.0-8.0 grams and is insectivorous. In summer this bat roosts in trees behind loose bark and in cracks/crevices/holes along the trunk of the tree. It rarely roosts in artificial structures. Unlike most of the state's bats, this species commonly forages in forest interior. In fall the northern long-eared bat migrates to caves and mines where they will hibernate for the winter.

Likely Impact to Species

Although minimization measures to protect the big brown, tricolored, little brown and northern long-eared bats are incorporated into this broad incidental take permit/authorization, it is not possible to fully avoid incidental take of these species in all situations. Due to the nature of activities covered under this permit/authorization, it is difficult to determine the exact number of individuals that could be taken as a result of the project; however take will be minimized by following specific minimization measures. The Department has concluded that the take allowed for under this permit/authorization is not likely to jeopardize the continued existence and recovery of the state

population of these bats or the whole plant-animal community of which they are a part.

Alternative Actions

The following alternatives were considered for this permit/authorization:

Alternative 1: Do not allow for any take of cave bats.

> This alternative was determined to not be feasible, due to the large number of affected activities, and is not an appropriate public health decision.

Alternative 2: Do not allow for any take of cave bats during the summer roosting period but allow for some take throughout the remainder of the year.

> This alternative was determined to not be feasible, due to the large number of affected activities that occur during the summer roosting period, and is not an appropriate public health decision.

Alternative 3: Allow for some take of cave bats, with minimization measures in place, during the summer roosting period and throughout the remainder of the year.

> This option was the preferred alternative because it addresses public health concerns; protects a large number of bats; and allows for most affected activities to continue as planned, or with minimal modifications.

Minimization Measures

This permit/authorization covers the activities listed below only if the associated minimization measures are followed and take is reported (where required). These measures must be followed when a bat is present or suspected to be present (e.g., evidence of bat presence, Endangered Resources Review). Please note that the northern long-eared bat is currently listed as threatened in Wisconsin and threatened with 4(d) rule at the federal level by the United States Fish and Wildlife Service (USFWS, http://www.fws.gov/Midwest/endangered/mammals/nleb/index.html). For the activities listed below, this Conservation Plan includes both state and federal requirements. The state cannot permit or authorize take of a federally listed species, however this Conservation Plan was written to incorporate both state and federal requirements.

For activities not listed below, contact the Wisconsin Department of Natural Resources' Endangered Resources Review Program (DNRERReview@wi.gov) for more information on state and federal requirements. Please note that building demolition, tree cutting, bridge projects, miscellaneous building projects and wind energy development typically require a full Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html to determine impacts to other wildlife species as well.

Note: Take covered under this permit/authorization must be reported within 5 working days (where required below). Take not reported within 5 working days is not legally covered and is in violation of the Wisconsin Endangered Species Law (s. 29.604, Wis. Stats.). Reports can be submitted via email (DNRBats@wi.gov), or by submitting a sick/dead bat report using the form: http://wiatri.net/Inventory/Bats/Report/BatForm.cfm. When using the form, state that you are reporting take in the "Additional Comments" section.

A. Health Exceptions

The landowner, rather than the DNR, is allowed to determine if they believe there is a health risk under this section (Section A).

Centers for Disease Control and Prevention (CDC) protocols should be followed for all situations where rabies or histoplasmosis is a possibility or may become a possibility if action is not taken (see Appendix 1).

Additionally, exclusions completed from June 1 through August 15 must be reported to the Department by submitting a Health Exemption Form in order to be covered under this permit or authorization. The landowner is responsible for completing and submitting the form, which is available online (http://dnr.wi.gov/topic/erreview/itbats.html). This form must be completed and submitted to the Department within **5 working days of start of work**.

If an activity qualifies as a health exception, it is exempt from timing minimization measures, and maximum take limits, but exclusions done during the non-exclusion period for human health reasons must still minimize take by following the approved exclusion protocols listed in Appendix 5. Exclusion practices used that are not described in Appendix 5 are in violation of this permit/authorization.

B. Bat Removals and Exclusions

Exclusion is defined as the process of allowing a colony of bats to leave the structure but not re-enter (i.e., use of one-way doors, see Appendices 2 and 5). Physically removing the colony of bats is not included in the definition of exclusion and is not covered under this section of the permit/authorization. Bats may be removed from the living space of a building at any time (see B.1. below).

Approved exclusion practices may be reviewed in Appendix 5. Exclusion practices used that are not described in Appendix 5 are in violation of this permit/authorization

If bats must be handled or transported for any reason during the exclusion process, the person conducting the exclusion must possess a valid Endangered/Threatened (E/T) Species Permit (http://dnr.wi.gov/topic/endangeredresources/permits.html). By obtaining the E/T Permit, the pest control operator can assure the landowner that practices used by the pest control company are in accordance with state law and no fines should incur while exclusion is completed. If bats must be handled during the exclusion, an E/T Permit holder (i.e. a rehabilitator or licensed pest control operator) may be contacted to handle the bats.

Practices that cause intentional take of the bats (i.e., sticky traps, sealing the entry/exit points to the roost with bats inside, large-hole netting that traps bats) are not considered exclusion methods, are not covered under this permit/authorization and are in violation of Wisconsin's Endangered Species Law (s. 29.604, Wis. Stats.).

1. Living Space or Place of Work

   A living space is defined as a place of residence that is routinely and consistently inhabited. A living space does not include attics that are empty or used as storage.

   If individual bats (5 or fewer) enter a living space or place of work, reasonable attempts must first be made to remove or exclude the bats alive and unharmed (see Appendix 2). If individual bats cannot realistically be removed unharmed, up to 5 bats may be killed for the purpose of removing them from a living space or place of work. No more than 5 bats may be

killed within any 24 hour period and a maximum of 10 bats may be killed from June 1 – August 15 (**take report recommended – see "Note" above**).

Removals and exclusions from June 1 – August 15 are allowed in hospitals, medical clinics, day cares centers, nursing homes, assisted living facilities and restaurants.

2. Storage Areas, Attics, Barns, etc.

   Bats found in storage areas, attics, barns, etc., may be excluded from the area August 16 – May 31 (see Appendix 2). Exclusion may not occur from June 1 – August 15 unless a health exemption report form is filed (see Section A).

3. In an effort to help curb the spread of white-nose syndrome (WNS), bat exclusion professionals and pest control operators must follow these guidelines concerning cleaning equipment (NR 40, Wis. Admin. Code.):

   - Equipment used outside of Wisconsin should be thoroughly cleaned and disinfected before use in Wisconsin following the protocols in Appendix 4.
   - Equipment used at multiple sites within Wisconsin should be cleaned thoroughly and disinfected between uses following the protocols in Appendix 4. Materials that come in direct contact with bats such as bat cones or exclusion devices should not be used at multiple sites and should be discarded after use.

C. Building Demolition

Please note that timing restrictions in this section vary slightly from those listed for other activities. Bats typically leave summer roosts (in buildings or other locations) in late fall and begin to return in early spring. However, one bat species in Wisconsin is known to hibernate in buildings in winter. Bats are not actively flying during winter hibernation and can appear dead. As a result, traditional exclusion methods do not work.

1. For projects occurring where there is no evidence of bat presence (see Appendix 3), there are no restrictions.
2. For building demolition occurring from June 1 – August 15, where there is evidence of bat presence (see Appendix 3):

   - Building demolition and bat exclusions are generally not permitted during this time period in order to protect flightless pups in the roost. Exclusion and subsequent demolition may occur only if the bats are considered by the landowner to be a health risk. In these situations, a health exemption form must be completed within 5 days of starting work (see section A).

3. For building demolition occurring from August 16 – October 31 or March 16 – May 31, where there is evidence of bat presence (see Appendix 3):

   - Bats must be excluded from the building for at least 7 consecutive days immediately prior to demolition. Full exclusion is not required if the building is unsafe to enter, however reasonable attempts should still be made to exclude as many bats as possible while keeping all people safe. (Report required for unsafe buildings – see "Note" on Page 3.)

4. For building demolition occurring from November 1 – March 15, where there is evidence of bat presence (see Appendix 3):

- For any bats found prior to demolition work or encountered during the demolition phase, attempts must be made to transfer the bats to a wildlife rehabilitator for the remainder of the hibernation period OR the DNR's bat biologists must be consulted for additional options (Paul White, 608-267-0813 and john.white@wi.gov, or Heather Kaarakka, 608-266-2576 and heather.kaarakka@wi.gov).

D. Tree Cutting

Northern long-eared bats are federally protected in trees that are known maternity roosts (from June 1 – July 31) and in areas where known hibernacula could be impacted (including tree removal within 0.25 miles of a hibernacula entrance). If you will be cutting trees, please have an Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html conducted to determine if known northern long-eared bat maternity roosts or hibernacula exist near your project. If the Endangered Resources Review states that these areas do not exist near your project, there are no restrictions for tree cutting; however special consideration should be given to protecting snags or dying trees, particularly from June 1 – August 15.

E. Bridge Projects

The process for assessing transportation project impacts to listed species and the associated minimization measures will follow existing protocols.

1. Bridge repairs or demolition occurring from August 16 – May 31 do not have any restrictions. If bats are present, reasonable attempts should be made to prevent take by excluding the bats from the structure prior to demolition.
2. Emergency bridge repairs or demolition occurring from June 1 – August 15 are covered under this permit/authorization but must be reported within 5 working days (**report required – see "Note" above**).
3. Non-emergency bridge repairs or demolition may not occur from June 1 - August 15 unless bats are excluded prior to April 1 to prevent bats from using the bridge during the maternity period.

F. Miscellaneous Building Projects (e.g., roofing, painting, siding)

1. For projects occurring where there is no evidence of bat presence (see Appendix 3):
    - Full bat exclusions are not required.
    - If roofing, painting or siding and bats are found incidentally under shingles or roof vents, or behind shutters or siding, set the shutters or siding down and leave the area. Once the bats have left, continue with repairs. If bats do not leave, attempts should be made to transfer the bats to a wildlife rehabilitator OR the DNR's bat biologists should be consulted for additional options (Paul White, 608-267-0813 and john.white@wi.gov, or Heather Kaarakka, 608-266-2576 and heather.kaarakka@wi.gov).
2. For projects occurring from June 1 – August 15, where there is known bat presence (see Appendix 3):
    - Building projects with the potential to impact bats and bat exclusions are generally not permitted during this time period in order to protect flightless pups in the roost. Exclusion and subsequent building repairs may occur only if the bats are considered

by the landowner to be a health risk. In these situations, a health exemption form must be completed within 5 days of starting work (see section A).

- If roofing, painting or siding and bats are found incidentally under shingles or roof vents, or behind shutters or siding, set the shutters or siding down and leave the area. Once the bats have left, continue with repairs. If bats do not leave, attempts should be made to transfer the bats to a wildlife rehabilitator OR the DNR's bat biologists should be consulted for additional options (Paul White, 608-267-0813 and john.white@wi.gov, or Heather Kaarakka, 608-266-2576 and heather.kaarakka@wi.gov). Note that full bat exclusions are not required when bats are only incidentally found during miscellaneous building projects.

3. Projects occurring from August 16 – May 31 where there is known bat presence (see Appendix 3):

    - Take should be minimized during the course of the project by following applicable exclusion protocols listed in Appendix 5. Exclusion practices used that are not described in Appendix 5 are in violation of this permit/authorization.

    - If roofing, painting or siding and bats are found incidentally under shingles or roof vents, or behind shutters or siding, set the shutters or siding down and leave the area. Once the bats have left, continue with repairs. If bats do not leave, attempts should be made to transfer the bats to a wildlife rehabilitator OR the DNR's bat biologists should be consulted for additional options (Paul White, 608-267-0813 and john.white@wi.gov, or Heather Kaarakka, 608-266-2576 and heather.kaarakka@wi.gov). Note that full bat exclusions are not required when bats are only incidentally found during miscellaneous building projects.

G. Wind Energy Development

Wind energy projects typically affect tree bat species (not currently listed) and only impact cave bat species in certain situations (e.g., projects located near cave bat hibernacula may increase the occurrence of impacts to cave bats especially during fall migration in August and September). Further, there is not enough data at this time to determine the impact of potential mortality to local bat populations. Because of this uncertainty and the scope of impacts, no additional actions, above those currently requested by the Department, will be required of this industry at this time.

Mitigation

For every take of a cave bat that occurs, reasonable attempts must be made to prevent future take in the same area (e.g., exclusion of bats from the area, sealing of siding or eaves after bats are gone).

Responsible Parties

Landowners are responsible for all actions and costs incurred as a result of following this Broad Incidental Take Permit/Authorization.

Funding

Landowners are responsible for all costs incurred as a result of following this Broad Incidental Take Permit/Authorization.

Appendix 1: Health Information

Appendix 2: Removing and Excluding Bats

Appendix 3: Determining Bat Presence

Appendix 4. Cleaning and Disinfection Protocols for Bat Exclusion Professionals

Appendix 5. WDNR Exclusion Protocol

Appendix 1: Health Information

The following information was created by the Center for Disease Control and Prevention (CDC): http://www.cdc.gov/rabies/bats/contact/index.html. This information should be followed when handling or testing bats for rabies or histoplasmosis.

Recent data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats. Human and domestic animal contact with bats should be minimized, and bats should never be handled by untrained and unvaccinated persons or be kept as pets.

In all instances of potential human exposures involving bats, the bat in question should be safely collected, if possible, and submitted for rabies diagnosis. Rabies postexposure prophylaxis is recommended for all persons with bite, scratch, or mucous membrane exposure to a bat, unless the bat is available for testing and is negative for evidence of rabies.

Postexposure prophylaxis should be considered when direct contact between a human and a bat has occurred, unless the exposed person can be certain a bite, scratch, or mucous membrane exposure did not occur.

In instances in which a bat is found indoors and there is no history of bat-human contact, the likely effectiveness of postexposure prophylaxis must be balanced against the low risk such exposures appear to present. Postexposure prophylaxis can be considered for persons who were in the same room as a bat and who might be unaware that a bite or direct contact had occurred (e.g., a sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person) and rabies cannot be ruled out by testing the bat. Postexposure prophylaxis would not be warranted for other household members.

If you woke up because a bat landed on you while you were sleeping or if you awakened and found a bat in your room, you should try to safely capture the bat and have it tested. The same precautions should be used if you see a bat in a room with an unattended child, or see a bat near a mentally impaired or intoxicated person.

The small teeth of the bat can make a bite difficult to find. Be safe and in these situations, try to safely capture the bat, have the bat tested, and seek medical advice.

Appendix 2: Removing and Excluding Bats

Bat Exclusion

Method used by The Wisconsin Bat Program

A PROVEN SOLUTION

Do you have bats that you would like to remove from your living space? The following description is the widely accepted, non-lethal approach for excluding bats from your home. Killing the bats you will find does not solve the root problem which involves locating and sealing the actual access point that the bats are using. The remaining bats and future bats will still find their way into your attic or similar roosting space until you locate and seal all access points. Bats are NOT rodents and therefore will NOT chew their way into your house if you close off the opening. They use only existing openings.

As you may already know, bats are extremely beneficial to have in your neighborhood and many property owners spend a lot of effort trying to attract bats to their area by providing artificial roosts for them. If you have bats in your home you are half-way to experiencing the benefits of these insect-eating mammals without having to share your living space. The first step is already done; you have the bats interested in your location. The second step involves providing these bats with alternative roosting options that allows them to remain on the property without having access to your home. Finally, after a successful exclusion, the bats you saved will have a good chance of staying nearby. Why should you care if they stay? A single bat can eat 1,000 or more mosquito-sized insects in one hour and the equivalent of the bat's own body weight per night. As that is just a single bat, you can imagine what a colony of 20 to 100 bats can eat in one night.

Bats will NOT attack you while you are enjoying an evening on your porch. Instead, they are enjoyable to view as they capture 100's and 1,000's of insect pests that would normally be interrupting your relaxing night outside. They conduct this service to you for free. You simply need to provide these bats with an alternative place to live that is not in your home. Like bird houses, a bat house is relatively easy to build yourself, inexpensive to purchase, and readily available from a variety of organizations.

Let's get started with the process.

First of all, timing is important when excluding bats from the home. Do not attempt to exclude bats during the summer months when the colony is established and the young are unable to fly. Bat exclusions should not be conducted from May 1st through August 31. Exclusions occurring during this time period will separate mothers from their pups, leaving the pups to die of starvation. Frantic mothers, searching for an opening to reach their pups, may enter your living space and be more difficult to deal with than what you started with. By trapping the flightless young inside, you may also have created another unexpected

problem involving the smell of dead animals.

Step 1: OBSERVE
Where are the bats entering?

At sunset or just before sunrise, have one or more persons located around the house observe where the bats are exiting the building. Observers should be able to see the entire structure without turning their heads; bats can exit and take flight in a matter of seconds. Make observations

Bat Guano

for several nights. This will ensure that all or most exit-points are identified. Pay special attention to areas in which bats commonly find access to your home: corners, eaves, louvers, loose siding, window air conditioners, and loose or damaged screens. Search the building for other various structural defects needing maintenance as the bats may search for alternative openings to their former roosting site after exclusion. It may take a second year of observation to ensure you have located all possible entry points.

Visible signs such as staining and guano (bat droppings) will also help identify openings. The body oils of bats can cause

Bat guano in front of garage

staining on the main access areas of the building, though you will need to look carefully because it is not always obvious. One of the best ways to find an opening is somewhat counter-intuitive: looking down instead of up. Guano found on the ground indicates bat activity from their opening above. When you find a concentration of these small droppings on the ground next to the foundation, you will often have a better chance of finding the access point.

Step 2: INSTALL
Can we still keep the bats here in my yard by putting up a bat house?

YES. Want to provide bats with a home, just not your own? We recommend installing an alternative roost, commonly referred to as a "bat house", in the general vicinity of the entry-points. If you exclude in the fall, installing the bat house a year before the exclusion or during the start of summer, provides the best chance for

Two types of bat houses

success. As bats come and go, they will become familiar with the structure. Upon exclusion, this familiarity will provide the best possible chance for the successful inhabitation of the bat house by the recently excluded bats. If you are interested in purchasing or building bat houses, contact the Wisconsin Bat Monitoring program. The program staff can help you decide on where to purchase the best bat house design with proven success. The Wisconsin Bat Monitoring program can also give you instructions for building your own bat house. Read our information pamphlet titled: "Building a Bat House" to learn how to build and locate your bat house. Location and design are critical pieces as bats are more difficult to attract to a bat house than birds are to a bird house.

Step 3: EXCLUDE

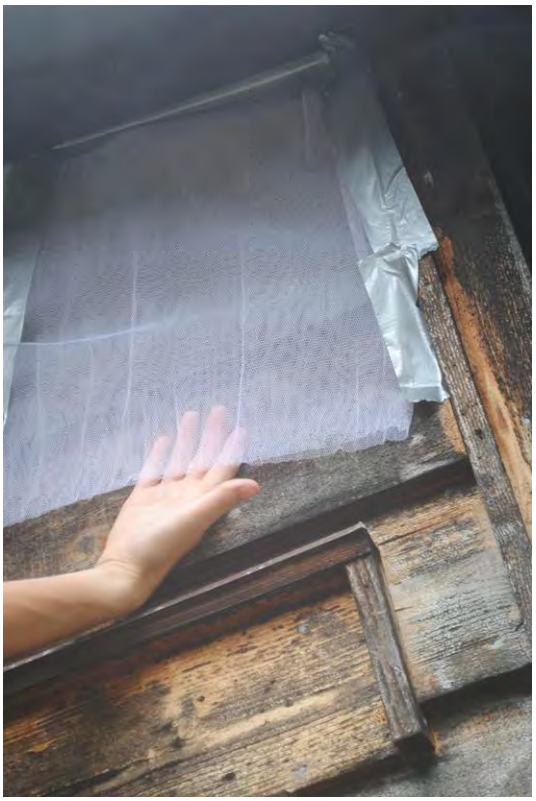
1. One-way doors 2. One-week wait, 3. Seal all of the holes.

After all openings have been discovered, install one-way exits. These exits will allow bats to leave, but will not allow them to re-enter. Keep in mind the time of year as you do not want to trap the flightless young inside. Avoid excluding bats between May 1st and August 31st.

One-way exclusion devices can be created using plastic netting with one-sixth inch (0.4 centimeter) or smaller mesh. Shape the plastic netting so that it covers the opening entirely and extends at least two feet below it. Using staples or duct tape, attach the top and side edges of the

Applying screen for one-way door

plastic netting to the building, leaving the bottom edge open. Be conscious of the netting's tautness; you should be able to slide your hand into the bottom opening though not so loose that the bats may easily crawl back up the opening. At sunset the following night, some of the bats will escape through the open, bottom portion. Leave the netting up for five to seven days; this will ensure that all bats have exited the building. After all bats have been excluded, you may then seal the openings permanently with appropriate construction materials.



Space on bottom for bats to escape

Remember that bats will not chew their way back inside your house. So, after you've found and sealed all of the access points you will have successfully excluded the bats from your living space.

Other materials can be used to create one-way exits, such as plastic sheeting or PVC pipe. Install the plastic sheeting in the exact manner as the plastic netting. A portion of PVC pipe, which should be similar in size to a tube of caulk, can be inserted into the opening. Seal the remaining portion of the opening that surrounds the outer rim of the pipe.

PVC one-way door

Clean-up

After the bats have been successfully excluded, most people will want to clean the guano out of the building. When cleaning enclosed spaces, there is one simple precaution you should take in protecting yourself from being exposed to a disease known as histoplasmosis. Histoplasmosis is a respiratory disease caused by a fungus that can grow on accumulations of bird and bat guano and may become airborne if disturbed during the cleaning process. The fungus is not necessarily present at your site; however it is best to approach any clean-up with some safety measures. Symptoms of histoplasmosis usually appear within 3 to 17 days after exposure, and may resemble a cold or chronic cough. The risk of histoplasmosis can be reduced and even prevented by wearing a face mask and gloves while working. Wash all clothes and equipment after cleaning out the previously occupied space. If you want nothing to do with a possible risk to your health there are professional cleaning services that can do this for you. Search online or in your phone directory for a local business. There are also a number of exclusion professionals that deal specifically with bat removal in the State of Wisconsin if you are not comfortable with the do-it-yourself method.

Summary

This is how you conduct widely accepted, non-lethal approach to excluding bats from your living space.

1. Observe your building around sunset or sunrise to detect all locations bats are using for access.
2. Install a bat house prior to conducting exclusion in order to maintain the beneficial insect-eating service of the bats in your back yard.
3. Install a one-way door over the opening(s) and wait a week until all of the bats have left.
4. Permanently seal the access points with appropriate materials.
5. Enjoy a night on your deck or patio and watch your relocated colony of bats eat 100's to 1,000's of mosquito-sized insects.
6. Let us know how it worked out as we would like to hear your success story about relocating bats from your attic to their own bat house.
7. For additional information on bats of Wisconsin check out our bat website.

Wisconsin Bat Monitoring Program
http://wiatri.net/inventory/bats

Bat Access points to your living space

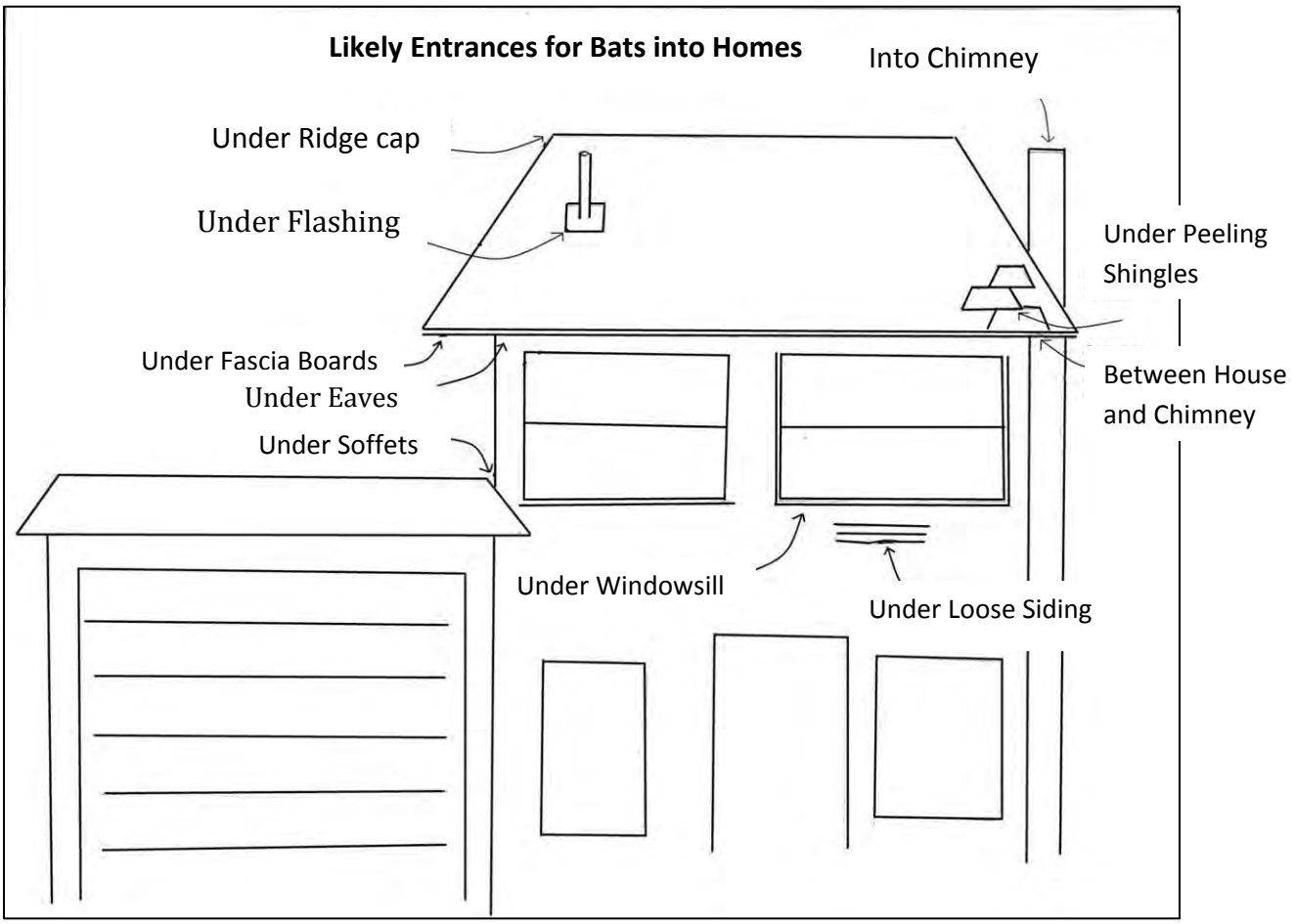


Figure 1: There are several common entry points for bats to find their way into your home. Check for guano piles and stains around these points first in locating the entry points.

Exit Only

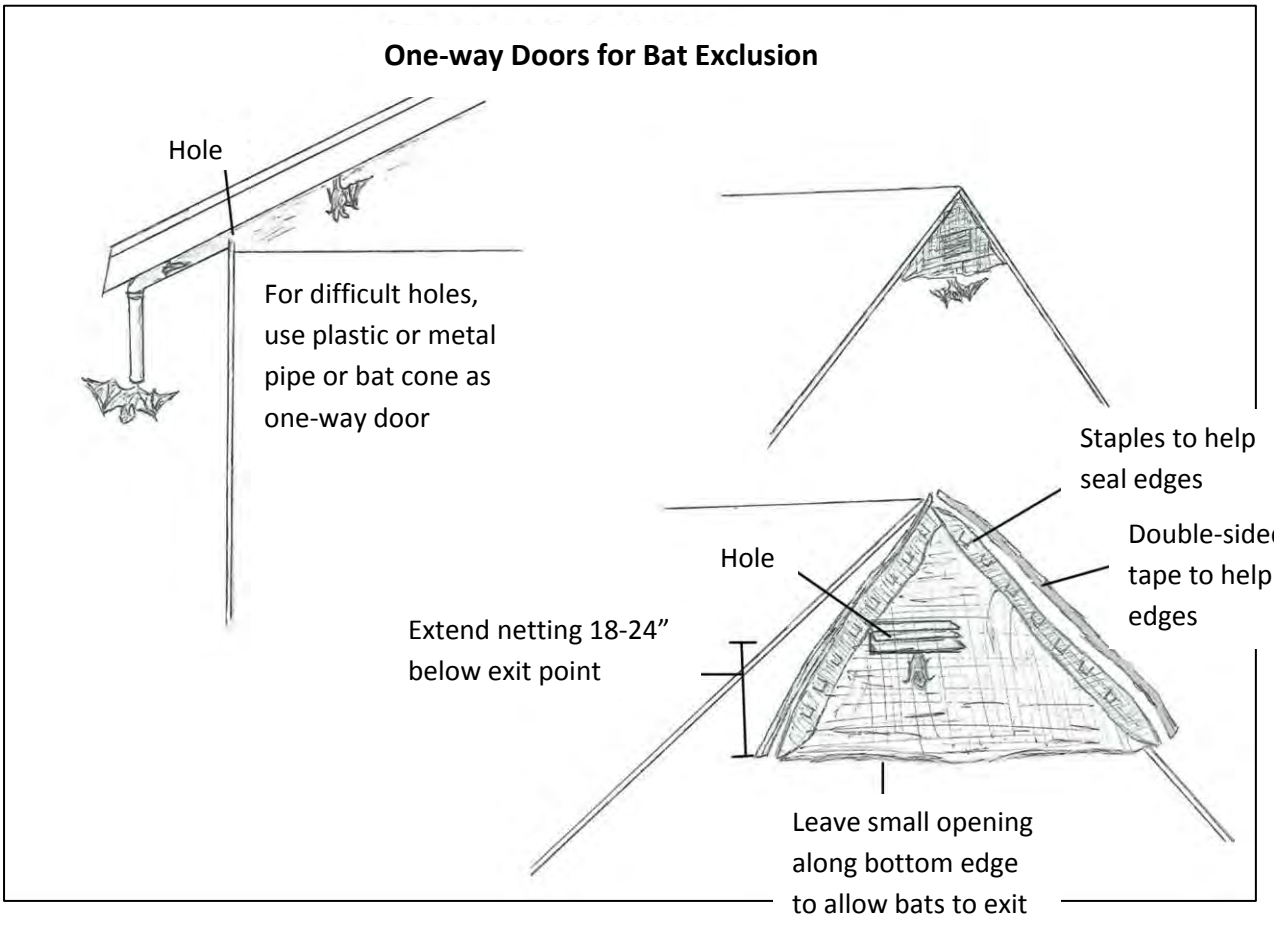


Figure 2: Two common one-way door designs: PVC tube for a small oddly-shaped hole, and netting or mesh for larger holes.

Appendix 3: Determining Bat Presence

1. Take note of places where bats are likely to enter your home. Bats can enter through holes smaller than a quarter in size. Places like fascia boards, where two buildings meet, between the building and a chimney, under loose shingles, under ridgecaps, under windows, through vents into attics, under flashing, under eaves and under loose siding are all common places for bats to enter.

2. Look for evidence on the ground. Bats will defecate while they roost, and piles of guano usually indicate where bats are roosting.

3. Look for evidence on the building itself. Places where bats enter and exit often have stains from urine and skin oils on the siding and holes. These can be good indications of where bats are entering.

4. Monitor in the evening. Even if no visible signs occur, bats may still be roosting in a building. Observe the building at dusk to see if any bats fly out of openings. Listening at this time can also alert the observer to the presence of bats. Bats will often become very vocal 5-10 minutes before they take flight to forage. Bats make an audible buzzing and clicking while they are roosting.

Appendix 4.

The WDNR is requiring cleaning of all equipment and clothing that comes in contact with cave bats and their habitat at any point during the year in an effort to control human transmission of white-nose syndrome. The fungus that causes white-nose syndrome, *Pseudogymnoascus destructans* was listed as prohibited invasive species in 2011 under NR. 40, and allow for the following control measures.

All equipment and clothing that is used outside of the state of Wisconsin and at multiple sites within the state during exclusion must be cleaned according to the protocols listed in appendix 4. Protocols are in accordance with U.S. Fish and Wildlife Service white-nose syndrome decontamination procedures: http://whitenosesyndrome.org.

Additionally, to minimize risk of possible transfer of the SARS-CoV-19 to North American bats, follow these guidelines for proper Personal Protective Equipment during work.

1. Per CDC guidelines for COVID-19, to block or minimize exchange of respiratory droplets wear a mask when doing work involving bats, including installation of one-way doors and cleaning of attics.
2. Use of disposable equipment and coverings (gloves, coveralls and booties) is highly recommended.
3. All equipment used during the exclusion process should be thoroughly scrubbed or brushed to remove all organic material.
4. Once scrubbed of organic material, clothing and equipment must be sealed in a plastic container or bag to be transported to a suitable site for cleaning. Anything that can be disposed of must be sealed in a plastic trash bag and discarded.
    a. All equipment and clothing that can be **completely submersed** must be washed with Woolite in wash cycle, rinsed, then
        i. submersed in hot water (>131 degrees F) for a minimum 20 minutes
        ii. soaked in 1:10 bleach solution for a minimum of 10 minutes,
        iii. soaked in 1:128 Lysol for a minimum of 10 minutes.
    b. All equipment that **cannot be completely submerged** in a solution or hot water or must be used immediately between sites must be scrubbed to remove all organic material and wiped with Lysol disinfecting wipes so that the entire surface is disinfected.
5. All equipment and clothing must air dry.
6. Prior to entering the vehicle, clean or remove clothing and footwear to avoid contaminating vehicles.

Appendix 5: WDNR Exclusion Protocol

Exclusion activities outside of the following protocol are not covered under the Broad Incidental Take Permit/Authorization and mortality may incur fines. The landowner and/or the pest control operator completing the work may be liable for fines.

Exclusion is the act of allowing bats to leave but not return to a building through the use of one-way doors. One-way doors may be comprised of the following materials and design:

1. **Tubing**- Tubes for exclusion may be plastic or metal and should hang down at least 10-15 inches from the opening. Netting may be installed at the end of the tube to prevent re-entry but the mesh must be plastic with holes smaller than 1/6th inch.
2. **Mesh or netting**- Netting may be installed over entry/exit points, but the netting must have holes 1/6th inch or smaller so as to not trap bats, and must extend at least two feet below the entry point. The mesh/netting must be open at the bottom to allow bats to exit under the screen.
    a. If it is found the netting used is tangling and trapping bats, the pest control operator must remove the bats and release them, and the netting must be replaced with smaller mesh or with a different type of one-way door.
3. **Plastic sheeting**- Plastic sheeting may be installed in a similar fashion to the mesh. There should be enough space behind the plastic to allow the bats to crawl out from behind the sheeting. It must be open at the bottom to allow the bats to exit.
4. **Changes to roosting environment**- changes can be made to the roosting habitat to discourage use by bats. These may include, but are not limited to, installation of windows to increase light in the roost, or installation of sheet metal on roosting surface to limit ability of bats to hang. Any changes to the roost environment must not cause take.

Exclusion devices must remain up for at least 5 days prior to sealing the openings, and there must not be bats in the roost when building is sealed.

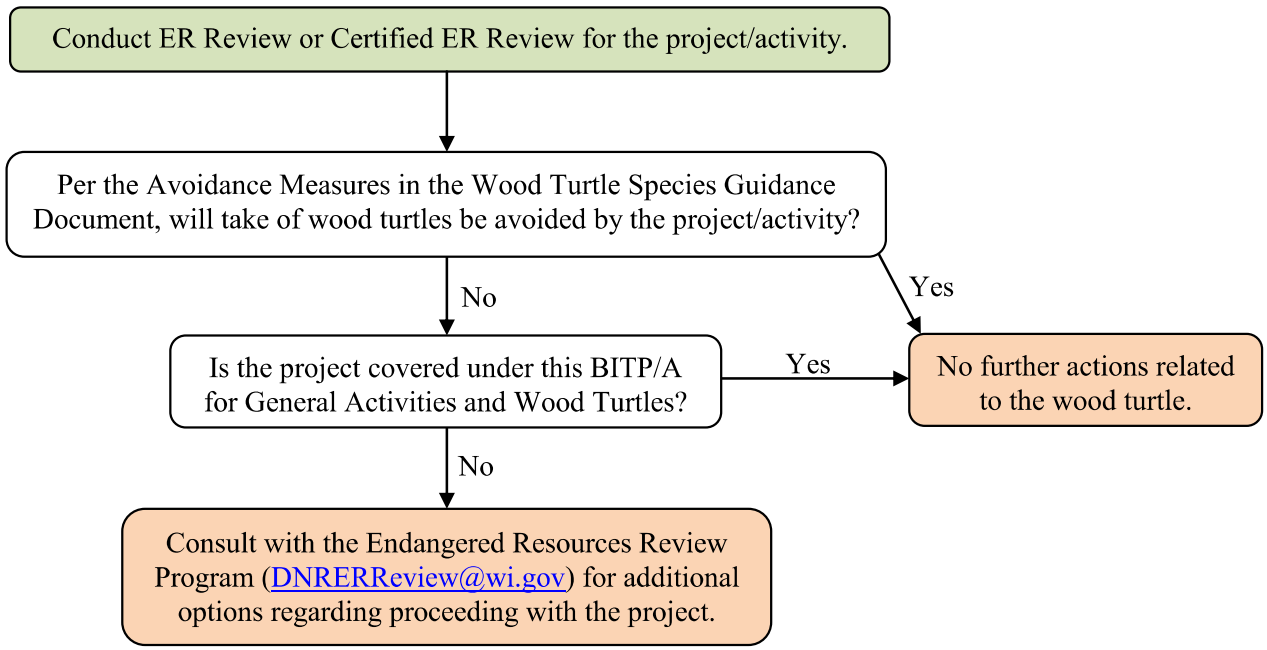
APPENDIX E-24 BITP/A for Wisconsin Wood Turtles

April 2016

Wisconsin Department of Natural Resources
Broad Incidental Take Permit/Authorization for Common Activities

General Activities
and
Wood Turtle (*Glyptemys insculpta*)

If an Endangered Resources (ER) Review or Certified ER Review has indicated the likely presence of the wood turtle and avoidance is not possible (per the Wood Turtle Species Guidance document: http://dnr.wi.gov/files/PDF/pubs/er/ER0684.pdf), this Broad Incidental Take Permit/Authorization (BITP/A) should be followed. In general, this BITP/A covers most activities that do not permanently impact habitat (e.g., land management, forestry activities, utility activities) but does not cover land conversion activities (e.g., commercial development, residential development, road expansion).



April 2016

The following activities are NOT covered under this Broad Incidental Take Permit/Authorization but may be eligible to apply for an individual Incidental Take Permit/Authorization or an Endangered/Threatened (E/T) Permit[1]:

1. Land conversion activities (e.g., commercial development, residential development, road expansion) that permanently alter or reduce habitat.
2. Ground disturbance, heavy equipment operation or supply/equipment storage within nesting habitat (exposed sand or gravel areas within 200 ft of a suitable stream/river) during the nesting season (May 20 – September 18), unless *erosion/sediment control fencing or amphibian/reptile exclusion fencing is installed around the project area during the inactive period (November 1 – March 14) to prevent turtles from accessing the work area.*
3. Prescribed burning during the egg laying period (May 20 – July 5) within nesting habitat (exposed sand or gravel areas within 200 ft of a suitable stream/river), unless *erosion/sediment control fencing or amphibian/reptile exclusion fencing is installed around the project area during the inactive period (November 1 – March 14) to prevent turtles from accessing the burn area.*
4. Instream work and drawdowns during the maximum overwintering period (October 1 – April 30). In stream work includes, but is not limited to, streambank/rip rap installation, ford installations, open cut trenching, and dredging.
5. Intentional killing or collection of wood turtles (includes eggs, hatchlings, juveniles and adults).

All projects not listed above are covered under this Broad Incidental Take Authorization if the following measures are followed:

1. Project personnel (individuals on site for project purposes rather than for the purpose of looking for turtles) must move any turtles observed on site out of harm's way.
2. Only the following herbicides may be used during periods when the turtles could be negatively impacted: 2, 4-D salt at concentrations of 40 ppm or less (2, 4-D ester should not be used), clopyralid (e.g., Transline), Cutrine without a surfactant, diquat (dibromide) at concentrations of 1.0 ppm or less, glyphosate without a surfactant (e.g., Aquaneat), hexazinone (e.g., Velpar), imazapyr (e.g., Arsenal, Chopper), Triclopyr ester and salt concentrations of less than 2.0 ppm. Other herbicides may be approved on a case by case basis by the Endangered Resources Review Program (DNRERReview@wi.gov). *Note – these herbicide brand names are only provided for reference and are not an endorsement of any specific brand.*

Voluntary Conservation Measures (these are strictly voluntary measures at the discretion of the landowner but would help to conserve this species, wherever possible):

1. For streambank stabilization/rip rap projects, it is recommended that all voids in exposed rock above the Ordinary High Water Mark be filled with soil and seeded with a native seed mix

1 Consult with the Endangered Resources Review Program (DNRERReview@wi.gov) for more information

appropriate for the habitat. It is recommended that any riprap not able to be top-dressed with soil and seeded will have the interstitial voids filled with 0.5 to 2.0 inch gravel to ensure that hatchling turtles cannot become entrapped in large voids between rocks.

2. It is recommended that activities during the turtle's active season that occur within 100 feet of a suitable wood turtle stream/river take place when 100% of the area is naturally snow covered.

3. It is recommended that activities during the turtle's active season that occur greater than 100 feet from a suitable wood turtle stream/river take place at any time of year when 50% or more of the harvest area is naturally snow covered.

4. Minimize work within wood turtle upland foraging areas (measured out from a suitable stream/river shoreline).

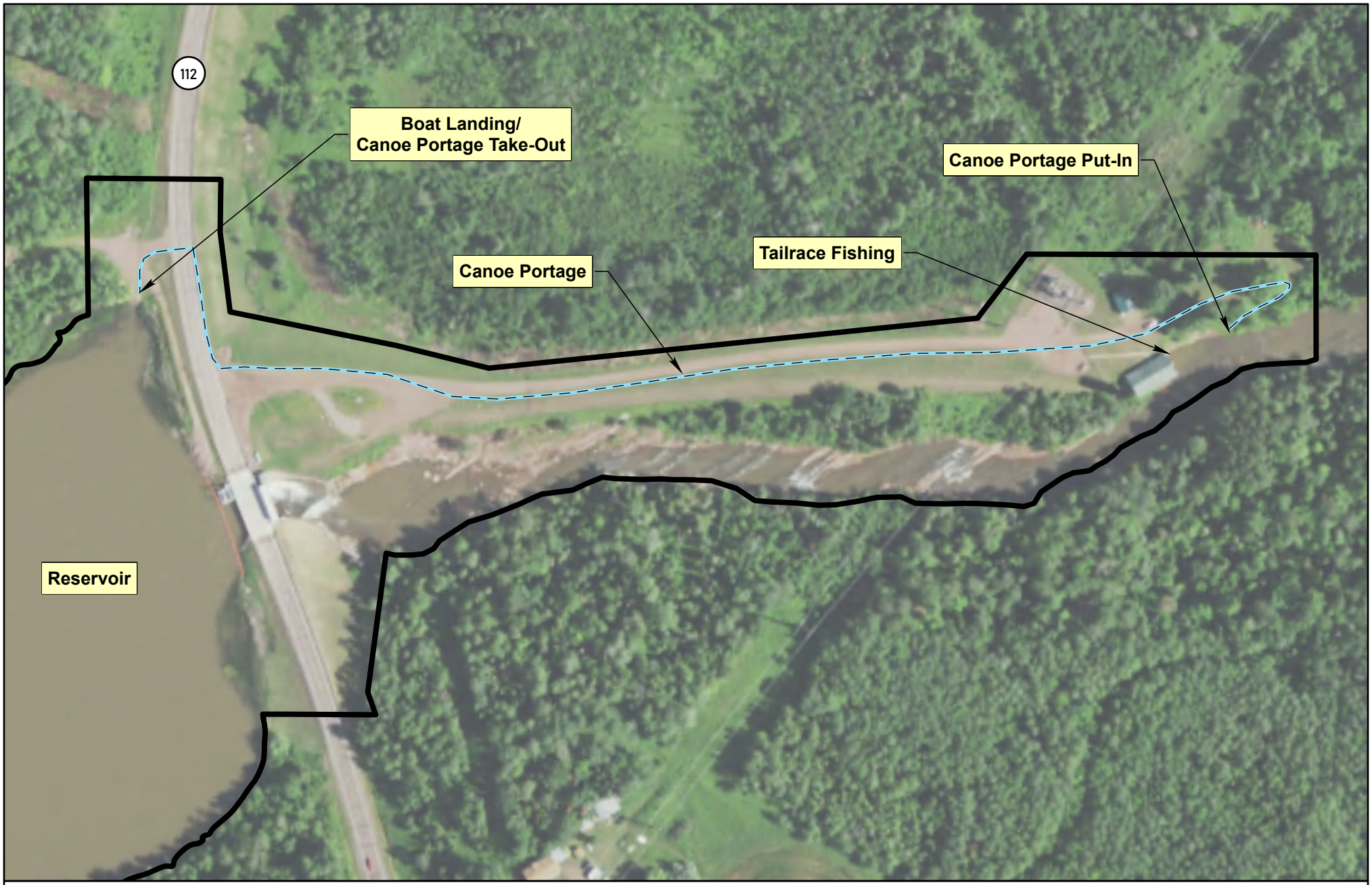
Dates*	**Wood Turtle Upland Foraging Area** (Recommend Minimizing Disturbance in These Areas)
Nov 1 - Mar 14	none
Mar 15 – May 14	0-75 m (0-264 ft)
May 15 – Sept 15	0-300 m (0-984 ft)
Sept 16 - Oct 31	0-75 m (0-264 ft)

**The dates listed can change each year based on annual weather conditions (e.g., cold spring, late snowfall, early frost). These changes will be posted on the DNR website: http://dnr.wi.gov/topic/WildlifeHabitat/Herps.asp#regs.*

***Uplands are defined as any area that is not a stream/river (i.e., not overwintering habitat).*

5. If erosion matting (also known as an erosion control blanket, erosion mat or erosion mesh netting) will be used, the following matting (or something similar) should be installed: Use matting that incorporate a "leno" or "gauze" weave (where strands have independent movement). Ensure the weave is loose and the strands have good mobility. American Excelsior "FibreNet" or "NetFree" products; East Coast Erosion biodegradable jute products; Erosion Tech biodegradable jute products; ErosionControlBlanket.com biodegradable leno weave products; North American Green S75BN, S150BN, SC150BN or C125BN; or Western Excelsior "All Natural" products. *Note – these brand names are only provided for reference and are not an endorsement of any specific brand.*
6. Nest site creation/restoration/enhancement (if you are interested in this option, please contact a District Ecologist or the Endangered Resources Review Team for more information).
7. Invasives clearing from a nesting or foraging area (if you are interested in this option, please contact a District Ecologist or the Endangered Resources Review Team for more information).
8. Install culverts under roads with turtle exclusion fencing (if you are interested in this option, please contact a District Ecologist or the Endangered Resources Review Team for more information).

APPENDIX E-25 Recreation Sites in the White River Project Boundary



Xcel Energy®

Mead & Hunt

Proposed Project Boundary

Canoe Portage

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

N

0 150 300

Feet

White River Hydroelectric Project
Recreation Facilities

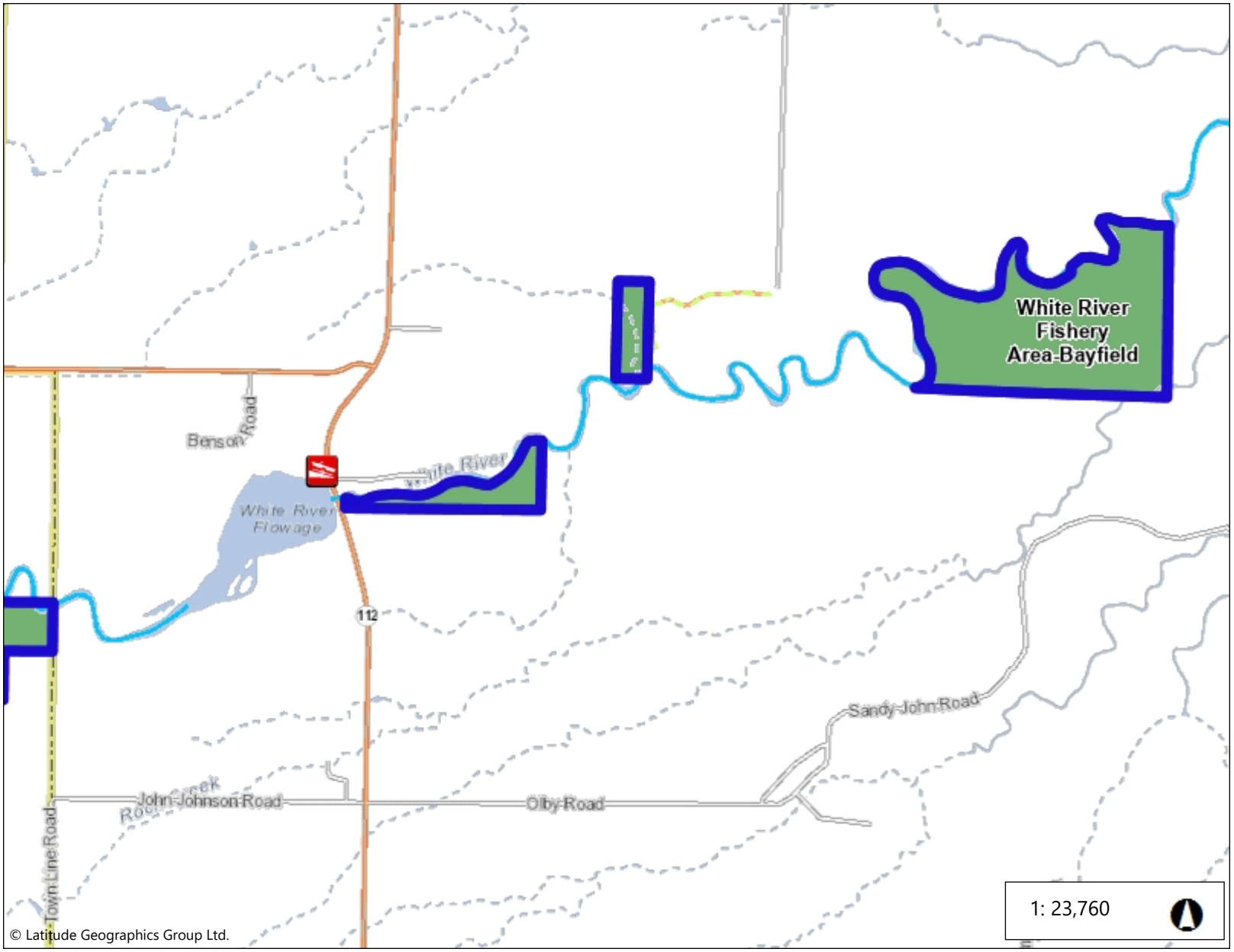
FERC No. 2444

Source Layer: WI 2022 NAIP (natural color, 0.6-meter resolution)

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA.aprx

APPENDIX E-26 Other Recreation Sites in the White River Project Vicinity

White River Fishery Area in Project Vicinity



Map Features

- DNR Parking Area
- Shore Fishing Site
- Boat Access Sites
  - CARRY-IN
  - RAMP
  - UNKNOWN
- Public Shooting Ranges
- Leased Hunting Land
  - VPA (Hunting, Fishing, Trapping, W
  - THAP (Spring Turkey Hunting Only
- Trout Stream Lines
  - Class 1
  - Class 2
  - Class 3
- Trout Spring Ponds
  - Class 1
  - Class 2
  - Class 3
- DNR Temporary Closed Area
- Natural Area Parcel Ownership
  - WI DNR
  - Non-DNR
- Roads Open for Licensed Stre Use
  - Open
  - Open Seasonally
- Roads Open For ATV/UTV/Sn
- Roads Open For ATV Use
- Roads Open For Snowmobile
- Closed and Restricted Areas

Notes

0.75 0 0.37 0.75 Miles

Projection: NAD_1983_HARN_Wisconsin_TM

Map created: 2/2/2023

APPENDIX E-27 Bayfield County Comprehensive Outdoor Recreation Plan

Bayfield County Comprehensive Outdoor Recreation Plan 2020- 2024

above expectations
BAYFIELD
COUNTY

Bayfield County Board of Supervisors

George Newago

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Brett T. Rondeau

The preparation of this report was completed by the Bayfield County Forestry & Parks Department.

Administrator
Jason Bodine

Recreation Forester
Jenifer Bratsch

Resolution

No. 2020-25

ADOPTING THE BAYFIELD COUNTY COMPREHENSIVE OUTDOOR RECREATION PLAN 2020-2024

WHEREAS, Bayfield County, has developed and maintained a local comprehensive outdoor recreation plan; and

WHEREAS, this plan is updated every five years to reflect the needs of local units of government, Tribal government, and various non-profit organizations that provide recreational opportunities for the public;

WHEREAS, this plan identifies existing recreation-based infrastructure and features that are managed and/or maintained by each entity, while also listing foreseeable outdoor recreation facility needs at various locations throughout Bayfield County, that can be adequately maintained for public use;

WHEREAS, the Forestry and Parks Committee approved this plan during their March 9, 2020 meeting; now

THEREFORE, BE IT RESOLVED, that the Bayfield County Board of Supervisors, meeting this 31st day of March 2020, hereby formally adopt the Bayfield County Comprehensive Outdoor Recreation Plan, as presented, as the official policy statement for the development and maintenance of outdoor recreation programs and facilities in Bayfield County.

BAYFIELD COUNTY BOARD OF SUPERVISORS

Dennis M Pocernich
Dennis M. Pocernich, *Chair*

STATE OF WISCONSIN)
)ss.
BAYFIELD COUNTY)

I, Scott S. Fibert, Bayfield County Clerk, hereby certify that the foregoing is a true and correct copy of Volume 27, adopted by the Bayfield County Board of Supervisors at their meeting held on the 31st day of March 2020.

Scott S. Fibert
Scott S. Fibert, *Bayfield County Clerk*

Table of Contents

Introduction

Bayfield County is the second largest county in Wisconsin containing 967,670 acres and it has abundant land and water recreational resources. This updated plan will serve as a guide for the development of existing and future outdoor recreation areas and facilities in the county to meet the recreational needs of its residents and visitors.

The plan is a cooperative effort between Bayfield County and its many municipalities, one tribal government and non-profits. Development and adoption of this updated recreation plan will enable Bayfield County and other governmental entities in the county to be eligible to apply for a number of outdoor recreational grant programs including: the Land and Water Conservation Fund (LAWCON), the Aids for the Acquisition and Development of Local Parks Program, the Aid for the Acquisition of Urban Green Space Program, Recreational Trails Program, and the Urban Rivers Grant Program.

Goals and Objectives

The overall goal of the Bayfield County Comprehensive Outdoor Recreation Plan is as follows:

Goal

> Provide a guide for the development of outdoor recreation areas and facilities in Bayfield County to meet the outdoor recreational needs of county residents and visitors.

In order to help attain this goal, a number of plan objectives have been identified, including:

Objectives

1. Promote the development and maintenance of quality recreation areas, parks and facilities in the county.

2. Identify the responsibility of the county and other governmental entities within the county to provide areas and facilities for recreational activities.

3. Help protect important aesthetic and environmental resources in the county for recreational uses through acquisition, easements and zoning.

4. Identify the outdoor recreational needs in the county.

5. Provide eligibility to the county and other governmental entities within the county to apply for federal and state grant funding programs for outdoor recreation areas and facilities.

Definitions and Standards

Definitions

Neighborhood Park

A neighborhood park provides open space for passive recreation for all ages within a neighborhood, particularly for the elderly and mothers with young children. An ideal neighborhood park site is scenic or wooded and located a maximum of one-quarter mile, which is normal walking distance, from primary users. Suggested minimum size for this type of park is one acre. Site development should include sidewalk, benches, landscaping and a designated tot lot with sandboxes and play devices for preschoolers.

Neighborhood Playground

A neighborhood playground is usually provided in conjunction with an elementary school and mostly serves the recreation needs of children 5 to 12 years of age. Its size is dependent on the types of activities it supports and facilities it provides. Playground apparatus, ball fields, basketball courts and open playfields are common in these areas. The service area for such a recreation area is highly variable, but too usually has a radius of one-quarter mile.

Community Park

This type of park usually serves several neighborhoods and is under municipal administration. Although size is not always a sound criterion for classifying parks, it is generally recognized that community parks are more spacious than neighborhood parks or playgrounds. In addition to the kinds of facilities provided at neighborhood parks, these parks may provide swimming pools, picnic areas, more elaborate playfields, shelter and toilet buildings and tennis courts. Community parks serve people of all ages and have an effective service area radius of one-half mile.

City-wide Park

A city-wide park may serve some or all types of a community's recreation needs. It can provide a wide range of activities for all age groups, or it can be very specific (i.e., a zoo). In addition to some of the facilities provided by other types of parks, city-wide parks may contain areas for nature study, hiking and riding trails, marinas, boat launching, pond fishing and numerous other activities. However, in many Wisconsin communities, a city-wide park is sometimes designated as such not because of its size and/or variety of recreation facilities, but because it is the only park available to the community.

Other types of parks can be found in some of Wisconsin's cities and villages. However, the ones defined here are sufficient to analyze recreation in Bayfield County. Comparisons of park definitions, areas and services should not be made among the State's municipalities. Each community is unique in its size and distribution of population; therefore, the classifications applied in a given community depend on how the community's parks function in meeting local recreation needs. For example, a given park might fall in any one of the four categories above, depending upon the community in which it is located, its particular location within that community, and their size, location and type of facilities.

Specialized Recreation Areas

Golf courses, historic sites, conservancy areas and floodplains are examples of specialized recreation areas. Most of these have limited active recreation value, are undeveloped for recreation, or are not always available for use by the public. Although such areas are not considered in current evaluations made for these municipalities, it must be realized that specialized areas are an important adjunct to a community and its parks program. As future evaluations of recreation opportunities in the county's cities and villages are undertaken, it may become necessary to include consideration of specialized recreation areas.

Standards

One of the most accepted ways of measuring the adequacy of a community's parks program is by determining the number of people it serves for has the capacity to serve. This is accomplished by assigning an acreage requirement for each type of park for each 1,000 persons in a community. Further, it is assumed that park distribution within the community is adequate. If such is not the case, careful attention should be given to location for new parks.

For purposes of this study the standard of 12 acres per thousand population is used as a basis for evaluating community programs. This acreage should be distributed among types of parks as follows:

Neighborhood Parks	2 acres/1,000 population
Community Parks	5 acres/1,000 population
City-wide Parks	5 acres/1,000 population
Total	12 acres/1,000 population

Other means of determining the effectiveness of a community's recreation program in meeting the needs of its citizens are related to the service areas of individual parks and to the type and quality of facilities offered. This is to say that a park must be accessible to the people it is intended to serve and it must provide a high quality recreation experience through its developed facilities and natural amenities. Deficiencies recognized within these categories are, to some extent, the result of a planner's judgment.

Planning Process

The process used to update the county's existing outdoor recreation plan, which was last adopted in 2015, was straightforward. Previous county outdoor recreation plans were first reviewed. In September 2019, a letter regarding the Bayfield County outdoor recreation plan update was sent to the 25 towns, 1 village, 2 cities, 1 Tribal government and several non-profits in the county. The letter explained that the Bayfield County Forestry and Parks Department was in the process of preparing an updated comprehensive outdoor recreation plan for the county. It mentioned that the plan would serve as a guide for Tribal and local units of government in acquiring and developing public outdoor parks and other recreation facilities, as well as ensuring that the minimum requirements for eligibility to participate in both state and federal grant programs are met.

As per the letter, communities were asked to review and update their previous list of recommended outdoor recreation facilities. New project recommendations were encouraged. Reviewers were directed to Bayfield County's website to review the existing plan and to fill out an online update form. The completed *Outdoor Recreation Facilities Inventory & Recommended Projects Form* was then submitted to the Bayfield County Forestry and Parks Department

The information received back from the various governmental units was then used to update the plan's outdoor recreation facility inventory and recommendations for outdoor recreation provisions sections.

Summary of Past Plans

Past Comprehensive Outdoor Recreation Plans were adopted by the Bayfield County Board in 1981, 1990, 1995, 2006, 2010 and 2015. The 1981 and 1990 plans were drafted by Northwest Regional Planning Commission, the 1995 and 2010 plans were written entirely by the Bayfield County Tourism Department and the 2006 plan was written by the Tourism Department and the Bayfield County University of Wisconsin Extension. The 2015 plan was written by the Bayfield County Forestry and Parks department. Using the past outdoor plans as a blueprint, many significant improvements by Bayfield County and several of the communities have been accomplished.

Social & Physical Characteristics of the Region

Social Characteristics of the Region

The estimated 2018 population of Bayfield County is 15,042. This is a slight increase when compared to the 2010 census of 15,014.

The median age in Bayfield County is 52, indicating an older population than the State of Wisconsin, which has a median age of 39 years. The population projections foretell a future where the elderly will make up an increasingly larger share of total population. In 2018, an estimated approximately 28% of the population in Bayfield County was 65 years and older, compared to less than 17% for the State of Wisconsin.

The history of northern Wisconsin is much like that of the rest of the Upper Great Lakes Region. Logging, mining and agriculture were the basis of the first period of rapid growth. With the decline of these extractive industries came declines in population. In Bayfield County, the population never again reached the peaks attained in 1920 near the end of these early industrial booms. Many years of decline ensued before the rise of the tourism and recreation industry brought new growth. The importance of recreation is clearly shown in the 2000 Census data on recreational homes. Over 40 percent of the county's homes were recreational.

Physical Characteristics of the Region

The landscape of Bayfield County varies greatly from north to south. A range of hills 10 to 15 miles wide, known as the Bayfield Peninsula Ridge, lies in a northeast-southeast direction at the northeast corner of the county. The ridge is a terminal moraine left between two lobes of the retreating Wisconsin Ice Sheet.

To the southwest, the hills drop abruptly to flat Pine Barrens while to the northwest and southeast they reach Lake Superior. The sandy "Pine Barrens" is a flat plain extending in a belt 10 to 20 miles wide from Bayfield County across Douglas and northern Washburn into Burnett and Polk Counties. The name "Pine Barrens" is derived from the fact that the vegetation is largely jack pine savannah. The maximum elevation of 1700 feet above sea level is found at the top of Mt. Telemark in the Town of Cable in southern Bayfield County, while the minimum elevation is 602 feet above sea level at Lake Superior. Immediately south of these ridges lie a series of morainic hills pitted with kettles. Lakes occupy many of the kettles, and swamps and marshes are numerous and extensive. The Bibon Swamp, a large area of shrub wetland, is located in the east central part of the county on the White River.

Bayfield County is underlain by ancient (pre-Cambrian) sandstone and igneous rocks. The northern part of the county is underlain with Superior red sandstone, over which is a thick mantle of clay and gravel, forming an artesian slope. This produces an excellent source of underground water supply. Crystalline rock underlies the southern part of the county with granite outcropping common along the Marengo River at the western edge of Penokee Range. Glacial deposits, reaching 300 feet over bedrock in some places, cover most of the county.

The Continental Divide, which separates the St. Lawrence (Lake Superior) and Mississippi River drainage systems, passes through the southern part of Bayfield County. The major drainage streams which lie north of the Continental Divide and empty into Lake Superior are the White, Fish, Sioux, Pike, Sand, Siskiwit, Cranberry, Flag and Iron Rivers. The Namekagon and Totagatic Rivers, tributaries to the St. Croix, drain the southern part of the county. The Eau Claire River, also an important tributary to the St. Croix, drains the Eau Claire Chain of Lakes located in the upper-southwest corner of the county.

Lakes and ponds are particularly abundant in the southern and west central parts of the county. Large areas of the west central and north central upland are without surface waters because of the subsurface drainage through coarse-textured glacial drift and underlying sandstone.

Unique to this region of Wisconsin is Lake Superior's Apostle Islands shoreline. The Bayfield County mainland shore bordering Lake Superior is 86.62 miles in length, more than one-third of Wisconsin's Lake Superior shore.

Due to the influence of Lake Superior and two distinct geographical regions of Bayfield County, the climate varies to a certain degree. Temperatures along and near the shoreline are modified by Lake Superior, especially during the spring and summer seasons when the average is lower in comparison to the southern interior area. Winter extremes are more severe inland.

Mean snowfall in inches varies from 50 inches near Cable to around 75 along the Upper Bayfield Peninsula. Precipitation over the year (28.0 inches) averages slightly less than the state average. Snowfall generally provides excellent winter recreation conditions for skiing and snowmobiling.

Prevailing winds are westerly from early fall through early spring and easterly the remainder of the year. April is usually the windiest month with an average of 15 miles per hour. July and August are the least windy with averages of 11 miles per hour. Since 1916, only three tornadoes have been observed in Bayfield County.

Existing Recreation Activities & Resources

Public Lands

Bayfield County offers almost one half million acres of publicly owned or controlled lands, or roughly 51 percent of the gross County area. These lands include County Forest land and Parks; Wisconsin Department of Natural Resources Fish, Wildlife and Forest lands and Federal lands comprising of Fish and Wildlife, National Forest and National Parks. The following table illustrates the individual acreage of public lands in Bayfield County.

LAND OWNERSHIP - BAYFIELD COUNTY

Ownership	Acres	% of Total
Private	470,374	48.6%
Federal - National Forest	270,258	27.9%
County - County Forest	173,171	17.9%
State	27,056	2.8%
Municipal	8,814	0.9%
Federal - Other	8,539	0.9%
Apostle Islands National Lakeshore	5,837	0.6%
County - Other	1,974	0.2%
National Scenic Riverway	1,287	0.1%
County - Parks	360	0.0%
Total	967,670	100.0%
Total Public Lands	496,936	51.4%

Chequamegon-Nicolet National Forest

The Bayfield County unit of the Chequamegon-Nicolet National Forest provides approximately 270,000 acres for a myriad of uses. This vast area is extremely valuable in terms of natural resources to not only the residents but all users of the Region. As is characteristic of the National Forest System, several types of recreational opportunities are available to visitors, some of which include swimming, berry picking, nature viewing, hunting, fishing, hiking, biking, skiing, snowshoeing and various forms of motorized recreation, etc. Virtually all forms of facilities are available at one or more of the designated recreation sites within Bayfield County.

At present there are 159 miles of designated snowmobile trails available to participants of snowmobiling in the CNNF. Trail opportunities for cross-country skiing are available at the Mt. Valhalla recreation area (north of Washburn), the Drummond Ski Trail (south of Drummond), and the Rock Lake National Recreation Trail (east of Cable).

Hunter walking trails has been established on the Washburn Ranger District to promote hunting on National Forest lands. The majority of the forest is open for hunting, fishing and camping.

Apostle Islands National Lakeshore

The Apostle Islands National Lakeshore consists of 21 islands and 12 miles of mainland shoreline. The islands are accessible via guided cruises, island shuttles, kayaks, sailboats, motorboats, guide services and boat charters. Bayfield County contains 4 of the 21 islands (Eagle, Sand, York and Raspberry), all of the mainland and the National Park Service Headquarters. Camping is available on most of the islands, as well as one location on the mainland (Little Sand Bay) and a single campsite on the mainland trail near the sea caves.

The Islands are home to nine lighthouses. Sandstone sea caves, formed by centuries of freezing, thawing and wave action, are seasonally accessible by water. In the winter, on the mainland, the sea caves transform into ice caves and are sometimes viewable via ice (Meyers Beach, conditions permitting). The sea caves/ice caves can also be viewed from above along the mainland trail.

Note: Madeline Island is not part of the National Park, but can be accessed by ferry most of the year and via an ice road in the winter (conditions permitting). Madeline Island has a year round residents in the Town of La Pointe, population 302.

State Lands

The Wisconsin DNR owns a little over 27,000 acres of land in Bayfield County. There are no state forest lands in Bayfield County so most of the DNR ownership is State Natural Areas and riparian corridors. The following are the DNR owned state natural areas in Bayfield County: Bark Bay Slough, Bibon Swamp, Big Rock Pines, Inch Lake, Jones Lake, Lake Two Pines, Lost Creek Bog, North Pikes Creek Boreal Forest, Nourse Sugarbush, Port Wing Boreal Forest, Sajdak Springs and White River Breaks.

County Lands

Collectively, Wisconsin's County Forests are the single largest public land base in the state of Wisconsin. In total, 30 Counties manage County Forests, covering a total of approximately 2.4 million acres.

Bayfield County manages the third largest County Forest program in the state, totaling approximately 173,000 acres. From north to south, the Forest extends across the entire length of Bayfield County, impacting many of the communities in the area.

Numerous recreational opportunities exist on the County Forest, including, but not limited to, hunting, fishing, trapping, nature viewing, hiking, biking, cross country skiing, trail running, horseback riding, dog sledding, snowmobiling and ATV/UTVing.

Water Resources

Lake Superior

Lake Superior is the largest freshwater lake in the world by surface area, with an area of 31,800 square miles (20,252,000 acres). Its length is 350 miles and its width is 160 miles.

Lake Superior provides excellent lake trout, Coho and brown trout fishing. In Bayfield County, lake access is provided at Port Wing, Cornucopia, Herbster, Little Sand Bay, Schooner Bay, Red Cliff, Bayfield, Port Superior and Washburn. Charter boats for lake trout trolling are available at most marinas.

The Lake Superior Water Trail is a network of mapped access points and recreational resources along Wisconsin's Lake Superior south shore. The Lake Superior Water Trail consists of two segments: a 40-mile segment from the St. Louis River to Port Wing and a 30-mile segment from Ashland to the Montreal River at the Wisconsin-Michigan state line. There is a published trail guide and online interactive map to help people find their way (http://www.nwrpc.com/868/Lake-Superior-Water-Trail).

Streams

Bayfield County has over 400 miles of streams classified as trout water, which provides some of the finest trout fishing in the State. Several streams are open for a special season before the regular trout season opens and, additionally, are also open longer in the fall. These streams provide excellent fishing for trout, which migrate upstream from Lake Superior. The majority of all streams are either Class I or Class II trout streams and support natural reproduction under favorable conditions. Stocking of trout is prevalent in the Class II streams to provide good fishing while those streams listed as Class III require extensive stocking in order to maintain suitable fishing conditions.

Inland Lakes

In terms of number and acreage, Bayfield County ranks high in the State for inland lake resources. Recent Wisconsin Department of Natural Resources surveys have listed 319 named lakes and 41 lakes, which have 100 acres or more in total acreage. In total, the county presently has 22,600 acres of inland lakes. Excellent fishing is found for walleye, northern pike, bass and panfish in many of the lakes. Fourteen lakes have muskellunge in them. The largest lake within the county is Lake Namekagon with approximately 3,200 surface acres. The deepest lake is Cisco Lake located in the south-central portion of the county with a depth of over 100 feet.

Canoeing and Kayaking

Bayfield County offers excellent river and lake canoeing. The White River and the Namekagon River provide excellent canoeing as do the hundreds of lakes in the county, particularly the Pike Lake Chain and the Eau Claire Lake Chain.

Bayfield County also offers many opportunities for great kayaking. Lake Superior and the Apostle Islands are very popular spots for sea kayaking. Several outfitters offer guided trips and equipment rental. The

White River offers some class 1 and class 2 rapids while the Namekagon River provides a more flatwater kayaking experience.

Boating

Because of its relationship to Lake Superior and the numerous inland lakes, Bayfield County offers more boating variety than any other county in the state. On Lake Superior, the climate and weather are favorable for recreational activities during the season of May through October. The inland lakes offer excellent recreational boating including the famous Eau Claire Lakes, Lakes Namekagon and Owen. The majority of the hundreds of smaller lakes provide excellent water quality.

Swimming

Bayfield County has many hundred feet of beach frontage in the county. Most of the beach frontage is along Lake Superior; however, the fact that the water temperature rarely gets high enough for most people to enjoy limits the real availability of Lake Superior for swimming. This frontage along Lake Superior is, nevertheless, extremely valuable in providing public lake access to the beach for other uses. The Forest Service provides three beaches with approximately 1,000 feet of water frontage. Three county parks also provide beaches with very adequate swimming facilities.

Fishing

With Lake Superior and numerous inland lakes, fishing is very popular in Bayfield County in all seasons. In Winter, early ice on Lake Superior offers great shallow-water fishing for many different species and inland lakes provide great ice fishing opportunities as well. Spring is the peak time for fishing on both Lake Superior and inland lakes with warming waters and spawning season. Bayfield County also has several streams including class I trout streams that provide good fishing opportunities for trout and salmon.

Camping

Public Campgrounds - The existing supply of public campgrounds spans a wide range of quality amenities and locations, from rustic sites with the minimal of facilities through new sites designed for RV's and trailers. Bayfield County has excellent, well-maintained County owned and operated campgrounds as well as three rustic yurts in the towns of Bayfield and Cable. Big Rock, Twin Bear Lake and Delta Lake Park Campgrounds all offer other amenities such as fishing and picnicking along with abundant natural scenery. Excellent camping is also available in the Chequamegon-Nicolet National Forest (CNNF), at the Red Cliff Marina, at Little Sand Bay and within the Cities of Washburn, Bayfield, Herbster, Drummond, Iron River and just outside Cornucopia.

The Washburn and Great Divide Ranger Districts of the Chequamegon-Nicolet National Forest are located within Bayfield County. These two Ranger Districts offer 6 developed campgrounds along lakes within the County. A wide variety of activities are available for campground visitors. Boating, hiking, fishing, hunting, berry picking, and bird watching are just a few popular recreational opportunities.

Campground facilities are designed to provide suitable places for pitching a tent, parking a recreation vehicle (RV), or setting up a pull behind camping trailer. Each site has a picnic table, fireplace, and a designated parking area. Drinking water is available and is tested for purity and quality.

National Forest campgrounds in Bayfield County include:

* Namekagon Lake - 34 sites (Great Divide Ranger District)
* Birch Grove - 16 sites (Washburn Ranger District)
* Wanoka Lake - 20 sites (Washburn Ranger District)
* Perch Lake - 16 sites (Washburn Ranger District)
* Horseshoe Lake - 11 sites (Washburn Ranger District)
* Two Lakes - 94 sites (Washburn Ranger District)

Private Campgrounds -- The present supply of private campgrounds is 16 and will likely increase in the future as campground use is increasingly popular.

Picnicking

There are excellent opportunities for picnicking throughout the county. The distribution of picnic areas is good, as all parts of the county have facilities located nearby. Several of the most scenic sites are found in parks within the small villages. The National Forest offers several very well-designed picnic areas that reflect the environmental qualities of the county.

Hiking

Hiking trails are numerous in this county in comparison to many other counties within the state. The Bayfield County Tourism office publishes a brochure listing 39 hiking trails that span the county, most of which are detailed in the following pages.

Two interpretive nature trails are located in the CNNF near the Lake Namekagon area in southeast Bayfield County: the Namekagon Nature Trail located just across the road from the Namekagon Lake Campground and the Forest Lodge Nature Trails on Garmish Road off of County Highway M. The National Forest works cooperatively with the Cable Natural History Museum to lead interpretive walks along the Forest Lodge Nature Trails.

Approximately 48 miles of the North Country National Scenic Trail traverses through Bayfield County. This segment is part of the longest National Scenic Trail in the country that will stretch from North Dakota to New York when 100% completed. As the trail winds through state parks and the CNNF, it offers a premier hiking opportunity through a variety of landscapes. Hunter walking trails in the National Forest, Wisconsin Department of Natural Resources and County provide additional miles of trail opportunities for hikers.

Many miles of old closed or lower level managed Forest Service roads also may be used for hiking and other trail related activities, such as snowshoeing, dog sledding, or back country skiing.

Biking

Bayfield County offers a variety of cycling opportunities for all levels of riders, including hundreds of miles of low traffic paved roads that offer enjoyable road cycling throughout the county. Popular routes include Lake Owen Drive and Pioneer Rd. near Cable, Delta-Drummond Road and Scenic Drive in Delta and Drummond, FR 236/Brinks Road near Ino, and Cty Hwy C from Washburn to Cornucopia to Bayfield, among many others. The North Coast Cycling Association works to promote all forms of cycling in the northern part of the county. Various bike maps are available from the County Tourism Office.

The Chequamegon Area Mountain Bike Association (CAMBA) has seven clusters of off-road (mountain) bike trails that start in Bayfield County and travel through and end in Sawyer County. The clusters located in Bayfield County are: Delta, Drummond, Cable, Mt. Ashwabay, and Namakagon, with most of the trails located on either Bayfield County Forest or U.S. Forest Service lands.

In addition, gravel road riding has gained great popularity across the region due to the large number of well-maintained Forest Service and town roads throughout the area. CAMBA has developed an area map and several online assets that identify recommended gravel routes from Washburn in the north to Cable in the south and into northern Sawyer County. The Washburn District of the CNNF has published maps for biking on forest roads (https://www.fs.usda.gov/activity/cnnf/recreation/bicycling) and the North Coast Cycling Association publishes road biking information as well (http://www.northcoastcycling.com/).

Bayfield County has also become a hotspot for winter biking with over 100 miles of groomed winter bike trails. Trails are located at Mt. Ashwabay, Mt. Valhalla, Cable Town Trail, and the Birkie Start Area.

Golfing

Currently, Bayfield County has three nine-hole and three eighteen-hole golf courses open to the public located in Bayfield, Washburn, Iron River, and Cable.

Skiing

Winter silent sports enthusiasts, such as cross country and downhill skiers, help in stimulating the local economies during the winter months. Bayfield County has many excellent ski areas. Mt. Ashwabay Ski & Recreation Area, near Bayfield, annually attracts thousands of skiers from Wisconsin, Minnesota, Illinois and Iowa for cross-country and downhill skiing.

Cross-country skiing is one of the fastest growing outdoor recreation activities in the area and this popularity has been reflected in trail development in Bayfield County. As mentioned above, the Ashwabay Outdoor Education Foundation (AOEF) manages and maintains excellent trails near Mt. Ashwabay, with trails located on County Forest, state and private lands. AOEF also maintains the Jerry Jolly Trail, which is located on County Forest and private lands. The American Birkebeiner Ski Foundation maintains a network of world-class cross-country ski trails and warming shelters on County and private land. They also host several races including the world-famous American Birkebeiner which attracts skiers from around the world. The North End Ski Club maintains an abundance of cross-country

ski trails on County Forest land near Cable. Trails that have been in place for a long time on the CNNF are the Valhalla Recreation Area (north of Washburn); Rock Lake Trail (east of Cable); Drummond Ski Trail (south of Drummond); and Namekagon Trail (near Lake Namekagon). More recently the Town of Barnes has added ski trails at Tomahawk Trail and trails have been developed at the Lincoln Community Forest in the Town of Lincoln.

Snowshoeing

Snowshoeing has gained popularity over recent years as equipment has become lighter and easier to use. Snowshoeing provides a good alternative to cross country skiing as the skill threshold required to start and enjoy the sport is considerably lower. Most snowshoers prefer to use designated trails, versus bushwhacking through the forest. Most ski trail systems do not permit snowshoeing on groomed ski trails as it can cause damage to the groomed surface. Many ski trail systems, however, also offer separate snowshoe trails. Popular snowshoe trails include: North End Trailhead in Cable, the Jerry Jolly trails near Bayfield and the Lincoln Community Forest Trail in the Town of Lincoln.

Horseback Riding

The Forest Service has one designated horse trail system that is managed only for pack saddle animals within Bayfield County. It is the Horseshoe Lake Horse Trail off of FR 245. Horses are allowed within the Rainbow Lakes Wilderness Area on both the Anderson Grade and the North Country National Scenic Trail. Horses are also allowed to use Forest Service roads. Actual trail availability is excellent throughout the County when logging roads are included.

Hunting

Bayfield County offers more than one half million acres of land open to the public for hunting. This vast area includes National Forest, State, County, industrial and private lands. Species most commonly hunted are white-tailed deer, black bear, and ruffed grouse, in addition to various migratory waterfowl and small game. County maps and plat books are available at the courthouse or to order online at www.bayfieldcounty.org.

Shooting Ranges

There are 5 shooting ranges in Bayfield County open to the public. The Town of Russell has a range in the northern part of the county. The ABC Sportman's club operates a shooting range on County Forest Land in the northwestern portion of the County. Sports Hollow is a for-profit range located just outside the city of Ashland in the Town of Eileen. The Cable Rod and Gun Club operates a shooting range near Cable, WI. The Eau Claire Lakes Conservation Club operates a rifle range in the Town of Barnes.

Motorized Trails

ATV

Motorized recreation continues to gain in popularity and there is an increasing demand for motorized recreational opportunities in the County. Bayfield County has designated approximately 145 state-funded miles for the operation of ATVs. The trail system is located on the Chequamegon-Nicolet National Forest, Bayfield County Forest Lands, and some private properties. ATV trails include the Tri-County Recreational Corridor, Iron River, Moquah Spur, Valhalla, Lenawee, Buckskin, Bear Paw, Wolf, Battle Axe, Bayfield Connector, Flagg Road Connector, Horse Pasture Grade Connector, Drummond Connector and Washburn trails.

In addition to state funded trails, ATV's (and UTV's) are allowed on many Town Roads and some County Highway connectors, as well as nearly 900 miles of logging roads and skid trails located on Bayfield County Forest Land. Make sure to check with local agencies for information on which roads and trails are open for ATV (UTV) use. The Bayfield County Tourism department produces an ATV/UTV map that is available at area businesses and can be ordered online.

Snowmobile

Excellent snowmobile trails are located throughout the County and are maintained by public agencies, the Bayfield County Snowmobile Alliance and local Snowmobile Clubs. Presently, there are approximately 450 miles of state-funded trails maintained by the Bayfield County Snowmobile Alliance in the County. The approved trails are located on private, County, State, and National Forest lands.

The state funded snowmobile trails are designated, marked and groomed for use. In addition, hundreds of miles of unmarked forest roads and trails and local gas tax roads are open to snowmobiling. On the Bayfield County Forest, there is over 1,000 miles of old logging roads and skid trails open to snowmobile use (not part of the state-funded, designated snowmobile trail network). The area usually enjoys enough snow to keep trails open until mid to late March. Even in lean snow years, snowmobilers have plenty of good riding opportunities, especially in the northern half of the County, primarily a result of the Lake Superior snowbelt.

The vast trail system links the entire County together, including some of the Apostle Islands. Many of the businesses in the County's Towns and smaller communities depend heavily on snowmobilers, so winter enthusiasts will always see the "welcome mat" out. Most visiting snowmobilers stay at one of the many lodging facilities found throughout the county.

Off-Highway Motorcycles

A new Off-Highway Motorcycle program was created by the DNR IN 2016 to serve the increasing demand for OHM trails in Wisconsin. In Bayfield County there are no trails designated as OHM trails, however ATV trails on Federal land are open to off-highway motorcycles. Currently, trails on County Forest land and private land are closed to OHM use.

Scenic Byway

Wisconsin's Lake Superior Scenic Byway highlights the historical, cultural, geological and recreational assets along a 70-mile segment of State Highway 13 on the Bayfield Peninsula. The majesty of Lake Superior unfolds along the Byway with sweeping views of the "big lake" and the Apostle Islands National Lakeshore. The Byway passes through quaint harbor towns, near orchards & fruit farms and through the homeland of the Red Cliff Band of Lake Superior Chippewa. The Byway helps draw attention to the outdoor recreation opportunities, sand beaches, museums and art galleries along with unique shops, restaurants and lodging.

Historical and Architectural Sites in Bayfield County

City of Bayfield

Most of the City of Bayfield has been designated a historic district in the National Register of Historic Places according to the State Historical Society. The Bayfield District, encompassing 46 blocks, is the 17th district in Wisconsin to be selected for the National Register.

Cornucopia

St. Mary's Russian Orthodox Church
Tragedy of the Siskiwit Marker

Port Wing

School Consolidation Official Marker
South Shore Community School (razed), State Highway 13

Town of Bayview

Houghton Village Depot and Paymaster's building, Bayview Park

Town of Russell

Red Cliff Indian Reservation (created 1854)

Washburn

City Hall, Washington Avenue & Pine Street
Public Library, 307 Washington Avenue
Bayfield County Courthouse, 117 East 5th Street
Washburn State Bank Building, Bayfield Street & Central Avenue
Madeline Island Official Marker, Highway 13, 5 miles north
Washburn Historic District

Ashland Vicinity

Radisson and Groeseilliers Fort Sites Official Marker, Highways 2 & 13

Archeological Sites

Four sites are listed by the Wisconsin State Historical Society. The most recent discovery was in 1969, one is from 1906 and two were first identified in 1895. It is not known if the 1906 and 1895 sites remain intact at this time. The location of each is not made public in order to protect the rights of private landowners and to eliminate excavation by “artifact hunters” or other “non-professional” archeologists not associated with the State Historical Society.

Demand Assessment and Trends

Demand for outdoor recreation is dependent on many variables, but one of the most significant is a locality's population, which includes those who reside in a jurisdiction and those who visit. In 2013, Bayfield County had a resident population of 15,042, a 0.2 percent increase from 2010. However, the county's peak population estimate for a single day in the summer of 2006 was 45,329, almost three times the resident population. This population figure includes: 15,666 residents, 7,350 lodgers filling all the hotel/motel rooms, campground sites, and recreation/educational camps, 19,968 second homeowners and 2,345 day trip visitors. Thus, one can see that in a jurisdiction like Bayfield County, which has a lot of tourists and visitors, demand for outdoor recreation increases considerably over and above the needs of the resident population.

The various characteristics of the population also can have a significant impact on the demand for outdoor recreation. These could include: age, gender, income, education, employment, marital status, and vacation time. Changing social and economic trends are also important variables that affect outdoor recreation demand. Other factors that can influence demand include: the weather, fuel costs, state of the economy, popularity of competing outdoor recreational locations, and quantity and quality of the available outdoor recreation facilities.

The State of Wisconsin published its Statewide Comprehensive Outdoor Recreation Plan (SCORP) in 2019 which used statewide survey data as well as national recreation trend data to assess recreation trends and needs in Wisconsin.

To help understand recreation demands and needs it's important to consider why people recreate outside. The SCORP provides the following table illustrating people's motivations for getting outside:

Reasons to get outside	**% of respondents**
Get exercise	64%
Be with family and friends	55%
Keep physically fit	50%
Observe scenic beauty	49%
Be close to nature	47%
Enjoy the sounds and smells of nature	47%
Get away from the usual demands	40%
Be with people who enjoy the same things I do	31%
Experience excitement and adventure	32%
Experience solitude	20%

In this plan Bayfield County is part of the Great Northwest Region, one of eight regions throughout the state. The Great Northwest Region is characterized by an abundance of natural resources that supports a large and growing tourism industry and attracts not only Wisconsin residents but residents from urban populations in neighboring states. The following trends and needs assessment is based on the entire Great Northwest Region and not just Bayfield County.

As part of the SCORP, the DNR conducted a recreational opportunities analysis (ROA) which gathered information from the public through meetings and online form submission. The ROA identified 4 factors that are important in determining people's favorite places to visit: 1) The quality of trails, 2) the desire to be in a quiet place, 3) the quality of habitat, and 4) good maps, signs or information about the property.

Another category that the ROA gathered information on was the top 10 most frequently identified recreation opportunities needed in the Great Northwest. They listed the following needs: 1) More hiking/walking/running trails, 2) More paved bicycling trails, 3) More natural surface (dirt) bicycling trails, 4) More rustic/quiet campgrounds, 5) More public shore access to lakes and streams, 6) More local parks and playgrounds, 7) More developed campgrounds, 8) More wildlife watching decks and platforms, 9) More trails for motorized recreation, and 10) More horseback trails.

Along with the ROA the DNR also sent questionnaires to county park systems and according to the results from that, the greatest need at county park properties are 1) motorized recreational trails, 2) campsites, 3) mountain biking trails, 4) hiking/walking/running trails, and 5) boat launches. The questionnaire also attempted to identify recreation trends and ranked activities as strong increase, moderate increase, slight increase, about constant, slight decrease and moderate decrease. The only activity that was shown to have a strong increase in the Northwest region was riding ATVs or UTVs. Seven activities were ranked as moderate increase: Bicycling – winter/fat tire biking, Camping – RV/pop-up, Bicycling – mountain biking, Bicycling – recreational/rail-trail biking, use of picnic areas/day use areas/beach areas, paddle boarding, and target firearm shooting at designated ranges. Only one activity showed a slight decrease, hunting big game, and no activities showed a moderate decrease. Comparatively, statewide the 4 activities that had strong increase were Bicycling – winter/fat tire biking, Camping – RV/pop-up, Bicycling – mountain biking, and riding ATVs or UTVs. The only activity to show a moderate decrease statewide was snowmobiling.

With motorized recreation we are able to track trends through vehicle registrations, although this data only shows vehicles registered in that county and doesn't account for visitors who register their vehicle in their home county and come to Bayfield County to recreate. Data is currently available for 2013-2016. In Bayfield County from 2013 to 2016 ATV registrations have increased by 8%, UTV registrations have increased by 67% and snowmobile registrations have increased by 4%. Compared to the state as whole where ATV registrations increased by 9%, UTV registrations increased by 95% and snowmobile registrations have stayed the same.

Bayfield County # of registrations

	ATVs	**UTVs**	**Snowmobiles**
2013	3886	359	2358
2014	4010	471	2429
2015	4166	596	2179
2016	4178	601	2455
4 year % change	+8%	+67%	+4%

Statewide # of registrations

	ATVs	UTVs	Snowmobiles
2013	292014	19245	182303
2014	302211	27349	184046
2015	316127	36820	167839
2016	318222	37458	182405
4 year % change	+9%	+95%	0%

Demand for most of the outdoor recreational activities identified above is expected to continue to grow. Vacationers to Bayfield County and second home use will continue to increase. As the baby boom generation begins to retire in ever greater numbers in the coming years, this will accelerate the development of seasonal and second homes in the county. Also, as the population ages, concerns about the accessibility of the county's outdoor recreational facilities to persons with mobility and other physical limitations become ever more important.

Plan Recommendations

County Facilities

ATKINS LAKE COUNTY PARK (T44N-R5W, Sec. 20)

Existing Facilities:

Located on the northeast corner of Atkins Lake on Old Grade Road, which is located 10 miles southeast of Grand View, this 3 acre park provides the only public access to this very deep lake. Atkins Lake provides good fishing with populations of northern pike, walleye, largemouth and smallmouth bass and panfish. The park serves as a picnic area, family and young adult gathering place and swimming beach. A new boat landing was constructed 2006 and dock a new was installed in 2018 The parking area was enlarged, graded and graveled. An information kiosk was installed by the boat landing, and cement pads have been poured for the picnic tables, fire rings, and hand pump. A new concrete ADA bathroom was constructed in 2007. Trees bordering the park are predominately mixed hardwoods and several conifers that were planted by The Wisconsin Conservation Corps as part of a shoreline restoration project.

Recommended Improvements:

- Construct ADA 10' x 25' shelter/pavilion.
- ADA access water pump.
- ADA access to swimming beach.

BIG ROCK COUNTY CAMPGROUND (T49N-R5W- Section 24)

Existing Facilities:

Located three miles northwest of Washburn on the Sioux River, (Class A Trout stream), this 40 acre park has camping, picnicking, wildlife viewing, fishing and a nature trail. Listed as a birding site by the Audubon Society for pileated woodpeckers and vireos, it is also home to thrushes, wrens, eagles and warblers. There are twelve single campsites and one group site with tables and fire rings. The park has newer concrete lighted pit toilets on both sides of the recreational area (ADLP grant). The park is situated in approximately 1 ½ acres of mature white and red pine, red maple, white and yellow birch, and red oak and hemlock trees. Spring steelhead runs on the Sioux River generate extremely heavy bank and stream fishing. The upgraded park has an improved parking area, picnic area, water pump with drinking fountain. The entire road system has new culverts and has been either blacktopped or graded and graveled.

Recommended Improvements:

- Construct ADA wood viewing deck overlooking the Sioux River.
- Gravel/improve all camping pads.
- Consider installing electricity at some or all camping sites.
- Repair access roads and walkways leading down to the river.
- Construct a shelter over pump/drinking fountain.
- Construct a small pavilion.

- Add back country camp sites
- Add tent pads to some existing sites
- Add natural fencing or shrubs to define current campsites
- Develop trails on both sides of the river
- Build camper cabin

DELTA LAKE COUNTY CAMPGROUND (T46N—R7W, Sec. 7)

Existing Facilities:

Located thirteen miles southeast of the Town of Iron River, Delta Lake Campground has become increasing popular. Mixed hardwoods dominate this 40-acre campground and the lake receives moderate use by wildlife. Delta Lake covers 170 acres and is an excellent fishing lake year round with populations of northern pike, bass, perch, bluegill, crappie and bullheads. The campground consists of 35 wooded campsites with picnic tables and fire rings. Picnicking is popular by the swimming beach area. The park serves as a trailhead for the CAMBA mountain bike trails. A new concessionaire was added in 2005 and a sanitary dump station the year before. Most sites have electricity and a 3-stall shower unit was constructed in 2008. The parking area for anglers has been improved and a new concrete boat ramp and wheeled aluminum 6'x20' dock was installed. A playset and an additional fishing pier were added in 2014. Another drinking water station was established. Underground power has been installed. High speed internet was added in 2015 and available throughout the campground. Additional boat mooring and fishing piers were installed in 2015 and 2016.

Recommended Improvements:

- Construct small lakefront shelter/pavilion.
- Construct additional set of concrete bathrooms by campsite #20
- Maintain ADA walkway near the beach area.
- Explore potential for rustic camping sites on the County owned island in the middle of Delta Lake.
- Gravel and grade all roads.
- Water hookups at all sites.
- Sewer hookups at most sites.
- Gravel all camp pads.
- Provide canoes and/or kayaks for rent.
- Install additional boat mooring and/or fishing piers.

JERRY J. JOLLY TRAIL (T50N-R4W, Sec. 19)

Existing Facilities:

Located on Star Route Road, 2.75 miles from the intersection with County Hwy J and Fish Hatchery Road, 73 acres of undeveloped land was donated to the County in 2005 by Jerry J. Jolly with the intention that non-motorized recreational trails be developed and maintained, so that the public would be able to enjoy the land. This donation, combined with the work of the Bayfield County Forestry and Parks Department and additional funding from the Nelson-Knowles Stewardship grant, allows the public to experience the beauty along Pike's Creek on what was once private property. Walking/hiking trails in the summer and cross-country ski trails in the winter provide year-round use of this scenic area. Present facilities include a parking area, ADA toilets, informational kiosk, donation station and picnic area.

Recommended Improvements:

- Installation of solar lighting.
- Develop 20' x 20' covered shelter.
- Install electric to shelter area.
- Install warming units along ski trail.
- Install rest stop benches.
- Construct yurt facilities for all season camping along the trails.
- Fix chronic wet spots w/ boardwalks or groundwork
- Install hand pump with drinking fountain.
- Acquire nearby property from willing sellers to protect ski trail linkages if funds are available.
- Update trail signs and markers.
- Create additional trails for increased recreational opportunities.
- Add rustic camp sites
- construct parallel snowshoe trail in areas where the ski trail is too narrow to accommodate both.

TWIN BEAR COUNTY CAMPGROUND (T47N-R8W, Sec 34, Govt #5)

Existing Facilities:

Located seven miles southeast of the Town of Iron River on Twin Bear Lake which is part of the Pike Chain of Lakes, this 40 acre park is surrounded by oak, birch, maple and a few scattered pines. Ever popular with boaters and fishing enthusiasts, the lake is home to northern pike, walleye, largemouth bass and panfish. The campground consists of 43 sites, with picnic tables and fire rings. There is daily parking for picnickers and vehicles with boat trailers. Facilities include a sanitary dump station, 20/30/50 amp electrical service at most sites (electricity was completely upgraded in 2012), concrete, three stall shower facility (with individual gas water heaters), several concrete pit toilets, swimming area, beach area, public picnic area, and concessionaire. A newly constructed ADA ramp provides access to the beach area and fishing pier. The park is home to an extremely popular boat launch, which provides access to the Pike Chain. There are also multiple boat mooring docks, as well as new fishing piers. A new playset was installed at the beach area in 2015. High speed internet was also installed throughout the campground in 2015. All power to this park is underground with power pedestals.

Recommended Improvements:

- Construct small covered shelter/pavilion by swimming area.
- Construct another 3-stall shower unit.
- Gravel camp pads.
- Replace all fire rings.
- Water hookups at sites.
- Sewer hookups at sites.
- Maintain/gravel and grade all roads.
- Install new boat mooring and/or fishing piers at various locations.
- Develop invasive species control management plan.
- Provide canoes and/or kayaks for rent.
- Maintain retaining walls at various locations throughout the campground.
- Improve and enlarge parking area near boat ramp and/or other locations on the property.
- Create more parking areas near the beach.
- Boat mooring docks near boat ramp.
- Build multiple footpaths for lake access.
- New picnic tables and/or fire rings for campsites and picnic area.
- Create new rustic tent sites on the high behind the shower building, with picnic tables and fire rings.

LOST CREEK FALLS

Existing Facilities:

A rustic, 1 ¼ mile hiking trail, with a small trail head parking area, located on Trail Drive, roughly ½ mile west of County Highway C, just south of Cornucopia. The trail meanders through thousands of acres of County Forest land before reaching a series of waterfalls on Lost Creek Number One. Several boardwalks were built to traverse wet areas and minimize foot traffic impacts.

Recommended Improvements:

- Existing trail improvements.
- Creation of additional trails i.e hiking, biking, skiing.
- Installation of new signs and trail markers.
- Add additional boardwalks as needed.
- Improve/expand parking area.
- Installation of new benches.
- Development of primitive camping sites and/or yurts.
- Map and improve social trails.
- Build boardwalk over drainage to the picnic area.

BAYFIELD COUNTY RUSTIC YURTS

There are three rustic yurts on Bayfield County Forest land; two on the Mt. Ashwabay ridge, in the Town of Bayfield, and one in Cable. All of them are located on non-motorized trail networks. They are available for rent year-round.

Existing Facilities (each yurt):

- Yurt w/ bunk beds, wood stove & table
- Privy
- Fire Ring
- Firewood shed
- Picnic Tables

Recommended Improvements (each yurt):

- Expand woodshed.
- Replace entry doors and/or add screens, as needed.
- Maintain decks and other amenities.

SISKIWIT FALLS

The Siskiwit River estuary preserve is a 100 acre recreational area just south of Cornucopia. While the majority of the property is forested, it was a former homestead and has an old apple orchard, an open field and some rough trails. The main attraction of the property is a series of waterfalls on the Siskiwit River. There is a fisherman's trail along the east side of the river that gives visitors access to the waterfalls.

Existing Facilities:

- Parking area on the West side of the river
- Parking area on the East side of the river.
- Rustic fisherman's trail with access to the Siskiwit River

Recommended Improvements:

- Improve existing fisherman's trail.
- Add kiosks to both parking areas
- Improve/build ADA trail on the west side of the river
- Create lookout platform on the west side of the river.
- Build Pedestrian bridge over the river
- Create a trail along field and through the woods for both summer use and potential winter cross-country skiing.
- Rehabilitate the apple orchard.
- Develop trail into town
- Build picnic shelter
- Build Pit toilets
- Create bird watching trail with educational signs

FIRE TOWER HILL

This 104 acre property was acquired at the end of 2019 and is located in the heart of Bayfield's "fruit loop" which draws a lot of tourists. The property has unique steep topography with primarily mature oak with some hemlock and a young birch stand.

Existing Facilities:

- ½ mile long paved road
- electrical service along paved road.

Recommended Improvements:

- Create Parking Area
- Add kiosk
- Create a loop trail
- Add gate
- Create series of educational signs along the trail
- Build camper cabin

GLACIAL KETTLES GEOLOGICAL AREA

Located in the Town of Bell east of County Highway C, this area is defined by a unique concentration of glacial knobs and kettles, many of which exhibit 150 to 200 feet of topographical relief. Most of the area is dominated by poorer quality oak (scrub oak) with a mixture of jack pine, aspen, red pine, and white pine.

Existing Facilities:

- None.

Recommended Improvements:

- Develop Trailhead
- Develop trails in and around the kettles
- Develop back country camp sites

ABC SPORTSMEN CLUB SHOOTING RANGE

Located on County Forest Land east of County Highway C in the Town of Bell. The range is managed by ABC Sportsmen Club as per a lease agreement with Bayfield County.

Existing Facilities:

- Eight shooting lanes with covered benches
- Parking Area
- Trap Range
- Vault Toilet
- Fencing
- ADA Accessible shooting lane

Recommended Improvements:

- Build trap house
- Improve existing infrastructure ie. Parking area
- Improve kiosk and signage

City Facilities

City of Bayfield

MEMORIAL PARK ANNEX (.02 acres)

Existing Facilities:

This small park is a "scenic overlook" within the city. Adjacent to Memorial Park, which is owned by the Bayfield Civic League, this area is used by thousands of residents and tourists during the summer months. It is located along the pathway that follows the lakefront from the Bayfield Pavilion to the East Dock Park and from its benches there are wonderful views of Madeline Island, the Bayfield marina and harbor. The trees, plantings, park benches and old street lights make this park unique.

Recommended Improvements:

- Rehabilitation of the City owned paved walking path to make it more level.

JAKE'S ISLAND VIEW PARK (.05 acres)

Existing Facilities:

This is a small triangle park located on the extreme east end of Manypenny Avenue. It overlooks Lake Superior and the Bayfield Marina, and is visible from both the Lake and the downtown district. The small park contains a bike rack, bench, and a variety of plants and shrubs. The pathway that goes through the park connects with the lakefront path along the harbor and also serves as part of the snowmobile trail during the winter months.

Recommended Improvements:

- More plantings (trees, shrubs, flowers).
- Drinking fountain.
- Attractive trash/recycling receptacles.
- Directional signs.
- Improved lighting.

EAST DOCK PARK (.03 acres)

Existing Facilities:

This park is located at the corner of First Street and Wilson Avenue near the Coast Guard station. It is on the shore of Lake Superior and offers a picnic area with a covered shelter, a number of tables and park benches. It has a lot of open space, with a volleyball court, a large playground area and a bike rack. Many special events are held here, and it is used by residents and tourists alike. There is always a slight breeze coming off the Lake which makes this park a popular place during the hot summer months.

In 2003, community volunteers, under the supervision and direction of Learning Structures renovated this playground into a one-of-a-kind park. The park provides play zones for different ages and host historic structures like the "Ferry" and "Sea Monster". Maintenance of these new structures and continually providing the proper absorption material beneath are priorities. Updates have been made in 2019 to some of the equipment in addition to a new fence being installed by volunteers.

High lake levels, increasingly intense storms, and extreme stormwater runoff are impacting the park. This requires evaluation of conditions and trends and the development of actions to make the park more resilient to these changing conditions. Additionally, the City's new Comprehensive Plan requires using green infrastructure where opportunities exist.

Recommended Improvements:

- Continue to provide the proper amount of absorbing material on the ground surface.
- Planting of trees & shrubs, especially shade trees near the playground area.
- Windbreaks near the existing picnic shelter.
- Implement actions to make the park more resilient to extreme storm events along the lakeshore and from stormwater runoff.

FISHING PIER

Existing Facilities:

In 1998 a public fishing pier was built adjacent to the East Dock Park. It provides handicap access from designated parking sites nearby. The fishing pier consists of a wood deck over rock filled wood cribs. Along the shoreline side of the pier is ample seating, on the lake side there is space for at least 20 anglers along the railing, with openings for disabled anglers. The pier, its walkway and the parking area are lit for security and safety by a period lamppost.

Recommended Improvements:

- Installation of a safety gate to keep toddlers from straying onto the lakefront (because of its proximity to the playground in East Dock Park).
- Annual inspection to the pier is needed to check for warped or loose planks.

FOUNTAIN PARK

Existing Facilities:

In 2019 the City completed the installation of a large fountain with interpretive information to honor the City's fountain history. The fountain was donated by Mary H. Rice and made possible with funds from Wisconsin Coastal Management. The fountain was accompanied by new modern restrooms to include three eco-friendly stalls with low flow toilets and slim dryers. This restroom is located adjacent to East Dock Park, creating an exciting new focal point for visitors along the Waterfront Walk.

Recommended Improvements:

- None at this time: maintenance is the priority for this new facility.

HISTORIC HALVOR REITEN PARK (BROAD STREET BEACH, DOCK L) (1 acre)

Existing Facilities:
This park is located at the south end of Broad Street. It consists of an open grassy area, a small structure (which serves as a storage area for lifeguard safety and rescue equipment in the summer) and a swimming beach area with a lifeguard tower, several benches and a bike rack.

The beach is located in an old boat-building and lumber-milling area of the shoreline. On-going efforts are needed clear debris and old dock cribbing from the water and beach area. In 2014 a new stormwater retention system was installed including a large rain garden and beach nourishment, grading and shaping of additional parking to the beach.

In 2006, the City of Bayfield obtained ownership of the property commonly known as "Dock L". The property was cleared of the hazardous debris that was left there, the dock was rebuilt, benches were installed and a walkway through the park was installed.

High lake levels, increasingly intense storms, and extreme stormwater runoff are impacting the park. This requires evaluation of conditions and trends and the development of actions to make the park more resilient to these changing conditions. Additionally, the City's new Comprehensive Plan requires using green infrastructure where opportunities exist.

Recommended Improvements:

- Signs designating the area for swimming only.
- Dock safety signs.
- Floats prohibiting motorized watercraft from the area.
- Re-design rain garden and other plantings for easy maintenance.
- The City is also considering whether to build another restroom facility in the area of Broad Street beach and the boat launch.
- Construction of pedestrian access via a boardwalk to the viewing dock.
- Interpretive signage to improve park's connection to City's waterfront trail and the Brownstone Trail.
- Purchase of adjacent shoreline property in an effort to increase the beach area and provide more public access to Lake Superior.
- Implement actions to make the park more resilient to extreme storm events along the lakeshore and from stormwater runoff.
- Re-construct access across the "Dock L" land spit out to the viewing platform at the end, using techniques to be resilient to high lake levels and extreme storm events.

RESTROOMS – FRONT STREET AND HARBOR (.15 acres)

Existing Facilities:

The City of Bayfield has two public restrooms downtown. One is located at Front Street and Washington Avenue near the ferry dock and the other is at First Street and Wilson Avenue near the harbor (known as Fountain Park). Both facilities are heavily used because Bayfield is a tourist community. The restrooms are ADA compliant, with larger stalls at Front Street and low-flow toilets in most stalls.

The restrooms at First and Washington were moved closer to East Dock Park in 2018. They were added with more stalls and an eco-friendly design which gives a more aesthetically pleasing visual to the area around the park. These restrooms are denoted more under the Fountain Park.

Recommended Improvements:

- Increase number of stalls and urinals.
- Replace old fixtures.
- Improve outside lighting and aesthetic appearance.
- Plant trees and shrubs.
- Incorporate "green" standards to both facilities (water conservation, reduce electrical needs, reduce paper consumption, etc.).

KORSEBERG PARK (.01 acres)

Existing Facilities:

This is a very small but prominent area on the north side of Highway 13 (at the sharp bend in the road) as you enter the city from the south. It overlooks Lake Superior with spectacular views of Madeline Island and Long Island. The park is owned by Bayfield County but maintained by the City of Bayfield.

Recommended Improvements:

- Additional benches.
- Minor planting of shrubs.
- Improved lighting.
- Attractive trash receptacles.
- Informational sign.
- The City may consider formally acquiring this land from Bayfield County.

COOPER HILL PARK (.01 acres)

Existing Facilities:

This is a small neighborhood park located at the corner of South Seventh Street and Manypenny Avenue. In 2008 the park was re-built, once again following the design and oversight of Learning Structures. It incorporates unique designs which portray the City's Train History. It provides a playground area for tots and for older children, and also a small stage for neighborhood plays.

Recommended Improvements:

- Continually provide the proper amounts of absorbing material on the ground surface.
- Add benches.
- Picnic area.
- Attractive trash/recycling receptacles.
- Plantings to improve the overall aesthetic appearance of the park.

THE GIL LARSEN NATURE TRAIL (.25 miles)

Existing Facilities:

The community, tourists and the school all make good use of the large ravine that opens onto Washington Avenue at the upper end of Broad Street. Years ago this unique ecosystem was developed into a nature trail and outdoor laboratory for the school and its use continues to increase. The boardwalks, benches, scenic overlooks and rest areas were constructed in 1984 by the WCC. The entrance to the Nature Trail is open and accommodating to most but would be exclusive to the elderly and disabled. At present, the trail ends behind the school.

Recommended Improvements:

- Improve trailhead with new steps, pathway, and pollinator garden.
- Addition of informational and directional signs.
- Repair and maintenance of existing amenities (walkways, benches, overlooks, etc.).
- Extension of trail as far as possible up the ravine (this way both residents and visitors can

enjoy the biological diversity our City offers in this unique location).

BIG RAVINE PARK (120 acres)

Existing Facilities:

In 1942, a summer rainstorm caused two of Bayfield's larger ravines to flood the downtown area, causing extensive property damage. The City of Bayfield subsequently purchased 120 acres, which includes much of the Big Ravine in order to protect its watershed. The soils in this area are extremely fragile, and a 1997 report by the local USDA soil conservationist recommended that the land be utilized for recreation and forestry so that it can continue to provide flood control for the city below. (This report also recommended that the city acquire the two 40-acre parcels north of the park to extend protection of the ravine from development upstream.)

This 120-acre area has been used for recreation purposes for many years and the results of the Bayfield Community Survey, conducted in 2001, indicate that people strongly support this continued use of the land. Along the west edge of the ravine, a system of trails has been established for hiking, cross-country skiing and snowshoeing, and a soccer field (see below) was established in 1999. Along the east edge of the ravine there is a snowmobile trail which connects Bayfield with a larger, county-wide trail system, and there are also areas for hiking in the upland woods. In the bottom of the ravine there is a footpath along the intermittent stream which can be reached from the Nature Trail that begins at Washington Avenue in Bayfield.

In 2018, the City of Bayfield signed a Memorandum of Agreement with Landmark Conservancy to help maintain and enhance the trails as much as possible.

Recommended Improvements:

- Trail development including railings along steep edges, steps where necessary to prevent erosion, benches at scenic overlooks, maps & signage.
- Develop trails to link those on the east and west sides with the Nature Trail.
- Develop connection between Bayfield School and the Nature Trail.
- Outdoor classroom and environmental education facilities.
- Expansion of athletic facilities.
- Parking area on Meyer-Olson Road.
- Pursue easements/acquisitions for access from the north end of Broad St. to the east side trail.

SOCCER FIELD

Existing Facilities:

In 1999, a group of citizens organized to build a youth soccer field on top of the old landfill site in the northwest corner of the city. This area is located at the end of the Old Dump Road and is within the 120 acres of Big Ravine Park. Utilizing grants from Wisconsin DNR and a local bank, an area was leveled and planted in grass. The field has been utilized for soccer and other activities since the spring of 2000; however, the school district has not used the field for soccer since 2017. Currently there is one large

playing field and one small practice field. Most of the improvements and maintenance are carried out by the Bayfield school under an agreement with the City.

Recommended Improvements:

- Add more soil to complete construction of a full-side level field.
- Storage shed for equipment.
- Construct concession stand.
- Add benches for spectators
- Improve field conditions (level, grass, watering).
- Add running track around perimeter of soccer field.
- Develop additional practice fields.
- Widen and improve Hilltop Road (access road)
- Designate parking area for events on the athletic fields (parking area could also provide remote visitor parking for downtown events).

HILLSIDE PARK

Existing Facilities:

This park is located northwest of the Bayfield School and includes three separate areas: a ballpark, parking lot and playground – all at different levels on the hillside.

The ballpark occupies the top of the hill and is probably one of the most scenic in all of northern Wisconsin. While attending a game, one can view Lake Superior, Madeline Island, Long Island, Chequamegon Bay and Bayfield itself. It is used by both the community and school. Facilities include bleachers and dugouts, new steps to the parking area and a handicap accessible walkway along the first base side. The entire field is surrounded by a four foot high chain link fence.

A restroom building is located down the hill from the bleachers. This facility was built by the school and is maintained by the school (except for turning the water service on in the spring and off in the fall, which is done by the City). This facility needs to be thoroughly evaluated, updated and certainly better maintained.

Recommended Improvements:

- Repairs to the infield.
- Restroom upgrade and maintenance.
- Scoreboard which can be stored between games.
- Painting/decoration of dugouts.
- Bull pen.
- Lights.

The parking lot is located just below the ballpark. This facility is used by both the community and the school. It is large enough to park about 25 cars and has two basketball hoops, one at each end of the lot. In the future, the school will be making more use of the parking lot during the academic year.

Each parking lot is also an educational area which the school utilizes as a community garden and, recently, installed a High Tunnel greenhouse.

Most of the improvements and maintenance are carried out by the Bayfield school under an agreement with the City.

SOUTH PLAYGROUND (.02 acres)

Existing Facilities:

This playground area is owned and maintained by the Bayfield School District and is located just below the Bayfield School. It provides several large pieces of play equipment and is utilized mostly by the elementary school children.

DALRYMPLE CAMPGROUND (14.54 acres)

Existing Facilities:

The campground is located ¼ mile north of the City of Bayfield. This campground is within a stone's throw of Lake Superior. It is a heavily wooded area with very deep ravines and a wonderful view of the Apostle Islands. The park has a rustic appearance and caters to tenting and small camper users, rather than to people using very large RVs. There are 30 campsites, with electricity to 70% of the sites. Because of the rough terrain of the area, improvements are progressing very slowly and are often expensive.

In the spring of 2009, both restrooms (pit toilets) were replaced with new vault systems including new concrete structures which have stalls and are ADA compliant.

High lake levels, increasingly intense storms, and extreme stormwater runoff are impacting the park. This requires evaluation of conditions and trends and the development of actions to make the park more resilient to these changing conditions. Additionally, the City's new Comprehensive Plan requires using green infrastructure where opportunities exist.

Electrical upgrades have been made in 2018/2019. The City of Bayfield is looking at adding more sites and upgrading the Waterfront Walk Tail System to reach the campground and beyond.

Recommended Improvements:

- Addition of more sites.
- Add changing rooms, drinking fountains and a storage area for supplies.
- Picnic shelter with windbreaks, more grills and tables.
- Additional fire rings, benches and trash receptacles.
- Improvement of existing sites (clear brush and dead trees, level ground).
- Walking trail to Bayfield with bridges, lake access opportunities.
- Information signs and displays.
- Improve lighting.
- Improve existing roads & add new roads as needed.
- Shoreline stabilization.

WALKING CORRIDOR

Existing Facilities:

Bayfield is a very interesting city. Although it is small, consisting of only one square mile, it has a quaint fishing village atmosphere with pleasant parks, pathways along Lake Superior, and many historical buildings. Its hillsides offer spectacular views of the Lake and the Apostle Islands.

In 2015 a waterfront walking corridor was developed linking many special "points of interest" in our historic community, the corridor starts at the head of the Brownstone Trail at 3rd St and Wilson Ave heading east along the shore then north to Front St and Washington Ave. Along this corridor will be interpretive signage depicting the history of Bayfield. The walking corridor connects to the new Fountain Park as a “turning point” to continue on to the rest of the trail.

Recommended Improvements:

- Additional rest/seating areas.
- Improved walking surfaces and trail connectors.
- Connecting to other trails.
- 2nd Street waterfront and Front Street marina look-out areas.

SKATEBOARD PARK

Existing Facilities:

The Bayfield School District created a skateboard park next to the Bayfield Area Recreation Center at 136 South Broad Street. This area provides a safe area for skateboarding activities.

Recommended Improvements:

- None at this time.

BICYCLE TRAIL

Having a trail where people can bicycle in and around the city with strategically placed bike racks.

SECOND DISTRICT PARK

One of the goals of the Bayfield Parks and Recreation Department is to have a suitable park/playground in every city district. This proposed park/playground would be located north of Washington Avenue between 5th Street and 10th Street where the city expects more development in the coming years. This area consists of heavily wooded sites high on a hillside (overlooking beautiful Lake Superior). There is, at present, no park or playground in this district.

Some development in this part of the city began in 1996. Several homes were built, 10th Street was extended north to Sweeny Avenue, and a sewer main installed. The city's Comprehensive Plan may designate the land north of the municipal wellhead as

a conservancy area because it includes a steep ravine which was identified in the 1997 soil report as an area of fragile soils which should be kept in its natural state for reasons of flood control.

CATHOLIC HILL PARK

There are no public parks or playgrounds located in this part of the city which is bounded by Broad Street and Wing Avenue (Highway 13) between Washington Avenue and North Limits Road. Some discussion about developing one has begun. The goal would be to provide a safe setting with combined park and playground, so that small children living here would not have to travel such long distances to reach other city facilities. Because of the lack of city owned property here, the first step would be to locate and purchase a suitable area to develop. Such neighborhood parks (such as our Cooper Hill Park), need not be very large, but still are used often and enjoyed by people living near them.

BAYFIELD AREA TRAILS SYSTEM:

Recommended Improvements:

• Implement a wayfinding system to facilitate public information and access to parks, trails (trailheads), and the lake.
• Work cooperatively with the Bayfield Area Trails System (BATS) Committee to develop and implement a unified trails system among the City, Town, County, and Red Cliff. This would include identifying and developing linkages between existing trails networks providing public information and access, and developing capacity to maintain trails. Place an emphasis on trails along the waterfront, notably a trail from the City to Dalrymple Park.
• Establish conservation easements on City Lands in the Big Ravine and other lands zoned as Conservancy (W-1) lands.

BROWNSTONE TRAIL

Existing Facilities:

Established in 1996 by Landmark Conservancy in partnership with private landowners, this approximate 2.5 mile trail connects the City of Bayfield's historic downtown at the corner of Wilson Avenue and S. 3rd Street to Pikes Bay Marina and Port Superior located in the Town of Bayfield. The trail is a highly used, public trail that travels alongside Lake Superior on an old railroad grade. Uses are non-motorized in nature and include walking, hiking, biking, cross-country skiing, and snowshoeing. The trail passes over brownstone cliffs and through a forested area of the shoreline that is home to native trees and shrubs as well as wildlife including migratory birds. Like other lakeshore areas, various section of the Brownstone Trail and its lakeside slopes have been impacted by natural and man-made causes through the years. Therefore, at times, sections of the Brownstone Trail may be closed or re-routed.

Recommended Improvements:

- Additional rest/seating areas
- Improved walking surfaces where needed
- Slope erosion and stabilization activities
- Invasive plant control and removal

- Connection to the Salmo Trail in the future
- Native plantings

City of Washburn

THOMPSON WEST END PARK

Existing Facilities:

- Campground
- Campsite Cable Hook-ups/Electrical sites and WIFI.
- Shower & restroom facilities in ADA compliance.
- Information kiosk and payment pipe
- Sewage dump station.
- Two Flowing wells.
- Festival area.
- Covered picnic shelter.
- Picnic area.
- Swimming beach.
- Playground area.
- One 75' fishing pier.
- Boat launch & docks.
- Storm water conveyance pond.

Recommended Improvements:

- Extending water & sewer utilities to campsites.
- Replacement of playground equipment.
- Additional covered picnic shelter.
- Extension of Lakefront Trail through park.
- Construction of year around ADA compliant restrooms within festival area.
- Purchase of an automated Beach Rake.
- Extending water utilities to festival area.
- Replace fishing pier, to include ADA compliance.
- Construct roof structure over flowing wells and upgrade piping.
- Construct equipment storage building.
- Extending adequate power facilities to festival area.
- Paving of parking lot with permeable materials.
- Expansion of playground area.
- Construction of gazebo by waterfront.
- Drive, for surface water management and park expansion.
- Pathways and access trails in park that comply with ADA.
- Expansion of Maritime Trails signage within park.
- Erosion control along lakefront.
- Construct campfire program area with seating.
- Storm water management improvements.
- Reduce lake level of Lake Superior.
- Development of additional campsites.
- Development of additional camping areas.
- Landscaping of current and any additional camping areas.
- Expand restroom/shower facilities within campground, with ADA compliance.
- Extension of municipal utilities to additional campsites and restrooms.
- Development of additional picnic and recreation facilities e.g. playground equipment, disc golf course and public pavilions.
- Construction of appropriate parking faculties for park facilities, including boat ramp and beach.

WEST END PARK BOAT LANDING

Existing Facilities:

- Lakefront & Maritime Trails Trail head
- Fitness Area and Equipment
- Boat Docks
- Boat Launch
- Overflow Camping Area
- Paved & Grass Parking Area
- Sailing, Kayak, Rowing Shell Instruction Beach

Recommended Improvements:

- Extending water & sewer utilities to public facilities at boat launch
- Construction of ADA compliant restrooms
- Storm water management improvements.
- Construction of community center
- Construction of access roads and parking by community center
- Removal of pilings to permit better water access to landing
- Construction of larger boat and trailer parking lot by boat ramp
- Extension of Lakefront Trail through park
- Addition of picnic tables and benches
- Expansion of Maritime Trails signage within park
- Relocate instructional facilities, and indoor storage for sailing, kayaking and rowing programs
- Landscaping and tree planting
- Purchase of buoys to mark channel to boat landing
- Dredging of the boat ramp area

PUBLIC LANDS - THOMPSON WEST END PARK TO SOUTH CITY LIMITS

Existing Facilities:

- ATV & Snowmobile Trail

Recommended Improvements:

- Extension of Lakefront Trail and Maritime Trail from Thompson's West End Park westward along lakefront to the south city limits (Summit Avenue).
- Construction of parking lot at trail head by Summit Avenue (south city limits).
- Design and construction of cross-country ski trails.
- Transition old railroad grade to multipurpose trail to include walking, biking, skiing.
- Construction of pedestrian bridge across Thompson Creek.
- Grading and surfacing of ATV/snowmobile trail along old railroad grade.
- Completion of ATV/snowmobile bridge across Thompson Creek.
- Installation of signage along trails.
- Installation of benches and picnic tables.
- Construction of fishing pier south of Thompson Creek.
- Purchase additional lands.
- Construction of trail shelters.
- Construction of boardwalks over marshy areas of pedestrian trail.

FORMER RAILROAD GRADE WITHIN CITY

Existing Facilities:

- ATV & Snowmobile Trail

Recommended Improvements:

- Purchase remaining railroad right-of-way in private hands between 4th Avenue East and Gary Road.
- Construction of ATV/Snowmobile trail and/or silent sports trail between 4th Avenue East and Gary Road.
- Transition old railroad grade to multipurpose trail to include walking, biking, skiing.
- Install signage as required.
- Landscaping as necessary.
- Grade and resurface trail throughout the city.
- Relocate overhead power lines.

LAKEFRONT PARKWAY

Existing Facilities:

- Gravel trail from 6th Avenue West to 1st Avenue East
- Maritimes Trail & Historical signage
- Picnic tables and benches
- Parking & trail head at 4th Avenue West
- Bridges over ravines
- Landscaping with native species
- 6th Avenue West to Washington Avenue is ADA accessible
- Unguarded beaches
- Parking & trail head at Washington Avenue

Recommended Improvements:

- Improve trail heads and parking lots.
- Pave entire trail for ADA accessibility.
- Install additional benches and picnic tables.
- Relocation of trail within Washburn Marina.
- Expansion of trail from 1st Avenue East to Memorial Park.
- Update of management plan.
- Renovation of trail between Washington Avenue and Marina with switchbacks and bridges across ravines to insure ADA accessibility.
- Install decorative and safety lighting as necessary.
- Expansion of picnic or pet exercising areas.
- Expansion of Maritime Trails, historical and informational signage within parkway.
- Expansion of Trail from 6th Avenue West to Summit Avenue.
- Replace existing and install new bridges across ravines as necessary.
- Remove invasive plant species, plant native species.

WASHBURN MARINA

Existing Facilities:

- 138 Boat slips
- Piers & Docks with utility hook-up
- Outdoor boat storage
- Boat lift
- Covered picnic shelter
- Store
- Petroleum sales
- Boat launch
- Fish cleaning station
- Paved and unpaved parking areas
- Restrooms & shower facilities
- Office building and repair building
- Lounge

Recommended Improvements:

- Addition of campsites.
- Replace pier decking on piers.
- Landscape to eliminate industrial look
- Replacement of existing office building with enlarged office, store and lounge.
- Construction of laundry facilities.
- Construction of playground area.
- Build enhancements to lakefront trail.
- Extension of south break wall to better protect interior basin opening.
- Installation of safety equipment on break wall and piers.
- Construction of picnic area.
- Construction of additional marina basin for 50-100 additional slips.
- Relocation of lakefront trail.
- Repair and expansion of parking areas.

COMMERCIAL DOCK & BEACH

Existing Facilities:

- Mooring bollard for commercial boats
- Fishing area
- Beach

Recommended Improvements at Beach:

- Upgrade parking at beach area
- Install benches or picnic tables
- Construct ADA bathroom
- Construction of premier (yurt style) campsite
- Purchase beach grooming equipment

ATHLETIC FIELDS & SKATE RINKS

Existing Facilities:

- Regulation softball field
- Regulation baseball field
- Regulation little league field
- 2 ice rinks
- Restrooms, concession stand, warming building
- Parking and access road
- Snowmobile trail

Recommended Improvements:

- Reconstruction of skate park ramps.
- Re-contouring of skating rink walls to permit better maintenance of landscaping.
- Paving of parking lot.
- Additional tree planting and landscaping.
- Electronic scoreboards at all fields.
- Installation of lighting at fields.
- Pave access road to concession stand.
- Reconstruct little league dugout.
- Complete fencing of little league field.
- Installation of bleachers at all fields.
- Construction and paving of pedestrian walkways throughout park that are ADA compliant.
- Extend water lines to softball field and little league field.
- Install better directional signage to park.

- Construct press box and announcer's stand at all fields.
- Extend lakefront parkway walking trail through park.
- Install additional benches and picnic tables at park.
- Construct new access road to park via 2nd Avenue East.
- Relocate and reconstruct skate park.
- Better sealing of east skating rink basin to permit it to hold water better.
- Improvement in storm water handling.
- Construct covered picnic pavilion at little league field.
- Prepare park development plan for Athletic Fields Park.
- Place fencing around baseball field and skate park at other locations.
- Construct equipment storage buildings.
- Install additional paved walkways.
- Construct field sports area including paved athletic track, bleachers, lighting and fencing.
- Construct dugouts at boy's baseball field and repair other dugouts.
- Purchase additional lands.

MEMORIAL PARK

Existing Facilities:

- Campground
- Covered picnic shelter
- Dump station
- Electric and cable TV service to some sites and WIFI.
- Playground
- Historic kitchen building
- Picnic areas
- Pathways and bridges across ravines
- Restrooms and shower building
- Information kiosk and payment pipe
- Parking area
- Park gate (South 6th Avenue East)

Recommended Improvements:

- Preparation of campground development plan.
- Renovation and redesign of campsites to facilitate access and identification.
- Install additional benches and picnic table.
- Expansion of lakefront trail through park.
- Construction of primitive campsites.
- Construction of premier (yurt style) campsites
- Extension of water lines within park.
- Construction of additional ADA compliant trails and pathways within park.
- Construction of concession stand.
- Construction of additional pedestrian bridges across ravines.
- Pave access roads.
- Construct new or renovate restroom/shower building to ADA compliance.
- Construction of fishing pier.
- Renovation & expansion of playground area.
- Replace playground equipment.
- Expansion of maritime trails, historical and informational signage within park.
- Re-establishment of fitness trail within park.
- Reconstruction of caretaker's house.
- Upgrading and expansion of electric service to campsites.
- Extension of sanitary sewer lines within park.
- Purchase of additional lands.
- Construction of additional picnic pavilion.
- Construction of beach access steps.
- Construct bandstand.
- Install sand lot volleyball courts.
- Construct campfire program area with seating.
- Storm water management best management practices.

INTER-COMMUNITY TRAIL

Existing Facilities:

- None

Recommended Improvements:

- Prepare recreational trail plan over abandoned railroad corridor between Washburn and Ashland for mixed use activities.
- Prepare recreational trail plan over abandoned railroad or existing highway corridors between Washburn and Bayfield for silent sports.
- Legal work to purchase lands and acquire easements as necessary.
- Surface trail with gravel or asphalt as warranted.
- Provide trail heads and parking as needed.
- Prepare maps and trail brochures.
- Undertake clearing and grade trail as necessary.
- Install bridges as necessary.
- Install signage as necessary.

DUPONT LINEAR PARK

Existing Facilities:

- None

Recommended Improvements:

- Prepare park development plan.
- Provide clearing and grading of silent sports trail.
- Install benches.
- Surface trail with gravel.
- Prepare & publish maps and brochures of park.
- Purchase additional lands and easements as necessary to provide access to park, extend park and establish trail heads.
- Provide signage as necessary.
- Install gates at access points to limit motorized vehicles.

WASHBURN GREEN CIRCLE TRAIL

Existing Facilities:

- None

Recommended Improvements:

- Prepare trail development plan.
- Provide clearing and grading of silent sports trail.
- Install benches.
- Purchase of trail maintenance equipment including ATV, trailers and accessories.
- Surface trail with gravel.
- Purchase additional lands and easements as necessary to provide access to park, extend park and establish trail heads.
- Provide signage as necessary.
- Prepare & publish maps and brochures of park.

- Install gates as necessary to prevent access of motorized vehicles.
- Purchase of snowmobile and cross-country skiing trail grooming equipment.
- Bridge ravines and streams as necessary.

JACKIE'S FIELD

Existing Facilities:

- Playground set
- Benches
- Sandlot ball field
- Picnic tables
- Gravel parking lot

Recommended Improvements:

- Construct covered picnic shelter.
- ADA compliant pathways throughout park.
- New backstop and fencing at ball field.
- Construction of soccer field.
- Extend utility lines to park.
- Informational signage.
- Install benches and picnic tables.
- Construction of restrooms.
- Pave parking lot
- Landscaping and tree planting.
- Improved storm water handling.

EAST SIDE TENNIS COURTS

Existing Facilities:

- Tennis courts
- Benches
- Fencing
- ½ court basketball court
- Tennis backboard

Recommended Improvements:

- Resurface tennis courts.
- Install drinking fountain.
- Expand basketball court to full court.
- Fence basketball court.
- Provide ADA compliant paved pathways.
- Install benches and picnic tables.
- Paint mural on tennis backboard.
- Construct maintenance building.
- Renovate tennis court lighting.
- Landscaping & tree planting.
- Improve signage.
- Purchase additional lands.

SMALL TRIANGLE

Existing Facilities:

- Flower gardens
- Benches

Recommended Improvements:

- Renovate flower gardens.
- Install benches.
- Landscaping and tree planting.
- Construct sculpture.
- Construct walkways and plaza.
- Install drinking fountain.

LEGION PARK

Existing Facilities:

- Veteran's Memorial
- Flag poles
- Flower gardens
- Pathways
- Benches

Recommended Improvements:

- Prepare park development plan.
- Extend utilities to park.
- Replace pathways with ADA compliant walkways.
- Install drinking water fountain.
- Renovate and expand flower gardens.
- Install benches.
- Renovate veteran's memorial.
- Upgrade electrical service to park.
- Construct fountain.
- Construct fountain plaza.
- Construct sculpture.
- Landscaping and tree planting.
- Install picnic tables.
- Install park lighting.

CITY HALL PLAZA

Existing Facilities:

- Fountain
- Lighting
- Walkways
- Flag poles
- Plaza
- Flower gardens
- Benches

Recommended Improvements:

- Renovation of fountain electrical controls
- Replacement of plaza lights
- Replacement of plaza walkways
- Benches
- Landscaping
- Renovation of flower gardens

WIKDAL PARK

Existing Facilities:

- Benches
- Lighting
- Picnic tables
- Flower gardens

Recommended Improvements:

- Prepare park development plan.
- Renovate flower gardens.
- Renovate outdoor lighting and upgrade electrical capability for festivals.
- Construct gazebo or band stage.
- Construct restrooms.
- Construct ADA compliant pathways and walkways.
- Install drinking fountain
- Place benches and picnic tables.

HILLSIDE PARK

Existing Facilities:

- Playground
- ½ court basketball court
- Benches & picnic tables
- Tennis courts
- Sand lot ball diamond
- Tennis backstop

Recommended Improvements:

- Resurface tennis courts.
- Renovate and expand playground.
- Extend utilities to site.
- Construct covered picnic shelter.
- Landscaping and tree planting.
- Construct full basketball court.
- Install signage as necessary.
- Construct ADA complaint pathways.
- Renovate tennis court lighting.
- Fence sand lot ball diamond.
- Construct ADA compliant restrooms.
- Install benches and picnic tables.
- Construct parking lot.

THOMPSON CREEK PARKWAY

Existing Facilities:

- None

Recommended Improvements:

- Purchase lands along Thompson Creek for park.
- Prepare park development plan.
- Construct access roads to park site.
- Extend utilities to access points.
- Construct hiking and cross-country ski trails.
- Landscaping & tree planting.
- Erosion control along stream banks.
- Construct picnic pavilion.
- Construct trail shelters.
- Construct parking lots at access points.
- Construct ADA compliant restrooms.
- Construct bridges across Thompson Creek as necessary.
- Install additional signage.
- Construct boardwalks across wetlands.

Township Facilities

Town of Barksdale

Existing Facilities:
- Skating rink

Recommended Improvements:
- Warming shed
- Equipment to flood rink

Town of Barnes

TOMAHAWK LAKE PARK

Existing Facilities:

- Public Boat Launch w/pier
- Public Beach
- Toilets - improved access
- Benches - added new
- Swimming Pier
- Sledding Hill
- Hiking, biking, and Cross-Country Ski Trail; expanded 2018-2019
- Picnic Pavilion
- Swings
- Interpretive and directional signs along trails including trail maps
- An accessible year-round shelter
- Security System
- Expanded accessible parking
- Accessible fishing pier
- Created drainage areas to capture runoff
- Additional parking lot was established on Barnes Road to access trails
- Additional picnic tables and benches
- Tetherball
- Road improvement and resurfacing
- Rain gardens and landscaping to encourage native gardening

Recommended Improvements:

- Design and implement lakeshore landscapes as visual education tools
- Public WIFI
- Add storage garage
- Accessible boat launch pier
- Replace swimming pier
- Create fire pit area
- Add playground equipment, like volleyball
- Accessible picnic table
- Accessible public toilets
- Sledding hill relocation

TOWN OF BARNES RECREATION AREA

Existing Facilities:

- Tennis/Pickleball Courts repainted lines in 2017, new wind nets for tennis courts
- Basketball Court resurfaced in 2017
- Ball Field
- Bleachers
- Ice Skating/Roller Skating Rink upgraded in 2019
- Skate Rink Warming House
- Playground - added equipment, benches & picnic tables
- Parking lot
- Pavilion
- Barbecue Pit
- Toilets
- Nip n Tuck Walking Trail
- Additional benches and picnic tables
- Fitness Equipment: added Balance Beam and Leg Lift in 2019
- 76 Acres was purchased adjacent to the park.

Town of Bayfield

BELANGER SETTLEMENT PARK

Existing Facilities:

- Picnic area with shelter

Recommended Improvements:
- Replace toilets
- Develop CAMBA mountain bike trails at and adjacent to Mt. Ashwabay
- Re-roof shelter

SALMO LAKEWALK TRAIL

Existing Facilities:

- Interpretive trail and boardwalk providing access to a Lake Superior beach.

Recommended improvements:

- Restrooms/privy
- Benches
- Drinking fountain
- Picnic area/pavilion
- Additional historical and interpretive signs

CAMBA TRAILHEAD -SKI HILL ROAD

Existing Facilities:

- Access to Mt. Ashwabay Cluster of Mountain Bike Trails.

Recommended Improvements:

- CAMBA Ski Hill Road Trailhead: gravel and grade parking lot; install trailhead gateway structure; install restroom/changing facility

• Create easy, entry-level trail as part of the CAMBA bike trail system at Mt. Ashwabay
• Develop downhill/gravity trails to complement CAMBA bike trail system

Mt. ASHWABAY SKI AND RECREATION AREA

Existing Facilities:

Located 3 miles north of the City of Bayfield, Mt. Ashwabay provides year-round recreation opportunities for residents of the Chequamegon Bay area as well as visitors. The area encompasses more than 2500 acres; composed of lands owned by Bayfield County, the State of Wisconsin, Mt. Ashwabay, Big Top Chautauqua, and a few private landowners. Recreation facilities and activities include alpine and nordic skiing, hiking, mountain biking, winter fat-tire biking, and camping in yurts. Since the 1940's, Mt. Ashwabay has been a cherished community resource that provides family-oriented outdoor recreation for all to enjoy. Much of the operations and maintenance are provided by community volunteers and non-profit organizations including the Ashwabay Outdoor Education Foundation (AOEF), Bayfield Nordic Inc. (BNI), and Chequamegon Area Mountain Biking Association (CAMBA).

Alpine Skiing:
• A chalet that provides a gathering place, snack bar, restrooms, and office space.
• A second building that houses equipment rental, restrooms, and bar.
• Maintenance area, including outbuildings/shop for equipment storage and maintenance
• 11 ski runs of varying degrees of difficulty, serviced by a chairlift and rope tow
• At the top of the hill is a ski race starting structure
• Parking area serving all uses throughout the year

Nordic Skiing:
• The Nordic trail system covers over 40 kilometers of classic and skate trails of varying difficulty.
• The primary access point for the Nordic trail system is the parking area at the Mt. Ashwabay ski hill.
• The trail system is supported by maps and signage posted at key locations.
• Although not currently open to the public, the historic Nourse Sugarbush cabin is a popular destination in the trail system.
• The trail system connects to the Jerry Jolly trail system that can be accessed from Star Route in the Town of Bayfield.

Snowshoeing:
• There are snowshoe trails accessible from the main parking area, at the biking parking access on Ski Hill Road, from Whiting Road (to access the yurts), and Jerry Jolly Trails at Star Route.

Mountain and Fat Biking:
• There are 19 unique miles of mountain biking singletrack trails traversing a range of terrain and levels of difficulty constructed and maintained by the Chequamegon Area Mountain Biking Association.
• During the winter 5 miles of trail are maintained for fat tire biking groomed with the support of Ashwabay Outdoor Education Foundation and Bayfield Nordic
• There are 2 mountain bike trailheads: 1) on Ski Hill Rd. north of the Mt. Ashwabay parking area; 2) on Whiting Rd. on the south side of Mt. Ashwabay.
• Fat bike trailhead is out of the Mt. Ashwabay base area.

Hiking:
• The network of biking and skiing trails also provide hiking opportunities.

Yurts:
• There are 2 rental yurts on top of Mt. Ashwabay that are owned and operated by Bayfield County. They are available for rent throughout the year, and can be accessed from Whiting Rd. on the south side of the mountain.

Recommended Improvements:

All Uses:
• Use trail digital apps. to develop and deliver online trail maps.
• Install radio repeater on top of the mountain to support radio communication from all locations. This will facilitate operations, grooming, but most importantly safety and emergency response.
• Lodging opportunities in summer and winter. Cabins and yurts.
• Camping opportunities in summer. Tent and RV
• Shower facilities in summer can be sauna facility in winter.

Alpine Skiing:
• In the near-term, re-furbish the ski chalet, including upgrade of restrooms.
• Long-term, replace the ski chalet while preserving key historic features as appropriate.
• Update ski hills to accommodate more diverse skiers and facilitate maintenance and grooming.

Nordic Skiing:
• Warming shelter and trail check-in at trailhead.
• Expanded and improved trails to provide for classic and skate skiers of all skill levels and across a variety of terrain.
• Work with the Wisconsin Department of Natural Resources to develop the historic Nourse Sugarbush Cabin for public use as a trail destination and possible warming hut. Consider including addition of a pit toilet.
• Improve the Jerry Jolly trails from Star Route and along Pike's Creek to make grooming easier and more efficient.
• Develop nordic trail connections with Valhalla ski area.
• Installation of bridges and/or culverts across drainages and wet areas.

Snowshoeing:
• To address current conflict between snowshoeing and skiing, update Jolly plans to construct snowshoe trail along south bank. Currently the X-ski trail is too narrow for multi-use and because of drainage issues it's probably best to make a separate snowshoe trail paralleling the X-ski trail.
• Expand snowshoe trail opportunities near the Mt. Ashwabay trailhead. This could include a snowshoe trail to Pike's Creek.

Mountain and Fat Biking:
• Add up to 5 miles of additional purpose built singletrack trail to improve trail navigation and access the Mt. Ashwabay ridge and vistas for a variety of abilities.
• Expand fat biking opportunities using shared trail, decommissioned Nordic and logging trails and areas of singletrack to expand the current network along the Mt. Ashwabay ridge incorporating connections to

the yurt access trails providing yurt guests access to the groomed fat bike trail for both biking and snowshoeing.
• Continue with spot singletrack maintenance and remediation on an ongoing, as needed basis to maintain the highest quality single track mountain biking experience.
• Improve on trailhead experiences and services at both Ski Hill Rd. and Whiting Rd. mountain bike trailheads.
• Ongoing trail signage and mapping updating.
• Expand trail network to provide a range of experiences while remaining compatible with skiing and hiking activities.
• Develop biking trail connection with Valhalla.

Hiking (and snowshoe and xc ski):
• Develop a trail connection from the State fish hatchery on Pike's Creek at Highway 13 to the Mt. Ashwabay trail network, most likely at the Jerry Jolly trails.

Town of Bayview

BAYVIEW PARK

Existing Facilities:

- Public beach access to Chequamegon Bay
- Picnic tables
- Fire rings
- Privy
- Pavilion
- Historic Buildings

Recommended Improvements:

- Trail on railroad grade to Friendly Valley
- Purchase railroad grade between Friendly Valley Beach and Bayview Park

HOUGHTON FALLS NATURAL AREA

Existing Facilities

- Scenic sandstone glen, falls and Lake Superior sandstone shoreline.
- Walking trail with interpretive signs.
- Parking lot.

Recommended Improvements:

- Interpretive Signage.
- Habitat rehabilitation activities, as needed.
- Privy at trailhead parking lot

FRIENDLY VALLEY BEACH ACCESS

Existing Facilities:

• Public beach access to Chequamegon Bay

Recommended Improvements:

• Privy

• Purchase railroad grade between Friendly Valley Beach and Bayview Park

WHITING ROAD CAMBA TRAILHEAD

Existing Facilities:

• Public access to Mt. Ashwabay Mountain Bike Trail System

Recommended Improvements:

• expand parking lot
• install trailhead gateway structure
• install restroom/changing facility

WHITING ROAD COUNTY FOREST YURT TRAILHEAD

Existing Facilities:

• Public access to County Forest Yurts

ONION RIVER ACCESS

Existing Facilities:

• None.

LITTLE SIOUX RIVER ACCESS

Existing Facilities:

• Boat Launch

Town of Bell

CORNUCOPIA

Existing Facilities:

- Cornucopia Beach on Lake Superior (approximately 350' of beach).
- Two tennis courts.
- Pickle Ball in the tennis courts
- Playground area.
- Various Town owned lands.
- Breakwall with fishing pier.
- Town Marina
- Airport

Recommended Improvements:

- Cornucopia Beach:
- Install kayak ramp/launch.
- Additional benches.
- Beach rehabilitation.
- Sand dune restoration.
- Town Owned Lands:
- Development and maintenance of recreational trails.
- Creation of camping sites.

TOWN MARINA

Existing Facilities:

- Boat launch.
- Boat slips.

Recommended Improvements:

- Install boat washing station.
- Add informational kiosks.
- Install a weather station.
- Improve boat launch ramp
- Hardening existing facilities against high water
- Maintain navigable channel
- sheet piling on river to add dockage and maintain channel

COMMUNITY CENTER

Existing Facilities:

- Public restrooms.
- Softball field.
- Full sized basketball court.
- Picnic tables.
- Educational signs and programs.
- Community gardens.
- Learning center
- Play ground

Recommend Improvements:

- Improve parking
- Upgrade Electrical system for efficiency

SISKIWIT BAY PARK – LAKE SUPERIOR

Existing Facilities:

- Shelter/pavilion.
- Green Shed Museum
- Spring water.
- Barbecue grills.
- Playground equipment.
- Breakwall with fishing pier.
- Shelter for flowing artesian well.
- Trail maintenance or improvements to the breakwall.
- Picnic tables.
- Volleyball court.
- Toilet building.

Recommended Improvements:

- Construction of a new stage, with electricity, for music and other festivals.
- Showers.
- Repair and maintenance of breakwall.
- New grills.
- Development of an exercise course.
- add hard surface for breakwall
- replace picnic shelter
- flowing well shelter

SISKIWIT LAKE CAMPGROUND

Existing Facilities:

- Camping
- Picnic sites
- Parking
- Porta-Potties
- Lake access
- Solar powered well
- Grills

Recommended Improvements:

- Construct new toilet building.
- Additional campsites.
- Beach restoration.
- Erosion control.
- Install kayak/canoe ramp/launch.

SISKIWIT LAKE ACCESS

Existing Facilities:

- Boat landing & dock.

Recommended Improvements:

- Install new boat ramp.
- Expand/improve parking area.
- New boat washing station.
- Install kayak/canoe ramp/launch.

LOST CREEK FALLS

Recommended Improvements:

- Trail development.
- Benches.
- Improvement to parking.
- Interpretive signage.
- Wood overlook deck.

THUNDER BAY SHORES PARK

Existing Facilities:

- Scenic overlook of Bark Bay on Lake Superior – land is 70 ft wide from road to lake.

AIRPORT

Existing Facilities:

- 2010 foot grass landing strip
- pilot shelter
- picnic tables and fire ring
- new storage building with bikes available for plane passengers
- Portable Toilet

Recommended Improvements:

- Improve landing surface
- Upgrade picnic area
- Add camping area
- Add restroom facility

Town of Cable

CABLE AREA RECREATIONAL PARK (located ½ mile west of Cable)

Existing Facilities:

- Ball fields and bleachers
- Picnic areas
- Shelter 40’ x 90’
- Historic depot
- Playground equipment
- Restrooms
- Walk-in campground (5 sites)
- Bicycle skills course
- Tennis courts/pickleball courts
- Lighted basketball court
- Covered pavilion
- Skateboard park

Recommended Improvements:

- Replace/update playground equipment
- Improve accessibility to depot

CABLE ROD & GUN CLUB

Existing Facilities:

- Trap range
- Club house
- Pistol Range
- High power rifle range
- Skeet range

COMMUNITY CENTRE

Existing Facilities:

- Playground equipment
- Basketball hoop
- Hiking/snowshoe/fat-bike trails (3K)

PERRY LAKE/CABLE LAKE/TAHKODAH LAKE

Existing Facilities:

- Public boat landings at all three locations.
- Perry Lake: restrooms, changing rooms, picnic area and swimming area.
- Cable Lake and Tahkodah Lake: seasonal restroom.

CABLE AREA CHAMBER OF COMMERCE

Existing Facilities:

- Area maps/information
- Restrooms
- Public telephone
- Bike rack
- Benches
- Drinking fountain

NAMAKAGON RIVER ACCESS (Randysek Road south one mile and Highway M east three miles.)

Existing Facilities:

- Canoe landing
- Tubing
- Picnic tables
- Restrooms
- Fishing

NORTH END SKI CLUB (located 3 miles south on Randysek Rd)

Existing Facilities:

- Warming cabin
- Ski/snowshoe trails (hiking in season)
- Pit toilet

AMERICAN BIRKEBEINER SKI FOUNDATION TRAILHEAD (located on McNaught Rd)

Home of the start of the legendary American Birkebeiner ski race, the American Birkebeiner Trailhead is the jewel in the crown that is the Birkie Trail. It's a great launching point for the Birkie Skate and Classic trails, as well as the North End Trails. Enthusiasts will experience glacial pot holes, ridges, and a continuous series of rolling hills. Amenities at the American Birkebeiner Trailhead include the Derksen Cabin, a beautiful warming shelter available 24/7, complete with heat, water, and a flush toilet! The American Birkebeiner Trailhead's Great Hall, also located at the trailhead, is a hub for a variety of events all-year-through.

Existing Facilities:

- Event start/finish facility
- Ski trails (hiking in season)
- Warming cabin
- Restrooms

TIMBER TRAIL AMERICAN BIRKEBEINER TRAILHEAD

For those looking for challenging terrain, look no further than Timber Trail Trailhead. Rolling hills in either direction provide the ultimate training ground for those seeking a good workout! Plan to stop at the trailside cabin to warm up or for a picnic lunch.

AMERICAN BIRKEBEINER SKI FOUNDATION (ABSF) TRAILS

There are over 20 kilometers of ski trails, most of which can be used year-round, on ABSF property and County Forest land. We are currently in a phase of exploration on acquiring the Telemark property which could potentially add more trails and recreational opportunities.

CHEQUAMEGON AREA MOUNTAIN BIKE ASSOCIATION (CAMBA)

Existing Facilities:

- Trailhead next to Firehall on Randysek Road.
- Trailhead at North End Cabin (3 miles south on Randysek Road)
- Trails throughout Bayfield County Forest connecting to Town of Namekagon and CTH OO in the Town of Seeley.

Recommended Improvements:

• Rehabilitate and improve Esker Trail
• Wild River Trail: construct connecting trail from abandoned railroad grade to abandoned snowmobile trail.
• Rehabilitate and improve Danky Dank and Treasure's Trace trails
• Develop Bike Park, Downhill/Gravity trails on Mt. Telemark (pending resolution of property ownership).
• Develop stacked loop trails starting from Birkie Start area that will provide easier and intermediate connections to Ojibwe Trail, which will also be suitable for NICA race course, collegiate racing and other events.
• Encourage the development of on-trail camping, shuttles, and guide services.

Town of Clover

CORNELL PARK/HERBSTER PUBLIC CAMPGROUND

Existing Facilities:

- Covered pavilion
- Flush toilets
- Tent sites
- RV sites
- Playground
- Well

Recommended Improvements:

- Shower facility
- Expanded restroom facility
- Parking area for campground & pavilion
- Improved signage
- Additional RV sites with electrical
- Additional tent sites
- Erosion control
- Restroom near playground
- Park benches
- Picnic tables
- Fire rings

BARK BAY SLOUGH PUBLIC BOAT LAUNCH

Existing Facilities:

- Boat ramp
- Parking
- Porta-Potty
- Scenic overlook

Recommended Improvements:

- Restroom Facility

BARK BAY SLOUGH PUBLIC BOAT LANDING

Existing Facilities:

- Access for small craft such as canoe or kayak
- Parking

Recommended Improvements:

- Boat ramp
- Restroom

Town of Delta

None

Town of Drummond

DRUMMOND PARK

Existing Facilities:

- 30’ x 60’ shelter
- Swimming beach
- Picnic area w/grills
- Playground structure and Swing set
- Parking
- Boat ramp with pier
- Vault Toilets

Recommended Improvements:

- Create nature trail
- Add picnic grills
- ADA accessible flush toilets
- Replace floor in shelter
- Vegetation removal from swimming beach

DRUMMOND LAKE CAMPGROUND

Existing Facilities:

- 4 seasonal camp sites with electric, water & sewer
- 11 camp sites with electric, water & sewer
- 6 campsites with electric only
- 20' X 20' shower house w/pay showers and restrooms
- Dump station
- Parking area

Recommended Improvements:

- Develop additional full hook-up sites
- Develop primitive tent sites
- Plant privacy landscaping
- Install barrier in parking area.

LONG BRANCH HIKING TRAIL

Existing Facilities:

- Trailhead located at boar ramp on Drummond Lake
- 'Out and Back' single path hiking trail with bridges and boardwalk.

Recommended Improvements:

- Provide interpretive signs for historic aspects along trail
- Develop return loop
- Develop map with historic context of trail.

VISITOR CENTER (located in Library/Museum building)

Existing Facilities:

- benches
- historic bell tower & log

Recommended Improvements:

- Provide area for maps/brochures for after-hours visitors
- Refurbish log
- Paint building exterior

Town of Eileen

None.

Town of Grand View

GREAT DIVIDE BALL PARK FACILITY

Existing Facilities:

- Three ball fields
- Bleachers
- Restrooms
- Storage shed
- Playground equipment
- 2 concession stands
- Grandstand

Recommended Improvement:

- New playground equipment
- Refurbish/replace restrooms
- Reconstruct bleachers
- New 30’x40’ shelter
- Basketball court

GRAND VIEW PARK

Existing Facilities:

- Tennis courts
- Picnic area
- 30’ x 60’ shelter
- Resurface Tennis Cour0074
- 2 concession stands
- Music pavilion
- Music pavilion

Recommended Improvements:

- Shelter with restrooms
- Install ADA concrete pit toilet
- Upgrade wiring in concession stands & shelter
- Enclose west side of shelter
- Scenic overlook

PARK ALONG HWY 63

Existing Facilities:

- Playground equipment
- Ice skating rink
- Basketball courts

Recommended Improvements:

- Refurbish/replace playground equipment
- Install unisex ADA concrete pit toilet
- Add a recycle collection unit
- Add a sheltered drinking fountain & picnic table
- Refurbish/replace basketball courts

HISTORIC GRAND VIEW TOWN HALL MUSEUM

Existing Facilities:

- Museum
- Caboose

Recommended Improvements:

- Restoration of caboose

Town of Hughes

None

Town of Iron River

MOON LAKE PARK (1 mi south on CTH H)

Existing Facilities:

- Swimming beach
- Dock
- Restrooms
- Shelter
- Camping
- Picnic sites
- Boat ramp

Recommended Improvements:

- New restrooms/change house/shower building
- Gravel special events parking lot
- Develop skiing/hiking trail
- Gravel and mark campsites
- New boat ramp
- Develop tent campsites
- Develop marked bike trail from park to Iron River
- New park well
- Update electricity
- New restrooms
- RV site
- Sidewalk from Highway 2 to park

IRON RIVER LIONS MEMORIAL PARK (adjacent to the Iron River School)

Existing Facilities:

- Ball field
- Outdoor hockey rink

Recommended Improvements:

- Add two tennis courts
- Additional Little League/softball field with backstop & fencing
- Enclose hockey rink
- Equipment building for hockey facility
- Serve park with municipal sewer and flush toilets
- Add gravel parking lot

HALF MOON LAKE PARK (east end of Half Moon Lake)

Existing Facilities:

- Public lake access
- Picnicking

Recommended Improvements:

- Place park sign on USH 2 for public access
- Add several picnic tables

WAYSIDE PARK

Existing Facilities:

- Picnic tables
- Well

Recommended Improvements:

•Add more picnic tables

Town of Kelly

None

Town of Keystone

Existing Facilities:

- None

Recommended Improvements:

- Campground
- Playground

Town of Lincoln

LINCOLN COMMUNITY FOREST

Existing Facilities:

Owned and managed by Landmark Conservancy, this property is 396 acres in size and includes 2 miles of the Marengo River. It is characterized by gently rolling terrain with interspersed steep-sided ravines along the river. The property is primarily forested and includes numerous seeps, several wetlands and ephemeral ponds, and one small lake. The forest provides habitat for wildlife including rare and endangered Wisconsin species, anadromous fish from Lake Superior, and resident and migratory birds as well as others. The property contains a couple of miles of well-maintained trails and is open to the public for non-motorized recreation including cross-country skiing, fishing, fat biking, hiking, hunting, snowshoeing, and trapping. The property is managed as a working forest for long-lived species and climate resiliency. The Friends of the Lincoln Community Forest help Landmark Conservancy steward this property.

Recommended Improvements:

- Additional rest/seating areas
- Additional trails and trail connections as well as infrastructure to keep visitors and resources safe
- Improved access to the small lake
- Improved trail surfaces and water control features where needed
- Invasive plant control and removal
- Native plantings
- Interpretive signage
- Wildlife habitat restoration and enhancement activities as needed

Town of Mason

None

Town of Namakagon

Existing Facilities:

- Several boat landings on Namakagon Lake

Recommended Improvements:

- Build a Town park

CHEQUAMEGON AREA MOUNTAIN BIKE (CAMBA) TRAILS

Town of Orienta

BOAT LANDING (mouth of Iron River)

Existing Facilities:

- Picnic table

Town of Oulu

TOWN PARK

Existing Facilities:

- 2 Baseball fields with bleachers
- Playground equipment

Recommended Improvements:

- Improve baseball field
- Upgrade playground equipment
- Cover second set of bleachers
- Cement pad under bleachers

Town of Pilsen

Existing Facilities:

- Baseball diamond
- Basketball court
- Playground area

Town of Port Wing

Recommended Improvements:

- Develop silent trails with easy access to Scenic Byway
- Provide travel center with public facilities
- Develop a "Historic Walk through Town" with interpretive signage

BASEBALL PARK

QUARRY BEACH

TWIN FALLS PARK

Existing Facilities:

- Trails
- Restroom

Recommended Improvements:

- Repair restroom
- Improve trail access and signage
- Add picnic table
- Remove deadfall from trails

OLD SCHOOL MEMORIAL PARK

Existing Facilities:

- Playground equipment

Recommended Improvements:

• Replace playground equipment

HARBOR PARK

Existing Facilities:

- Bathroom facilities
- Historical lighthouse
- Picnic tables
- Benches

Recommended Improvements:

- Sand blast and paint the historical lighthouse
- Upgrade bathroom facilities
- Upgrade water system
- Upgrade fish cleaning station
- Install interpretive kiosks and marker
- Update & improve picnic tables & benches
- Build accessible observation deck overlooking Lake Superior with historical interpretive signage

Town of Russell

LITTLE SAND BAY RECREATION AREA

Existing Facilities:

The Little Sand Bay Recreation Area is located on the shores of Lake Superior at the northern tip of the Bayfield Peninsula. The facility is approximately 12 miles north of the City of Bayfield, Wisconsin. The Town of Russell owns and operates a campground, boat launching ramp and dock, the east pier of the boat harbor basin for transient slips, a swimming beach, picnic grounds and ball field/play area.

The Town of Russell Little Sand Bay Recreation Area is located within the boundaries of the Apostle Islands National Lakeshore (AINL). The National Park Service (NPS) administers the AINL and operates a visitor center at Little Sand Bay.

The boat launching ramp and dock serve recreational boaters and fishermen. The launch ramp is paved with a portable dock system to assist boaters with launching. The launch ramp is located within the protected harbor and boat basin at Little Sand Bay. Paved, drive through parking is provided for vehicles with trailers attached. A launching area dedicated to canoes and kayaks is also provided by the AINL
.
The Town maintains the docking slips on the east pier of the boat basin for transient and overnight docking of boats for campers.

A beautiful sand beach for swimming is located east of the boat basin for use by day visitors, campers and picnickers. A picnic shelter and playground for young children is adjacent to the beach area.
A parking area is available adjacent to the swimming beach for day users and picnickers.

The campground has 39 sites in total. Thirty-one of these sites will accommodate RVs and have electrical service. Water hydrants are located throughout the facility. An RV dump station is provided for campers. Six of the sites are suitable for tents and small trailers. Two sites are handicap accessible and one site is designated as a group camp site with a shelter.

All sites have parking areas for vehicles, picnic tables, fire rings and access to trash receptacles and recycling containers. Flush toilets and wash facilities are provided by the AINL and pit toilets also serve the campers and picnickers. The Town has shower facilities for campers. Firewood and ice are available for purchase from the Town.

A large level open area between the campground and boat basin is available for recreational purposes such as ball games and other group events.

Recommended Improvements:

- Install additional playground equipment
- Provide WiFi service to campers
- Replace wood picnic tables with composite & steel tables
- Develop an on-line reservation system to accept cred/debit card payments of fees
- Expand seating (benches) in the beach/playground area

TOWN OF RUSSELL SHOOTING RANGE

Existing Facility:

The Town of Russell operates a public shooting range off Old County K at the end of Valley View Road. The range has a 100 yard rifle range with protective berm and is also suitable for trap shooting. The facility has a covered shelter with shooting benches and picnic tables for observers. A fire pit and benches are available along with a large vehicle parking area. The range is open to the public starting on May 1 and closes the day before the deer gun season.

Recommended improvements:

- Install electric service to the shelter building with shelter lighting
- Install pit toilets
- Provide permanent target holding system
- Install metal distance marking posts at 15, 25, 50, 75 and 100 yards
- Install a firewood shed
- Install a permanent trap throwing system and range lighting system

HISTORICAL CARVER SCHOOL REST AREA

Existing facilities:

The Town of Russell operates a wayside rest area at the intersection of East Old County K and State Highway 13 which acknowledges the location of the historic Carver School. An informational display of the original Carver School Bell along with historical information is present. Picnic tables and drinking water are available.

Recommended improvements:

- Install a picnic shelter
- Install a pit toilets
- Install cooking grill/fire pit
- Landscaping and tree planting
- Install garbage and re-cycling containers

RASPBERRY SCHOOL HISTORICAL SITE

Existing facilities:

The original Raspberry School has been relocated and is on display at Old World Wisconsin.

Recommended improvements:

- Install a sign with historical information at the site of the school and provide a safe parking pull-off area.
- Install signage on State Highway 13 and Old County K of a historical site

NORTH PIKES CREEK WETLANDS COMMUNITY FOREST

Existing Facilities:

Owned and managed by Landmark Conservancy, this property is 280 acres of forested wetlands in the headwaters of the North Pikes Creek watershed. It is characterized by very flat topography and wetland soils, and as a result, wet conditions prevail over much of the property except during dry periods. Over a mile of the stream runs through the property, and then continues approximately 7 miles farther before flowing into Lake Superior near the South Shore Lake Superior Fish and Wildlife Area. The forest provides habitat for much wildlife including rare and endangered Wisconsin species and resident and migratory birds. The property contains primitive trails and is more easily accessible in the winter months. The community forest is open for non-motorized recreation including cross-country skiing, fishing, hiking, hunting, and snowshoeing.

Recommended improvements:

- Develop a parking area
- Trail development
- Additional trails and trail connections as well as infrastructure to keep visitors and resources safe
- Improved access to North Pikes Creek
- Signage
- Invasive plant control and removal
- Native plantings
- Interpretive signage

BEAVER HOLLOW OUTDOOR EDUCATION AREA

Recommended improvements

- Establish a trailhead and parking area
- Trail development
- Signage

Town of Tripp

JACKMAN LAKE PARK (north of Iron River)

Existing Facilities:

- Swimming
- Picnicking

Recommended Improvements:

- New restrooms
- Parking area improvements
- Swimming dock

Town of Washburn

AREA OFF ARNSO ROAD

Existing Facilities:

- None

Recommended Improvements:

- Bicycle lanes
- Walking trails
- Picnic tables

Village Facilities

Village of Mason

MASON PARK

Existing Facilities:

- Pavilion
- Restrooms
- Parking
- Camping

Recommended Improvements:

- Dock
- New pavilion roof
- Historical marker for old mill

PLAYGROUND BY MUSEUM

Existing Facilities:

- Basketball courts
- Playground equipment

Recommended Improvements:

- 1 or 2 new items of playground equipment

Tribal Facilities

Red Cliff Band of Lake Superior Chippewa

FROG BAY TRIBAL NATIONAL PARK

Existing Facilities:

Frog Bay Tribal National Park (FBTNP) is the first tribal national park in the United States! The park was created in 2012, with the addition of the Conservation Management Area (CMA) in 2017. The CMA permanently protects ¾ mile of undeveloped sandy Lake Superior shoreline, 1 mile of stream corridor, 118 acres of wetlands and freshwater estuary, nearly 300 acres of land around Frog Bay, and boasts panoramic views of 5 of the Apostle Islands. There are 2 miles of hiking trails within FBTNP; dotted with 20+ interpretive Ojibwe cultural signs, 20 boardwalks/footbridges, and a 130 foot steel truss bridge. The park is open year round from dawn to dusk, free of admission. A donation box exists near the comfort station and trailhead kiosk at the parking area.

Recommended Improvements:

- Acquire additional non-tribal lands in Frog Bay for continued park expansion.
- Add trail distance markers.
- Add hiking trails and boardwalks where appropriate.

CLAYTON CREEK TRAIL

Existing Facilities:

The Clayton Creek Trail was constructed in 2017 for the enjoyment of all. Whether you are simply looking to spend some time in nature, or would like to take an alternative route between Legendary Waters Casino and the Health Center, Farm, or Pow Wow Grounds, this trail is a great opportunity to get outside! This 1 mile moderate trail brings hikers through a variety of habitats as it follows Clayton Creek, passing through the old fields and apple trees of the community farm, through stands of hardwoods, boreal forest, and along steep ravines.

Recommended Improvements:

- Additional boardwalks
- Interpretive signage
- Add trail distance markers

BUFFALO BAY CAMPGROUND

Existing Facilities:

- Camp/tent (11) and RV sites (34).
- Bathroom and shower facility.
- Swimming area at adjacent marina.
- Interpretive walking trail showcasing green infrastructure efforts.

Recommended Improvements:

- Additional campsites.
- Reforest camping area and remove hazard trees.
- Develop a camp store.
- Create additional recreational opportunities for guests such as outdoor volleyball, playgrounds, horseshoes, cornhole toss, mini golf, etc.
- Develop a laundry facility.
- Repair pump out and potable water station.
- Expand sites with electrical, water & sewer hookups.
- Develop outdoor pool area.
- Improve signage.
- Create separate swimming area, away from marina.
- Create separate kayak launch area, away from marina.
- Add mini chalets or cabins for additional rental opportunities.
- Restore shoreline to prevent continued erosion of facility.
- Develop recreational fishing/overlook pier.
- Improve campground and campsite driveways.
- Update all picnic tables and fire rings.

BUFFALO BAY MARINA

Existing Facilities:

- Dockage (46 Seasonal and 10 transient slips).
- Boat landing.
- Swimming area.
- Viewing platform.

Recommended Improvements:

- Expand number of boat slips.
- Install boat lift/straddle hoist.
- Provide year-round boat storage.
- Develop fueling and pump out station.
- Develop repair facility.
- Improve electrical and water hookups.
- Add commercial telescope to viewing platform.
- Improve boat launch site.
- Improve parking facilities.
- Improve marina “clubhouse” area.
- Develop 30’ X 40’ shoreline building with restrooms, showers, laundry and marina office to collect launch fees and sell bait & ice.
- Create opportunities for winter activities such as ice skating, sledding, snow tubing, winter parking, and ice fishing

POINT DETOUR CAMPGROUND

Existing Facilities:

- Rustic camping (25 sites).
- Rustic vault toilet.

Recommended Improvements:

- Improved restroom facilities.
- Develop central socialization, cooking, and storm safety area.
- Explore opportunities to develop a hiking trail from Pt Detour Campground to Little Sand Bay Campground (Town of Russell) and Visitor Center (Apostle Islands National Park Service), working cooperatively with the relevant entities.
- Improve shoreline safety and protection measures.
- Expand camping opportunities to include hike-in campsites.
- Update all picnic tables and fire rings.
- Improve existing drive in/tent pad areas to create a more level camping surface.
- Improve signage.
- Reforest between campsites and remove hazard trees.

<u>Additional Recommended Improvements:</u>

- Explore opportunities to create a permanent snowmobile trail connecting Red Cliff to the Bayfield County snowmobile trail system.
- Explore opportunities to create a pedestrian and bicyclist trail connecting the communities of Red Cliff and Bayfield, originating at the Red Cliff Community Health Center.
- Explore opportunities to improve pedestrian/bicyclist movement throughout the community, especially from Legendary Waters Casino to Frog Bay Tribal National Park and between municipal facilities and developed areas.

APPENDIX E-28 White River Recreation Inventory and Condition Assessment Forms

Recreation Inventory and Condition Assessment									
Location:	Boat Landing-Canoe Portage Take-out							Date:	6/17/2021
White River Hydroelectric Project P-2444									
Survey Person:	Shawn Puzen								
GPS Location:	46° 29'54.91758948 N		90°54' 36.09913255W						
Amenity Photo Numbers:	1, 2, 3								
Shoreline Photo Numbers:	4								
Entryway Photo Number:	5								

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	driftwood at ramp	N
Scenic Overlook	N/A	N R M G		N
Tailwater Access	N/A	N R M G		N
Restroom	N/A	N R M G		N
Trash Receptacles	N/A	N R M G		N
Other	N/A	N R M G		

Parking	**No. Spaces (each type):**				**Condition:**	**Notes:**
	Standard:	Barrier-Free:	Trailer:	Other (specify):		
	0		4		N R M G	Gravel

Signage:	**Number:**	**Condition:**	**Comments: Provide Details on which signs need attention.**
FERC Project Sign	1	N R M G	Needs to be updated to meet current Part 8 requirements
Regulations Signs	1	N R M G	
Directional	2	N R M G	Canoe portage takeout sign and site ID sign by road
Interpretive	0	N R M G	

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

Need to remove driftwood collected at boat ramp.

Recreation Inventory and Condition Assessment

Location:	Canoe Portage Put-In and Trail						Date:	6/17/2021
White River Hydroelectric Project P-2444								
Survey Person:	Shawn Puzen							
GPS Location:	46° 29' 54.56434595N		90° 54' 12.11139833W					
Amenity Photo Numbers:		7, 8, 9, 10						
Shoreline Photo Numbers:		11						
Entryway Photo Number:		6						

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)
Canoe Portage Put-In	1	N R M G (G marked)	Mowed path to water	N
Scenic Overlook	N/A	N R M G		N/A
Tailwater and Bypass Reach Access	1	N R M G (G marked)	used for bank fishing	N
Restroom	N/A	N R M G		N
Trash Receptacles	N/A	N R M G		N/A
Other	Canoe portage path	N R M G (G marked)	gravel & mowed	N

Parking	No. Spaces (each type): Standard:	Barrier-Free:	Trailer:	Other (specify):	Condition:	Notes:
	10	0			N R M G (G marked)	Gravel

Signage:	Number:	Condition:	Comments: Provide Details on which signs need attention.
FERC Project Sign	1	N R M G (M marked)	Needs to be reviewed to ensure meets current Part 8 standards
Regulations Signs	6	N R M G (G marked)	good condition
Directional	1	N R M G (M marked)	Directional sign by road is also the Part 8 sign-needs to be updated to meet current standards
Interpretive	0	N R M G	

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

Canoe portage path allows access to the bypass reach and the tailwater area below the powerhouse for bank fishing. Portage path partially gravel and parially mowed grass path-both portions are in good condition. Canoe portage and regulatory signs in good condition. Parking area shared with Tailwater Access Area.

Recreation Inventory and Condition Assessment										
Location:	Tailrace Fishing Area							Date:	6/17/2021	
White River Hydroelectric Project P-2444										
Survey Person:	Shawn Puzen									
GPS Location:	46° 29' 54.21980018 N		90° 54' 13.43236839 W							
Amenity Photo Numbers:	12, 13									
Shoreline Photo Numbers:	13									
Entryway Photo Number:	6- Same as Canoe Portage Put-in									

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: 0 Launches: 0	N R M G		N/A
Scenic Overlook	N/A	N R M G		N/A
Tailwater Access	1	N R M G	Tailrace area capacity 9	N
Restroom	0	N R M G		N/A
Trash Receptacles	0	N R M G		N/A
Other	N/A	N R M G		N/A

Parking	**No. Spaces (each type):**				**Condition:**	**Notes:**
	Standard:	Barrier-Free:	Trailer:	Other (specify):		
	10	0			N R M G	Gravel

Signage:	**Number:**	**Condition:**	**Comments: Provide Details on which signs need attention.**
FERC Project Sign	1	N R M G	Same sign as Canoe Portage Put-in. Needs review to ensure meets current standards
Regulations Signs	4	N R M G	2 regulatory/safety signs on north side of powerhouse and 2 on east side of powerhouse-good condition
Directional	1	N R M G	Directional/Part 8 sign by road is same as canoe portage put-in. Needs to be updated to meet current standards.
Interpretive	0	N R M G	

Additional Comments:
Describe any signs of overuse or anything observed that is not already documented above.

Parking area and directional site ID signage is shared with canoe portage put-in.

APPENDIX E-29 White River Recreation Site Photographs

Photo 1 Boat Landing/Canoe Portage Take-out

Photo 2 Part 8 Sign

Photo 3-Canoe Portage Take-out Directional Sign

Photo 4 Boat Ramp and Reservoir Shoreline

Photo 5 Site ID/Directional Sign by Road

Photo 6-Canoe Portage Path and Directional Sign by Road

Photo 7-Canoe Portage Put-in/ Tailwater Access Parking Area

Photo 8-Bypass Reach Safety Signage

Photo 9-Canoe Portage Path

Photo 10-Canoe Portage Path

Photo 11-Canoe Portage Putin (at shoreline)

Photo 12-Stairway to access Tailrace Fishing Area

Photo 13-Tailrace Fishing Area

APPENDIX E-30 White River Recreation Use Survey Forms and Summary Worksheets

Recreation Observation Form																
Date:	4/16/2022			Time:	0900											
White River Project P-2444																
Survey Person:	Tim Hudak												Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.			
Temperature:	23F	Weather:	overcast		Wind Speed:	W14										
			Recreation Activities													
Recreation Site	Number of People	ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	Notes		
Boat Launch																
Canoe Portage	2												P	spillway viewing		
Tailwater Fishing Area																
Additional Comments:																

Recreation Observation Form

Date:	4/17/2022	Time:	1000		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	32F	Weather:	partly cloudy	Wind Speed:	SE 5

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch														
Canoe Portage	1												P	spillway viewing
Tailwater Fishing Area														

Additional Comments:

Recreation Observation Form

Date:	5/7/2022	Time:	0950		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	64F	Weather:	clear	Wind Speed:	S 10

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	9		S	P										
Canoe Portage	3		P											
Tailwater Fishing Area	6		P											

Recreation Observation Form																
Date:	5/8/2022			Time:	0930											
White River Project P-2444																
Survey Person:	Tim Hudak													Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.		
Temperature:	56F	Weather:	overcast		Wind Speed:	S 10										
			Recreation Activities													
Recreation Site	Number of People	ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	Notes		
Boat Launch																
Canoe Portage																
Tailwater Fishing Area	5		P													

Recreation Observation Form

Date:	5/30/2022	Time:	1000

White River Project P-2444

Survey Person:	Tim Hudak					Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.
Temperature:	73F	Weather:	overcast	Wind Speed:	SW 14	

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch														
Canoe Portage	4		P											spillway fishing
Tailwater Fishing Area	2		P											

Recreation Observation Form

Date:	6/4/2022	Time:	1100

White River Project P-2444

Survey Person:	Tim Hudak					Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.
Temperature:	72F	Weather:	clear	Wind Speed:	W 16	

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch														
Canoe Portage														
Tailwater Fishing Area	2		P											

Recreation Observation Form

Date:	6/12/2022	Time:	1100		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	60 F	Weather:	overcast	Wind Speed:	E 6

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	0													
Canoe Portage	0													
Tailwater Fishing Area	0													

State Hwy 112 closed at White River bridge for DOT contract work has likely impacted the number of people visiting the site.

Recreation Observation Form

Date:	6/26/2022	Time:	1100		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	61 F	Weather:	overcast	Wind Speed:	W 17

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	0													
Canoe Portage	0													
Tailwater Fishing Area	0													

State Hwy 112 closed at White River bridge for DOT contract work has likely impacted the number of people visiting the site.

Recreation Observation Form

Date:	7/3/2022	Time:	1200		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	73 F	Weather:	clear	Wind Speed:	N 9

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	2			2										
Canoe Portage	0													
Tailwater Fishing Area	2			2										

State Hwy 112 closed at White River bridge for DOT contract work has likely impacted the number of people visiting the site. 3 day holiday weekend.

Recreation Observation Form

Date:	7/15/2022	Time:	0900		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	66 F	Weather:	few clouds	Wind Speed:	W 5

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	0													
Canoe Portage	0													
Tailwater Fishing Area	3		3											

DOT bridge project was completed on 13 Jul 2022

Recreation Observation Form

Date:	7/17/2022	Time:	1100		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	75 F	Weather:	clear	Wind Speed:	N 7

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	2			2										
Canoe Portage	0													
Tailwater Fishing Area	0													

DOT bridge project was completed on 13 Jul 2022

Recreation Observation Form

Date:	8/3/2022	Time:	1300		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	81 F	Weather:	Fair	Wind Speed:	W 18

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	0													
Canoe Portage	4		4											
Tailwater Fishing Area	2		2											

Recreation Observation Form

Date:	8/14/2022	Time:	1200

White River Project P-2444

Survey Person:	Tim Hudak					Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.
Temperature:	64 F	Weather:	Overcast	Wind Speed:	N 5	

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	0													
Canoe Portage	0													
Tailwater Fishing Area	0													

Recreation Observation Form

Date:	8/20/2022	Time:	1600		
White River Project P-2444					
Survey Person:	Tim Hudak			Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.	
Temperature:	69 F	Weather:	Overcast	Wind Speed:	NE 15

Recreation Site	Number of People	Recreation Activities												Notes
		ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	
Boat Launch	2			2										
Canoe Portage	0													
Tailwater Fishing Area	0													

White River Project Amenity Use Summary

Recreation Site	Number of days activity observed during recreation observation surveys												
	ATV Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking	Biking	Picnicking	Birdwatching	Wildlife Viewing	Non -powered Boating	Power Boating	Other*	Totals
Boat Launch/Canoe portage take-out	0	1	4	0	0	0	0	0	0	0	0	0	5
Canoe portage trail & put-in	0	3	0	0	0	0	0	0	0	0	0	2	5
Tailrace Fishing Access	0	6	1	0	0	0	0	0	0	0	0	0	7
Totals	0	10	5	0	0	0	0	0	0	0	0	2	17

*Other use noted was spillway viewing

White River Recreation Observation Survey Summary Worksheet

Date	Recreation Facilities	"X" if Activity Observed During Recreation Observation Survey												Total Number of People
		ATV/Snowmobile	Shoreline Fishing	Boat Fishing	Swimming	Hiking	Bicycling	Picnicking	Bird watching	Wildlife Viewing	Non-powered Boating	Power Boating	Other	
16-Apr	Boat Launch													0
17-Apr	Boat Launch													0
7-May	Boat Launch		X	X										9
8-May	Boat Launch													0
30-May	Boat Launch													0
4-Jun	Boat Launch													0
12-Jun	Boat Launch													0
26-Jun	Boat Launch													0
3-Jul	Boat Launch			X										2
15-Jul	Boat Launch													0
17-Jul	Boat Launch			X										2
3-Aug	Boat Launch													0
14-Aug	Boat Launch													0
20-Aug	Boat Launch			x										2
Total for Site		0	1	4	0	0	0	0	0	0	0	0	0	15
16-Apr	Portage Path and Put-in												X (spillway viewing)	2
17-Apr	Portage Path and Put-in												X (spillway viewing	1
7-May	Portage Path and Put-in		X											3
8-May	Portage Path and Put-in													0
30-May	Portage Path and Put-in		X											4
4-Jun	Portage Path and Put-in													0
12-Jun	Portage Path and Put-in													0
26-Jun	Portage Path and Put-in													0
3-Jul	Portage Path and Put-in													0
15-Jul	Portage Path and Put-in													0
17-Jul	Portage Path and Put-in												-	0
3-Aug	Portage Path and Put-in		X											4
14-Aug	Portage Path and Put-in													0
20-Aug	Portage Path and Put-in													0
Total for Site		0	3	0	0	0	0	0	0	0	0	0	2	14
16-Apr	Tailrace Fishing													0
17-Apr	Tailrace Fishing													0
7-May	Tailrace Fishing		X											6
8-May	Tailrace Fishing		X											5
30-May	Tailrace Fishing		X											2
4-Jun	Tailrace Fishing		X											2
12-Jun	Tailrace Fishing													0
26-Jun	Tailrace Fishing													0
3-Jul	Tailrace Fishing			X										2
15-Jul	Tailrace Fishing		X											3
17-Jul	Tailrace Fishing													0
3-Aug	Tailrace Fishing		X											2
14-Aug	Tailrace Fishing													0
20-Aug	Tailrace Fishing													0
Total for Site		0	6	1	0	0	0	0	0	0	0	0	0	22
Totals All Sites		0	10	5	0	0	0	0	0	0	0	0	2	51

APPENDIX E-31 White River Recreation Questionnaires and Responses

Darrin Johnson

From: Jen Schuetz
Sent: Thursday, July 14, 2022 11:23 AM
To: heather.schutte@co.ashland.wi.us
Cc: Miller, Matthew J; Jen Schuetz
Subject: RE: White River Hydroelectric Project Recreation Questionnaire
Attachments: White River Recreation Questionnaire_fillable.pdf

Hello Ms. Schutte,

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. As part of this relicensing process, Xcel Energy must include an evaluation of the existing recreational facilities associated with the Project, along with proposed recreation enhancements.

Ashland County has been identified as an entity responsible for existing recreation within the Project vicinity. Input from the County is requested on the attached White River Hydroelectric Project Recreation Questionnaire, which is a fillable PDF.

Please send the completed survey within 30 days to Matt Miller, who is copied on this email, at matthew.j.miller@xcelenergy.com.

If you have any difficulties entering information into the PDF, please contact me at jen.schuetz@meadhunt.com or 608-443-0460.

Thank you for your time and interest in the White River Hydroelectric Project relicensing efforts.

Jen

JEN SCHUETZ
GIS AND COMPLIANCE SPECIALIST, WATER
(She, Her, Hers)
Mead & Hunt
Direct: 608-443-0460 | Transfer Files
meadhunt.com | LinkedIn | Twitter | Facebook | Instagram
120 YEARS OF SHAPING THE FUTURE

JEN SCHUETZ
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Darrin Johnson

From: Jen Schuetz <jen.schuetz@meadhunt.com>
Sent: Thursday, July 14, 2022 11:14 AM
To: bkucera@coawi.org
Cc: Miller, Matthew J; Jen Schuetz
Subject: White River Hydroelectric Project Recreation Questionnaire
Attachments: White River Recreation Questionnaire_fillable.pdf

Categories: Filed by Newforma

Hello Mr. Kucera,

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. As part of this relicensing process, Xcel Energy must include an evaluation of the existing recreational facilities associated with the Project, along with proposed recreation enhancements.

The City of Ashland has been identified as a municipality responsible for existing recreation within the Project vicinity. Your input is requested on the attached White River Hydroelectric Project Recreation Questionnaire, which is a fillable PDF.

Please send the completed survey within 30 days to Matt Miller, who is copied on this email, at matthew.j.miller@xcelenergy.com.

If you have any difficulties entering information into the PDF, please contact me at jen.schuetz@meadhunt.com or 608-443-0460.

Thank you for your time and interest in the White River Hydroelectric Project relicensing efforts.

Jen

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Darrin Johnson

From: Jen Schuetz
Sent: Thursday, July 14, 2022 11:15 AM
To: 14ledo81@gmail.com
Cc: Miller, Matthew J; Jen Schuetz
Subject: White River Hydroelectric Project Recreation Questionnaire
Attachments: White River Recreation Questionnaire_fillable.pdf

Hello Mr. Lehto,

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. As part of this relicensing process, Xcel Energy must include an evaluation of the existing recreational facilities associated with the Project, along with proposed recreation enhancements.

The Town of White River has been identified as a municipality responsible for existing recreation within the Project vicinity. Your input is requested on the attached White River Hydroelectric Project Recreation Questionnaire, which is a fillable PDF.

Please send the completed survey within 30 days to Matt Miller, who is copied on this email, at matthew.j.miller@xcelenergy.com.

If you have any difficulties entering information into the PDF, please contact me at jen.schuetz@meadhunt.com or 608-443-0460.

Thank you for your time and interest in the White River Hydroelectric Project relicensing efforts.

Jen

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Darrin Johnson

From: Jen Schuetz <jen.schuetz@meadhunt.com>
Sent: Thursday, July 14, 2022 11:15 AM
To: Laatsch, Cheryl - DNR
Cc: Miller, Matthew J; Jen Schuetz
Subject: White River Hydroelectric Project Recreation Questionnaire
Attachments: White River Recreation Questionnaire_fillable.pdf

Categories: Filed by Newforma

Hello Ms Laatsch,

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. As part of this relicensing process, Xcel Energy must include an evaluation of the existing recreational facilities associated with the Project, along with proposed recreation enhancements.

The Wisconsin Department of Natural Resources has been identified as a entity responsible for existing recreation within the Project vicinity. Your input is requested on the attached White River Hydroelectric Project Recreation Questionnaire, which is a fillable PDF.

Please send the completed survey within 30 days to Matt Miller, who is copied on this email, at matthew.j.miller@xcelenergy.com.

If you have any difficulties entering information into the PDF, please contact me at jen.schuetz@meadhunt.com or 608-443-0460.

Thank you for your time and interest in the White River Hydroelectric Project relicensing efforts.

Jen

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Northern States Power Company-Wisconsin (d/b/a Xcel Energy) is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. Xcel Energy is gathering information about potential recreation needs in the vicinity of the Project.

The Project vicinity is defined as the area upstream and downstream of the White River Dam and Powerhouse within ½ mile of the shoreline extending two (2) miles upstream and one (1) mile downstream of the White River 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 any 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. Based on the specific recreation sites listed in 2a and amenities listed in 2b, do you have any planned improvements of existing recreation sites 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 by Xcel Energy or their representative for any recreation site listed above: ***(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 via the email address listed 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 White River Hydroelectric Project.*

Comments, questions, and/or this completed questionnaire may also be sent via email to:
Matthew.J.Miller@XcelEnergy.com

Darrin Johnson

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Tuesday, July 19, 2022 2:49 PM
To: Jen Schuetz
Cc: Miller, Matthew J
Subject: RE: White River Hydroelectric Project Recreation Questionnaire

We have nothing to add at this time. The formal DNR managed properties are just outside of the FERC project boundary. The areas above the dam are heavily used as is a well established fishery recreation area.

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: Jen Schuetz <jen.schuetz@meadhunt.com>
Sent: Thursday, July 14, 2022 11:15 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Miller, Matthew J <Matthew.j.miller@xcelenergy.com>; Jen Schuetz <jen.schuetz@meadhunt.com>
Subject: White River Hydroelectric Project Recreation Questionnaire

Hello Ms Laatsch,

Northern States Power Company – Wisconsin, d/b/a Xcel Energy, is in the process of relicensing the White River Hydroelectric Project (Project) located on the White River in Ashland County, Wisconsin. As part of this relicensing process, Xcel Energy must include an evaluation of the existing recreational facilities associated with the Project, along with proposed recreation enhancements.

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If you have any difficulties entering information into the PDF, please contact me at jen.schuetz@meadhunt.com or 608-443-0460.

Thank you for your time and interest in the White River Hydroelectric Project relicensing efforts.

Jen

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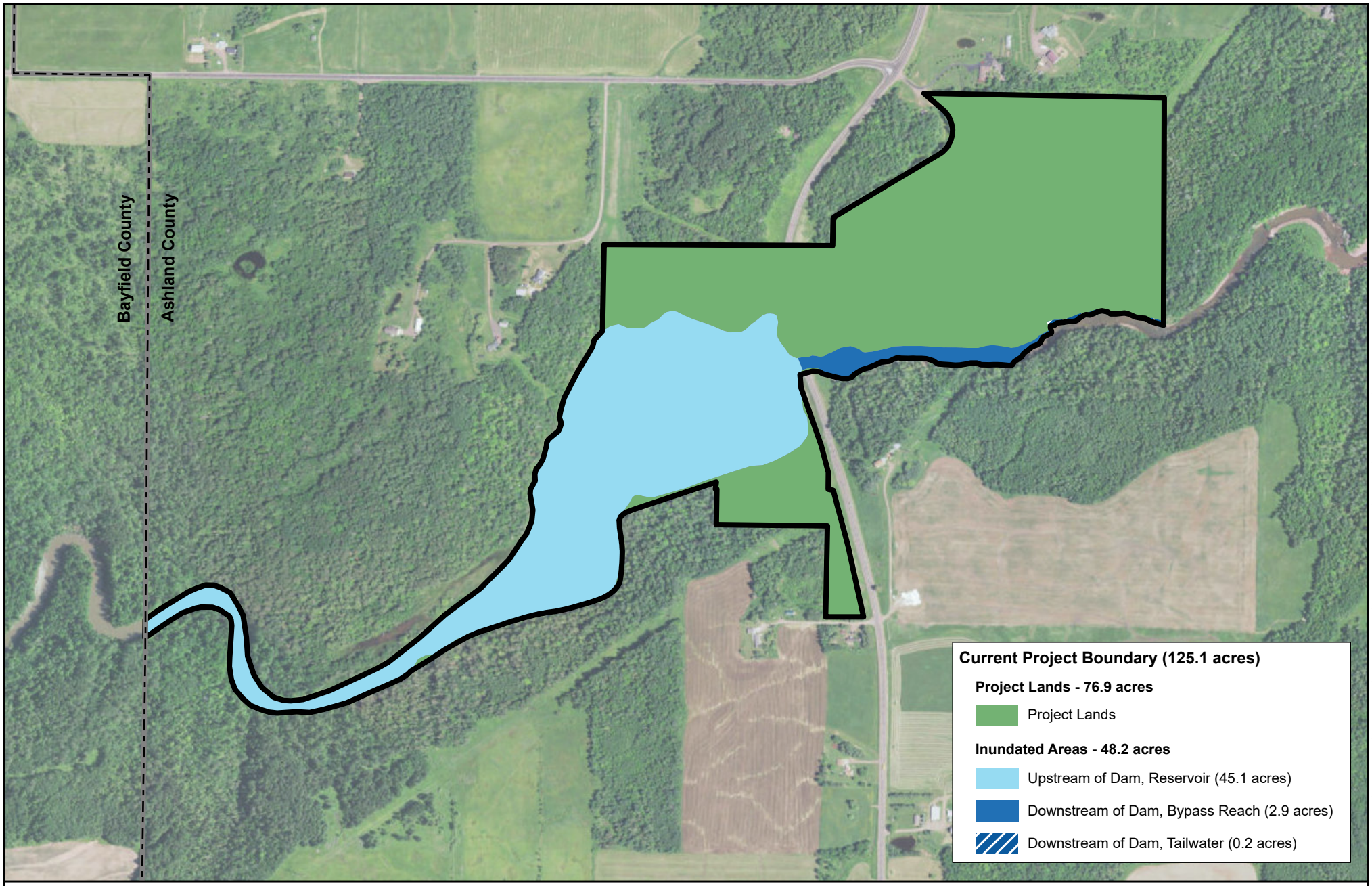
APPENDIX E-32 White River Project Land and Inundated Areas Map



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Mead & Hunt

Current Project Boundary
County Boundary

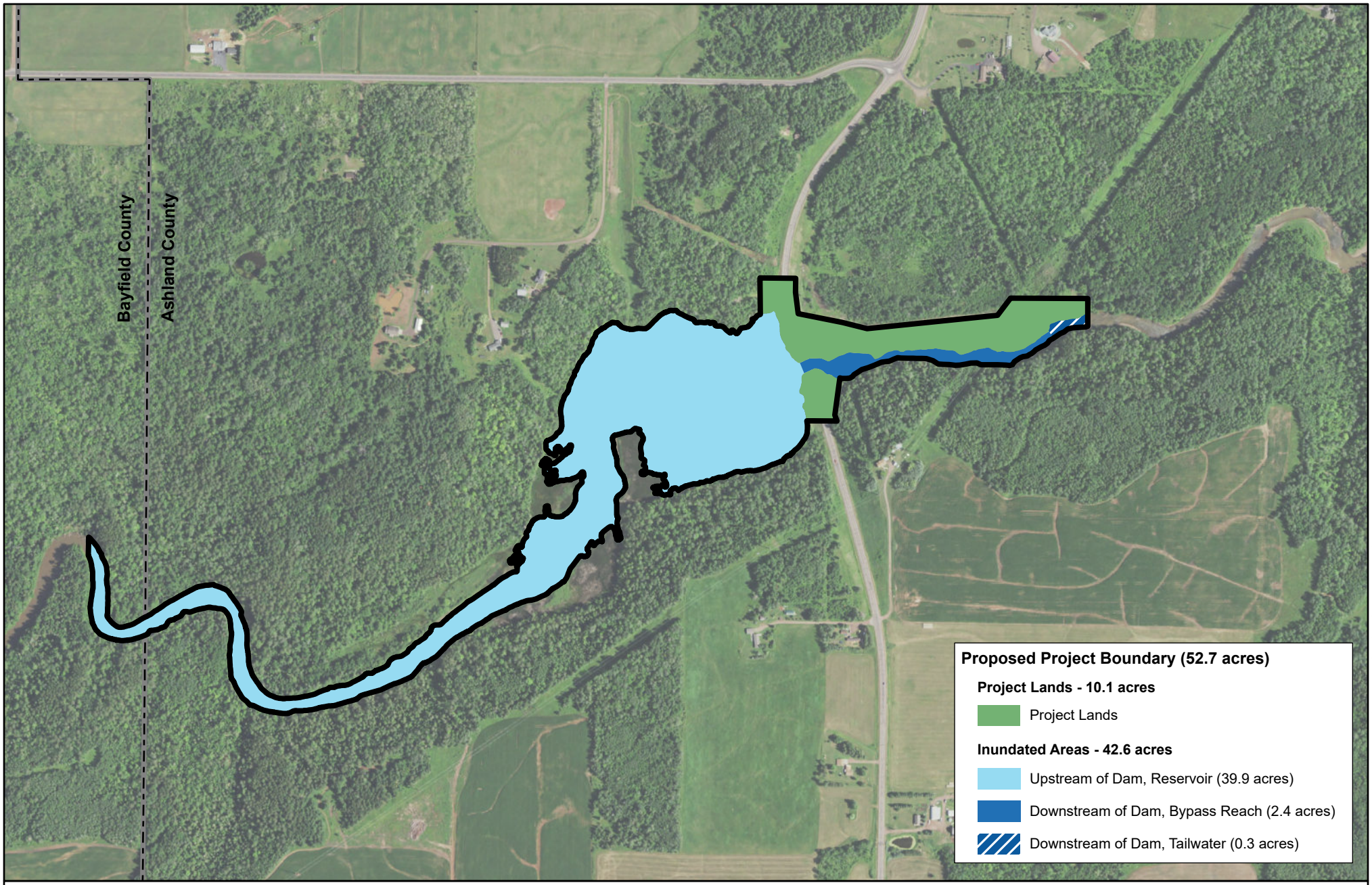
N
0 500 1,000
Feet

White River Hydroelectric Project
Current Project Lands and Inundated Areas

FERC No. 2444

Source Layer:GIS Core Services,WisDOT

\\corp.meadhunt.com\sharedfolders\entp\240010\192923.011\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA.aprx



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Mead & Hunt

Proposed Project Boundary
County Boundary

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

N

0 500 1,000
Feet

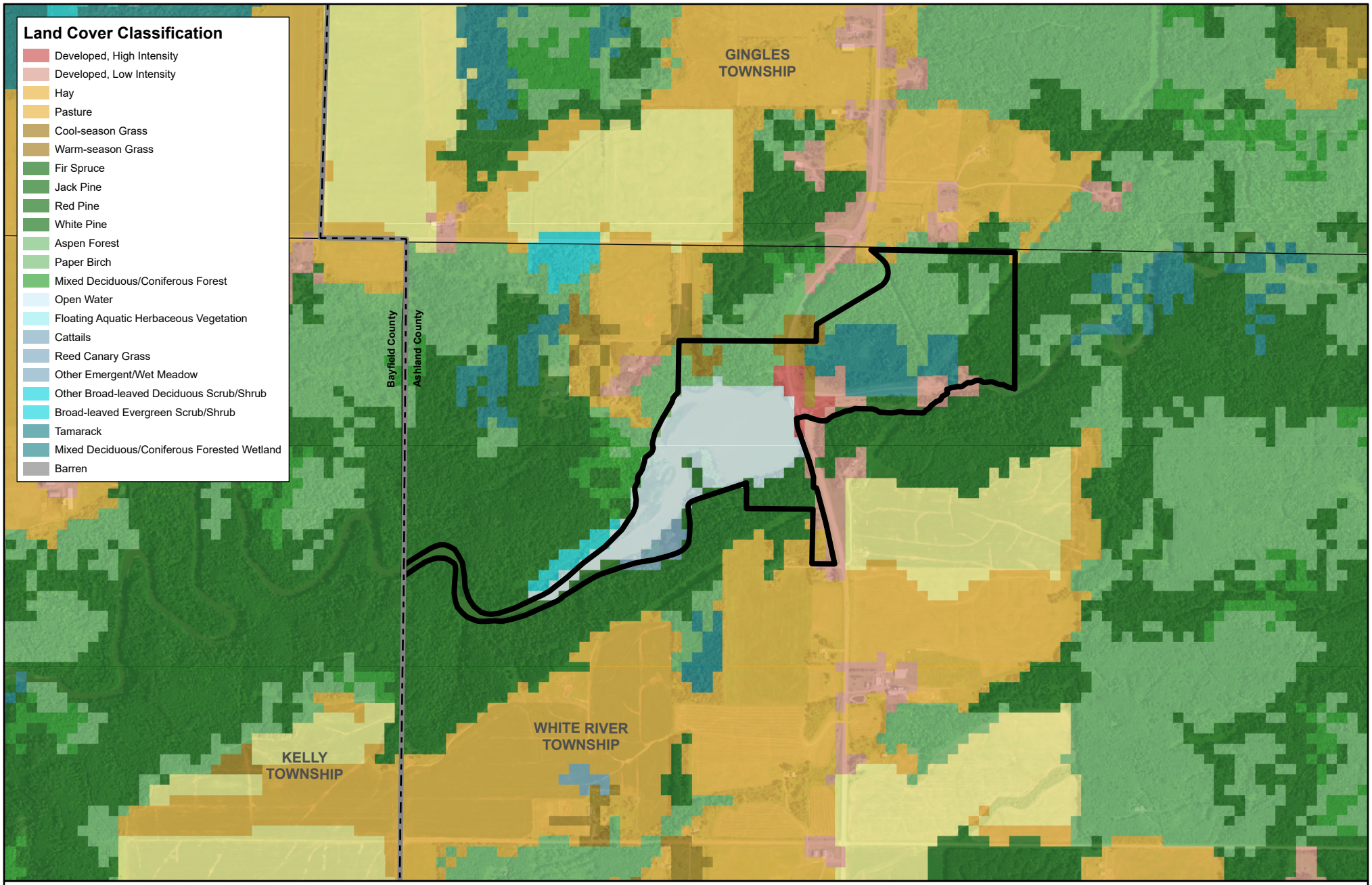
White River Hydroelectric Project
Proposed Project Lands and Inundated Areas

FERC No. 2444

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA.aprx

Source Layer: WI 2022 NAIP (natural color, 0.6-meter resolution)

APPENDIX E-33 White River Project WISCLAND 2 Cover Type Maps



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Current Project Boundary
County Boundary
Township Boundary

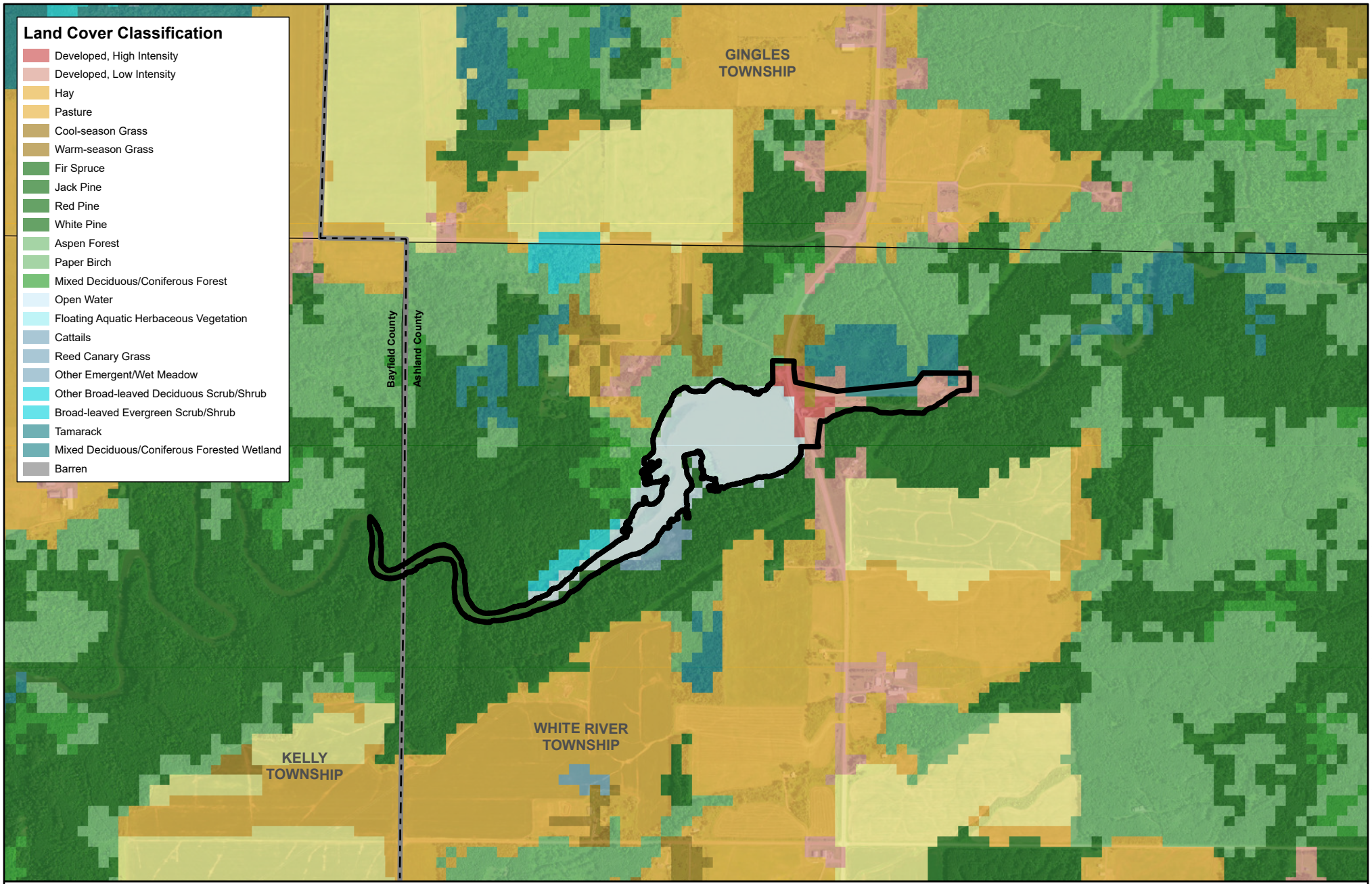
N

0 1,000 2,000 Feet

White River Hydroelectric Project
Major Land Cover in Vicinity of
Current Project Boundary
FERC No. 2444

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA.aprx

Source Layer: Wisconsin Department of Natural Recourses WISCLAND 2019 update, WI 2022 NAIP (natural color, 0.6-meter resolution)



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Mead & Hunt

Proposed Project Boundary
County Boundary
Township Boundary

N

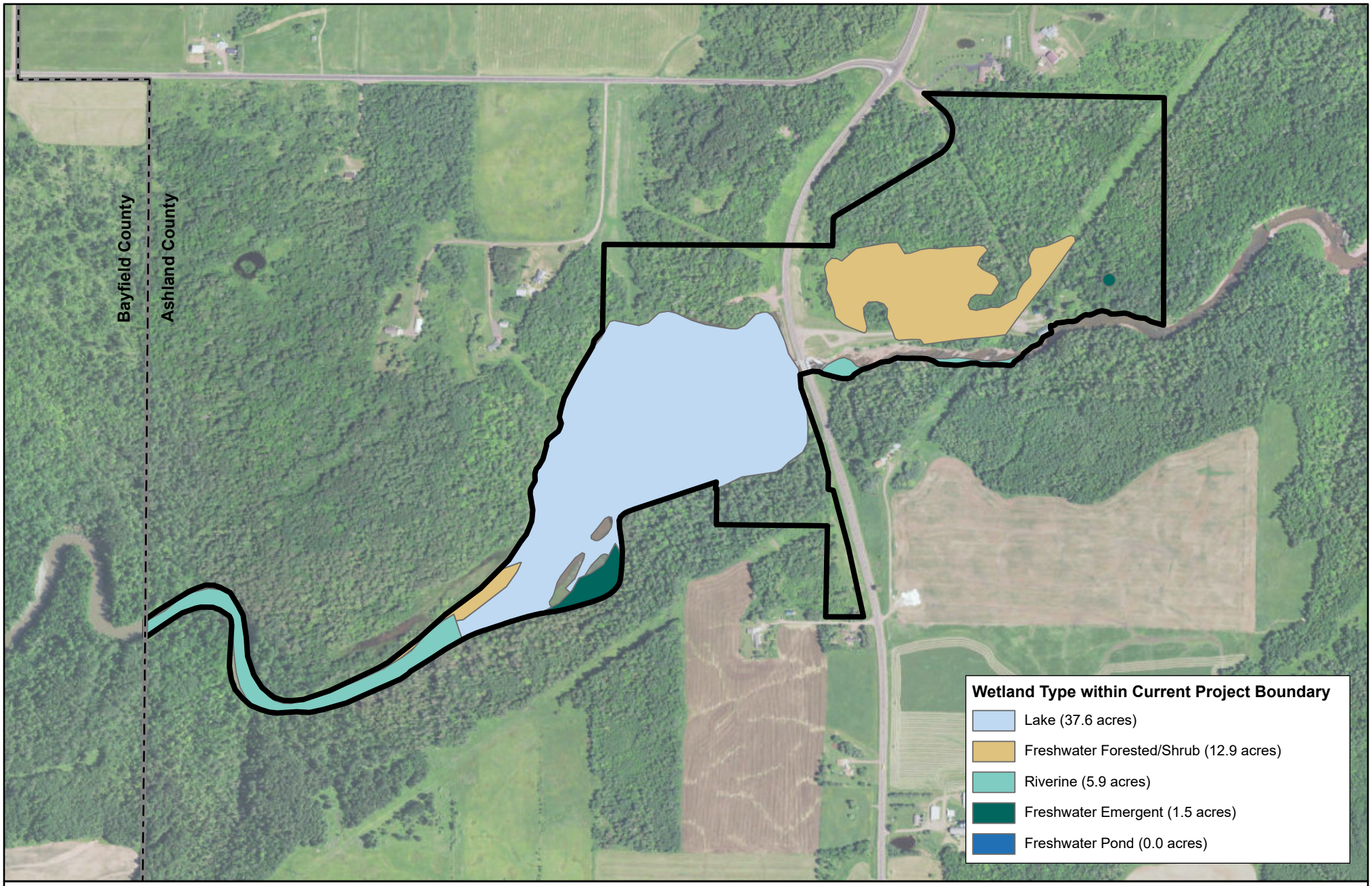
0 1,000 2,000 Feet

White River Hydroelectric Project
Major Land Cover in Vicinity of
Proposed Project Boundary
FERC No. 2444

X:\24001\001\92923.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLA\WhiteRiver_DLA_WISCLANDUSE.aprx

Source Layer: Wisconsin Department of Natural Recourses WISCLAND 2019 update, WI 2022 NAIP (natural color, 0.6-meter resolution)

APPENDIX E-34 Wetlands Within the White River Proposed and Current Project Boundary



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Current Project Boundary
County Boundary

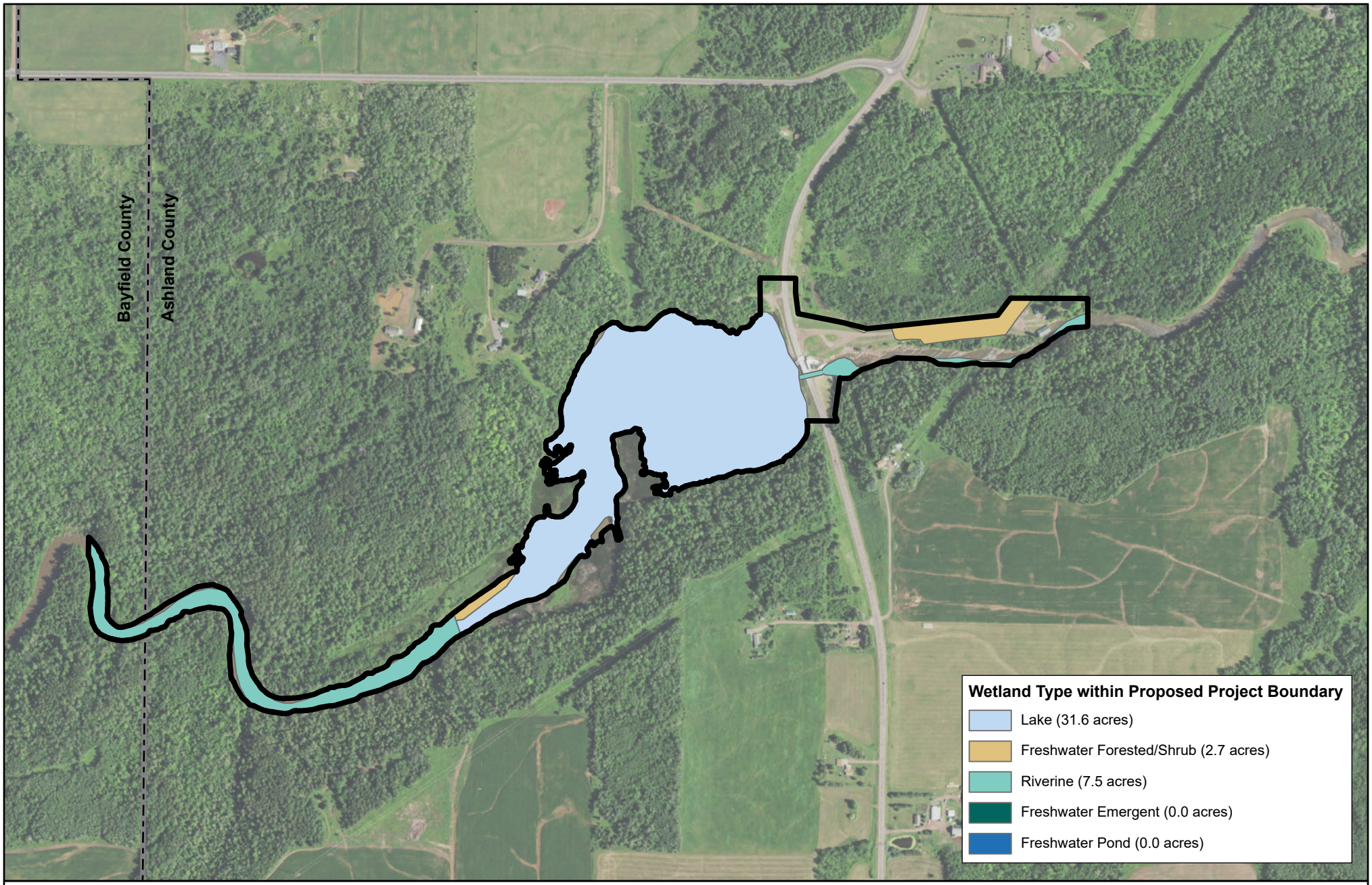
N
0 500 1,000
Feet

White River Hydroelectric Project
Project Vicinity Wetlands

FERC No. 2444

Source Layer:GIS Core Services,WisDOT

X:\240010019292 3.01\TECH\White River\Project Maps\DLA\PRO\WhiteRiver_DLAWhiteRiver_DLA.aprx



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Mead & Hunt

Proposed Project Boundary
County Boundary

Note: the impounded Proposed Project Boundary is established at elevation 711.6 feet NGVD.

N

0 500 1,000
Feet

White River Hydroelectric Project
Project Vicinity Wetlands

FERC No. 2444

Source Layer: WI 2022 NAIP (natural color, 0.6-meter resolution)

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APPENDIX E-35 Wisconsin Construction Site Erosion Control Field Guide


WISCONSIN
CONSTRUCTION SITE
EROSION CONTROL
FIELD GUIDE
NASECA
WISCONSIN

Table of Contents

ACRONYMS

- **WDNR T.S.** Wisconsin Department of Natural Resources Stormwater Management Technical Standard
- **WisDOT PAL** Wisconsin Department of Transportation Product Acceptability List
- **BMP** Best Management Practice

CONTACTS

- **NASECA-Wisconsin**
  P.O. Box 70714 | Madison, WI 53707-0714
  info@nasecawi.org | www.nasecawi.org

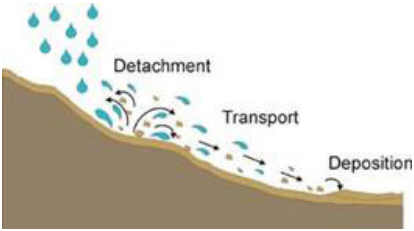
- **Emmons & Olivier Resources**
  119 S. Main Street | Cottage Grove, WI 53527
  bnelson@eorinc.com | www.eorinic.com

ACKNOWLEDGEMENTS

- Wisconsin Department of Natural Resources (WDNR)
- Wisconsin Department of Transportation (WisDOT)
- Dane County Land and Water Resources Department
- Gil Layton, Layton Environmental
- Tony Vandermuss, Capital Area Regional Planning Commission
- U.S. Environmental Protection Agency (EPA)

This guide is current as of October 2, 2019.

Background



As our society has become more environmentally aware, federal, state and local regulatory agencies have recognized the impacts of sediment pollution on our lakes, streams and wetlands and have established rules to reduce those impacts.

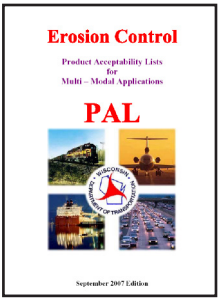
Project owners and contractors are required to meet the standards prescribed in the rules during construction. Consequently, erosion control Best Management Practices (BMPs) have become a standard part of the construction process.

Erosion control BMPs are designed to limit off-site effects of erosion, aid in project construction while minimizing overall cost, and to comply with federal, state, and local laws and regulations.

BMPs can be generally classified into two categories, erosion control and sediment control.

- Erosion Control - Directly protect the disturbed soil surface from erosion. They are the best measure for preventing erosion.
- Sediment Control - Aid in removal of sediments from water after the erosion process has already begun. This is accomplished by using barriers, containments, or other devices to filter or reduce the velocity of the water so soil particles can no longer remain suspended.

This guide is intended to aid designers, inspectors and contractors in selecting and correctly installing BMPs to reduce erosion, by following technical standards developed by the Wisconsin DNR.



WISCONSIN DEPARTMENT OF TRANSPORTATION PRODUCT ACCEPTABILITY LIST (PAL)

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/pal/default.aspx

This list provides guidance in selecting and proper application of erosion and sediment control products. The Product Acceptability List pages are for the guidance of design engineers, technicians, and inspection personnel, municipalities, counties, contractors, and suppliers engaged in bridge and highway design, plan preparation, and construction.

Categories include tackifiers, erosion mats, soil stabilizers, inlet protection, and temporary ditch checks. Projects permitted by the State of Wisconsin shall utilize products listed on the PAL when appropriate.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES STORMWATER CONSTRUCTION AND POST-CONSTRUCTION TECHNICAL STANDARDS

http://dnr.wi.gov/topic/stormwater/standards

Stormwater Construction and Post-Construction Technical Standards are minimum requirements needed to plan, design, install and maintain a wide array of conservation practices aimed at preserving the land and water resources of Wisconsin. The WDNR recommends that these technical standards be used for erosion/sediment control or stormwater management as they have been determined to be adequate and effective to implement the performance standards of subch. III or IV of ch. NR 151 and Trans 401.06, WI Administrative Code.

BMP Matrix

WDNR T.S.	Best Management Practice	Construction		Site Features		
		Summer	Winter	Steep Slopes	Ditches or Channels	Sensitive Features
		May-September	October-April	Slopes >10%	Concentrated Flow	Wetlands, Waterways, Streams
Erosion Control						
1050	Land Application of Additives	OK	OK	OK	✗	✗
1052	Non-Channel Erosion Mat	OK	OK	OK	✗	✗
1053	Channel Erosion Mat	OK	OK	✗	OK	✗
1058	Mulch	OK	OK	OK	✗	✗
1059	Seeding	OK	✗	OK	✗	✗
1067	Temporary Grading Practices	OK	OK	OK	✗	✗
1068	Dust Control	OK	OK	✗	✗	✗

WDNR T.S.	Best Management Practice	Construction		Site Features		
		Summer	Winter	Steep Slopes	Ditches or Channels	Sensitive Features
		May-September	October-April	Slopes >10%	Concentrated Flow	Wetlands, Waterways, Streams
Sediment Control						
1051	Water Application of Additives	OK	OK		OK	OK
1054	Vegetative Buffer	OK		OK		OK
1055	Sediment Bale Barrier	OK	OK	OK		OK
1056	Silt Fence	OK	OK	OK		OK
1057	Trackout Control Pracitices	OK	OK			
1060	Storm Drain Inlet Protection	OK	OK			
1061	Dewatering	OK	OK			
1062	Temporary Ditch Check	OK	OK		OK	OK
1063	Sediment Trap	OK	OK		OK	
1064	Sediment Basin	OK	OK		OK	
1066	Construction Site Diversion	OK	OK	OK	OK	
1069	Turbidity Barrier	OK	OK			OK
1070	Silt Curtain	OK	OK			OK
1071	Temporary Slope Breaks	OK	OK	OK		

Land Application of Additives WDNR T.S. 1050

DEFINITION

The land application of products containing water soluble and non-soluble additives to temporarily reduce erosion.

PURPOSE

To reduce erosion from wind and water on construction sites and agricultural lands until vegetation is established.

CONDITIONS WHERE PRACTICE APPLIES

Intended for direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. Such areas may include agricultural lands where plant residues are inadequate to protect the soil surface and construction sites where land disturbing activities or winter shutdown prevent establishment or maintenance of a cover crop.

This practice is not intended for application to surface waters of the state as defined by WDNR ch. NR 102.

LAND APPLICATION OF ADDITIVES INSTALLATION

Application

- Selected from the approved list in the WisDOT PAL. This product is defined as "Soil Stabilizer, Type B" on the WisDOT PAL.
- Apply additives by the methods and at the rates specified by manufacturer.
- The additive may be used either alone as a temporary stabilization measure or in conjunction with seeding and mulching for permanent restoration.
- Additives may be particularly applicable for temporary stabilization of disturbed areas that will receive intermittent periods of disturbance throughout a construction project.
- May be applied with conventional hydraulic seeding equipment or through dry spreading. Choose application method for uniform coverage and to minimize drift to non-target areas. Prevent over-spray from reaching pavement (pavement becomes slippery).

Restrictions

- Application rates shall not exceed manufacturer's written application rate or WDNR allowable application rate (expressed in lbs/ac).
- Do not use in areas within 30 feet of wetlands, waterways, or channels.
- Use of additives shall be restricted to slopes 3 horizontal : 1 vertical or flatter unless used in conjuction with other surface stabilization methods.

Documentation

- Document and keep with the erosion control plan and inspection notes:
  - » Name of person performing the application;
  - » Date, location of application, and weather conditions;
  - » Type of additive applied (manufacturer, product name, concentration);
  - » Application rate per acre, amount of material used, and method.

INSPECTION AND MAINTENANCE

Reapply after disturbance, large rain events, or where wind/rill erosion is apparent since the last application. May lose effectiveness in 2 months.

Water Application of Additives (WDNR T.S. 1051)

DEFINITION

The application of products containing water-soluble additives to remove suspended solids in sediment control structures.

PURPOSE

To clarify water prior to discharge by settling suspended solids within sediment control structures for construction or post-construction process systems.

CONDITIONS WHERE PRACTICE APPLIES

- Use to improve the sediment removal efficiency of self-contained sediment control structures (such as a detention basin) on a temporary basis for construction sites or, in an emergency, for post-construction sites.
- Do not apply polymers directly to surface waters of the state.
- If used in accordance with the use restriction, polymer must meet an acceptable level of risk such that it can be used without harm to organisms that inhabit or come in contact with the aquatic environment. Every attempt shall be made to eliminate any environmentally toxic chemicals within a polymer mixture, and must be non-combustible.
- Contact WDNR Stormwater Program Coordinator at (608) 266-2621 to obtain current list of products with reviewed toxicity data and allowable application rates.

WATER APPLICATION OF ADDITIVES INSTALLATION

Application

- Maximum application rates in pounds per acre-feet shall be the lesser of WDNR's use restriction multiplied by 1.35 or manufacturer's rate.
- Neither the manufacturer's written application rate recommendations nor the application rate shall exceed the WDNR use restriction.
- The manufacturer or distributor shall provide for the applicator:
  - » Labels affixed to the polymer mixture containers that indicate the recommended application rate and the maximum application rate based on the use restriction;
  - » Product expiration date for the polymer mixture based on product expiration dates of the polymer and written application methods;
  - » Written instructions for safety, storage, and mixing of their product.
- The product must be applied uniformly and in one of the following ways:
  - » Passive Applications: Polymers applied by non-mechanically dosing the sediment laden inflow prior to it entering the impoundment area of the sediment control structure. Manufacturer must base passive application rates on the dissolution rate and/or the dead storage volume of the sediment control structure.
  - » Active or Mechanical Applications: Polymer applied by mechanically or hydraulically mixing directly into a sediment control structure.

Documentation

- » Name of applicator, product type, and method of application;
- » Application rate in pounds per acre-feet of stormwater runoff;
- » Date applied and weather conditions during application; and pH in sediment control structure after application.
- » Contractor shall enter this information into a monitoring log or a project diary and must be made available upon request.

INSPECTION AND MAINTENANCE

Monitor sediment levels on the bottom of the structure to measure the loss of storage capacity due to enhanced sedimentation by the polymer mixture.

Non-Channel Erosion Mat (WDNR T.S. 1052)

DEFINITION

A protective soil cover made of straw, wood, coconut fiber or other suitable plant residue, or plastic fibers formed into a mat, usually with a plastic or biodegradable mesh on one or both sides. Rolled products are available in many varieties and combinations of material and with varying life spans.

PURPOSE

To protect the soil surface from the erosive effect of rainfall and prevent sheet erosion during the establishment of grass or other vegetation, and to reduce soil moisture loss due to evaporation. Applies to both Erosion Control Revegetative Mats (ECRM) and Turf-Reinforcement Mats (TRM).

CONDITIONS WHERE PRACTICE APPLIES

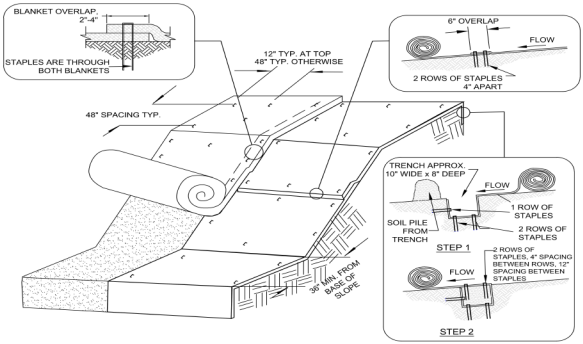
Erosion mats for use on erodible slopes. Not for channel erosion; for channel applications see WDNR T.S. Channel Erosion Mat (1053).

NON-CHANNEL EROSION CONTROL MAT INSTALLATION

- Use only products listed in the WisDOT PAL.
- Erosion mat shall be in firm and continuous contact with the soil and extend upslope one-foot from land disturbance.
- Where possible, use a single roll of EC mat to span the disturbed area.

NON-CHANNEL EROSION CONTROL MAT INSTALLATION

- Staples used for erosion mats shall be 1-2 inch wide, U-shaped, made of No.11 (3.05mm) or larger diameter steel wire, and not less than 6 inches long for firm soils and 12 inches long for loose soils.
- In areas with mowed turf or where animal entrapment is possible, use urban mats. Urban mats and associated anchoring devices shall be selected based upon the WisDOT PAL.
- Erosion mat shall be anchored, overlapped, staked and entrenched per the manufacturer's recommendations.
- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Install additional anchoring in areas of rilling and concentrated flow beneath the mat. If rilling is preventing vegetation establishment, remove erosion mat, regrade, compact, re-seed, and replace the section of mat.

Channel Erosion Mat (WDNR T.S. 1053)

DEFINITION

A protective soil cover of straw, wood, coconut fiber or other suitable plant residue, or plastic fibers formed into a mat, usually with a plastic or biodegradable mesh on one or both sides. Rolled products are available in many varieties and combination of materials and with varying life spans.

PURPOSE

To protect the channel from erosion or act as turf reinforcement during and after the establishment of grass or other vegetation in a channel. Applies to erosion control revegetative mats (ECRM) and turf-reinforcement mats (TRM).

CONDITIONS WHERE PRACTICE APPLIES

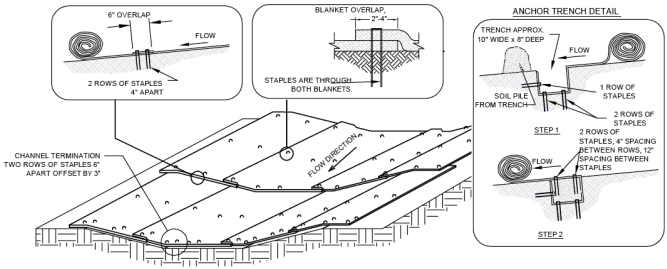
Where runoff channelizes in intermittent flow and vegetation is to be established. Some products may have limited applicability in projects adjacent to navigable waters due to potential wildlife entrapment.

- Use channel erosion mat products identified on the WisDOT PAL.
- Use WisDOT PAL classes and types to select and specify erosion mat.
- Select an erosion mat based on the calculated shear stress, given drainage area characteristics and channel geometry for the design storm depth.
- Select erosion mat that will last until turf grass or other vegetation becomes densely established.

CHANNEL EROSION MAT INSTALLATION

- Install and anchor erosion mat in accordance with manufacturer's instructions.
- At time of installation, retain material labels and manufacturer's installation instructions until the site has been stabilized.
- Install ECRMs after topsoil is placed and seeding is complete.
- Install TRMs in conjunction with placement of topsoil, followed by ECRM installation.
- Install erosion mat so that it bears completely on the soil surface.
- Use staples that are at least 6 inches long.

- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Install additional anchoring in areas of rilling and concentrated flow beneath the mat. If rilling is preventing vegetation establishment, remove erosion mat, regrade, compact, re-seed, and replace the section of mat.

Vegetative Buffer (WDNR T.S. 1054)

DEFINITION

An area of dense vegetation intended to slow runoff and trap sediment. Vegetative buffers are commonly referred to as filter or buffer strips.

PURPOSE

To remove sediment in sheet flow by velocity reduction.

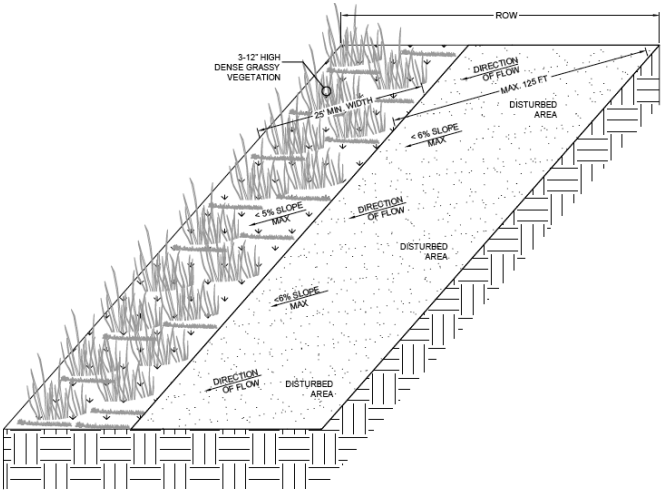
CONDITIONS WHERE PRACTICE APPLIES

Areas where sediment delivery is in the form of sheet and rill erosion from disturbed areas.

VEGETATIVE BUFFER INSTALLATION

- Shall consist of a dense stand of existing grassy vegetation or vegetation established during the project provided sufficient vegetative cover is established prior to land disturbing activities.
- Must be clearly marked as area of no disturbance, including vehicle traffic.
- Vegetative buffers are only effective if sheet flow conditions are present.

- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Look for improper distribution of flows, sediment accumulation, and rill erosion. If the vegetative buffer becomes sediment covered, shows rill erosion, or is ineffective, other practices must be implemented.

Sediment Bale Barrier (WDNR T.S. 1055)

DEFINITION

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales, hay bales or equivalent material used to intercept sediment-laden sheet flow from small drainage areas of disturbed soil.

PURPOSE

To reduce slope length of the disturbed area and to intercept and retain transported sediment from disturbed areas.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to the following applications where:

- Erosion occurs in the form of sheet and rill erosion. There is no concentration of water flowing to the barrier (channel erosion).
- Where adjacent areas need protection from sediment-laden runoff.
- Effectiveness is required for less than 3 months.
- Conditions allow for the bales to be properly entrenched and staked as outlined in Criteria Section V of WDNR T.S. Sediment Bale Barrier (1055).

Under no circumstance shall products be used in the following applications:

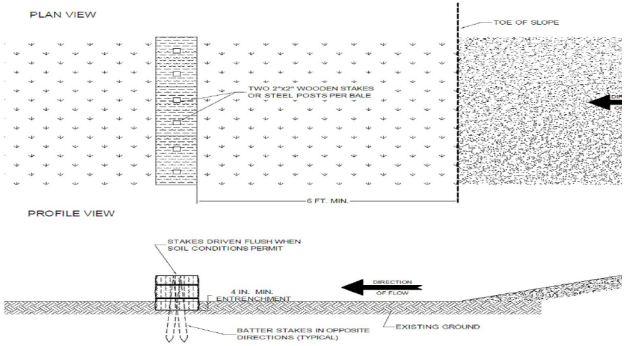
- Below the ordinary high watermark or placed perpendicular to flow in streams, swales, ditches or any place where flow is concentrated.
- Where the maximum gradient upslope of the fence is >50% (2:1).

SEDIMENT BALE BARRIER INSTALLATION

- Install materials per manufacturer's recommendations.
- When joints are necessary, overlap and secure to minimize potential for concentrated flow. Ends should tie into the slope to prevent erosion from concentrated flow around the ends.
- Should be used in conjunction with permanent restoration practices.
- When not used in conjunction with other practices, install spacing per:

Slope	Spacing
< 2 %	100 feet
2 - 5 %	75 feet
5 - 10 %	50 feet

- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Look for indicators that water is eroding around the ends, undercutting the barrier, or erosion is occurring downslope. Remove sediment from behind barrier when reaching 1/2 the height. Remove when permanent vegetation is established.

Silt Fence (WDNR T.S. 1056)

DEFINITION

Silt fence is a temporary sediment barrier of entrenched permeable geotextile fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil to create ponding.

PURPOSE

Reduce slope length and intercept and retain sediment from disturbed areas.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to the following applications where:

- Erosion occurs in the form of sheet and rill erosion. There is no concentration of water flowing to the barrier (channel erosion).
- Where adjacent areas need protection from sediment-laden runoff.
- Where effectiveness is required for one year or less.
- Where conditions allow for silt fence to be properly entrenched and staked as outlined in Criteria Section V of WDNR T.S. Silt Fence (1056).

Under no circumstance shall products be used in the following applications:

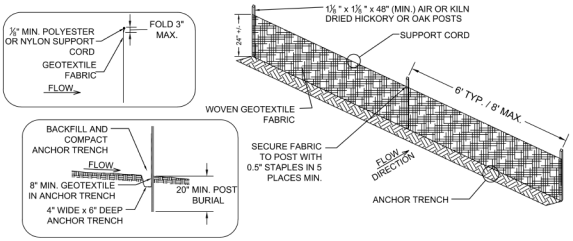
- Below the ordinary high watermark or placed perpendicular to flow in streams, swales, ditches or any place where flow is concentrated.
- Where the maximum gradient upslope of the fence is >50% (2:1).
- Lettering on the fence is not permissible on WisDOT projects.
- Must have support cord.

SILT FENCE INSTALLATION

- Construct in an arc with the ends pointing upslope to avoid erosion around ends of the fence. Best installation method is static slicing. Failure to properly anchor silt fence could result in water and sediment release beneath the silt fence. It is critical to backfill and compact the trench.
- Construct from a continuous roll of geotextile to avoid joints. Where joints are necessary, overlap to the next post or wrap adjoining fabrics together around the joint post and tightly fasten.
- When not used in conjunction with other practices and when using for slope interruption, install spacing per:

Slope	Fence Spacing
< 2 %	100 feet
2 - 5 %	75 feet
5 - 10 %	50 feet
10 - 33 %	25 feet
> 33 %	20 feet

- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Look for indicators that water is eroding around the ends, undercutting the barrier, or erosion downslope. Remove sediment behind silt fence when reaching 1/2 the height. Remove when permanent vegetation is established.

Trackout Control Practices (WDNR T.S. 1057)

DEFINITION

A practice or combination of practices used to prevent, reduce, or mitigate trackout of sediment.

GENERAL CRITERIA

Trackout is best managed by implementing controls in the order below:

1. Prevent trackout with stabilized work surfaces and reduced vehicle contact with soil;
2. Reduce trackout with stone tracking pad, manufactured trackout control devices, or tire washing;
3. Mitigate trackout with street cleaning.

INSTALLATION

Stabilized Work Surfaces

- Install aggregate, concrete, asphalt, manufactured mats, or other material in work areas and haul roads to minimize contact of vehicles with exposed soils and standing water.
- Stabilized work surfaces may be used as a stand-alone practice if vehicles leaving the site are restricted to the stabilized surface and the surface is properly maintained.

Stone Tracking Pads

- Install the stone tracking pad to ensure vehicles that drive over exposed soil exit along the full length of the pad.
- Use hard, durable, angular stone or recycled concrete meeting the gradation in Table 1. Driving surface shall be at least 12 feet wide, 1 foot thick and 50 feet long.
- Where warranted due to soil type or high groundwater, underlay the stone tracking pad with geotextile fabric to minimize migration of underlying soil into the stone. Select fabric type based on soil conditions and vehicle loading.
- Rocks lodged between the tires of dual wheel vehicles shall be removed prior to leaving the construction site.

Table 1

Sieve Size	% passing by weight
3"	100
2-1/2"	90-100
1-1/2"	25-60
3/4"	0-20
3/8"	0-5

Manufactured Trackout Control Devices

- Install the manufactured trackout control device on a surface capable of supporting anticipated loads per manufacturer recommendations.
- Provide a minimum device length of 32 feet for stand-alone installations.
- Add length if needed to reduce trackout in adverse conditions.

Tire Washing

- Shall be located on site in an area that is stabilized and drains into suitable sediment trapping or settling device;
- Monitor tire washing station for sediment accumulation, clogged hoses, appropriate water levels, and effectiveness.
- For manufactured tire washing stations, operate per manufacturer's recommendations.

Street/Pavement Cleaning

- Scrape and/or sweep pavements and gutters until a shovel-clean or broom-clean condition is obtained. Repeat as needed to maintain public safety and reduce sediment delivery to drainage infrastructure or water resources, and at the end of each work day.

Mulch (WDNR T.S. 1058)

DEFINITION

Mulching is the application of organic material to the soil surface to protect it from raindrop impact and overland flow. Mulch covers the soil and absorbs the erosive impact of rainfall and reduces the flow velocity of runoff.

PURPOSE

To reduce soil erosion, aid in seed germination and establish plant cover or conserve soil moisture.

CONDITIONS WHERE PRACTICE APPLIES

May be applied on exposed soils as a temporary control where soil grading or landscaping has taken place or in conjunction with temporary or permanent seeding. Mulching is not appropriate in areas of concentrated flow.

ACCEPTABLE MULCH TYPES

- Straw or hay in air-dry condition, wood excelsior fiber or wood chips, or other suitable material of a similar nature that the engineer approves. Use of marsh hay will not be accepted. All mulch material shall be free of noxious weeds and objectionable foreign matter.
- Wood chips or wood bark should be used for temporary stabilization only and should not be used in conjunction with seeding.

MULCH INSTALLATION

Prepare area to remove gullies/rills. If seeding, apply prior to mulch.

Wood Chips or Bark Mulch

- Apply at uniform rate of 9 tons/acre. Mulch should cover a minimum of 80% of the soil surface with an applied thickness of 0.5 - 1.5 inches.

Straw Mulch

- Apply at a uniform rate of 2 tons/acre. Mulch should cover a minimum of 70% of the soil surface with an applied thickness of 0.5 - 1.5 inches.
- If straw mulch is used without seeding, apply at a uniform rate of 3 tons/acre. Mulch should cover a minimum of 80% of the soil surface with an applied thickness of 1.5 - 3.0 inches.
- Anchor by crimping or with a tackifier.

Straw Mulch Crimping

- Just after spreading, anchor mulch using a crimper or equivalent device consisting of a series of dull flat discs with notched edges spaced approximately 8 inches apart to impress mulch in the soil to a depth of 1 - 3 inches.

Straw Mulch Tackifiers

- Select from the approved list in the WisDOT PAL. Apply at a uniform rate.
- Spray tackifier at the same time as the mulch application or just after. Do not spray during conditions preventing proper placement of adhesive.
- Apply at manufacturer's recommended rate or at the rate per acre specified below, whichever is greater:
    - » Latex base: mix 15 gallons adhesive and a minimum of 250 pounds recycled newsprint (pulp) as tracer with 375 gallons water;
    - » Guar gum: mix 50 pounds dry adhesive and a minimum of 250 pounds recycled newsprint (pulp) as tracer with 1,300 gallons water;
    - » Other tackifiers: mix 100 pounds dry adhesive and a minimum of 250 pounds recycled newsprint (pulp) as tracer with 1,300 gallons water.

INSPECTION AND MAINTENANCE

Reapply as needed.

Seeding (WDNR T.S. 1059)

DEFINITION

Planting seed to establish temporary/permanent vegetation for erosion control.

PURPOSE

Temporary Seeding reduces runoff and erosion until permanent vegetation or other erosion control practices can be established.

Permanent Seeding permanently stabilizes areas of exposed soil.

Nurse Crop is seeded with a permanent mix to provide fast-growing cover to protect the soil surface until permanent vegetation becomes established.

CONDITIONS WHERE PRACTICE APPLIES

Areas of exposed soil where the establishment of vegetation is desired.

- Temporary seeding: disturbed areas that will not be brought to final grade or on which land-disturbing activities will not be performed for a period greater than 30 days and requires vegetative cover for less than one year.
- Permanent seeding: where perennial vegetative cover is needed.

SEED

- Seed shall conform to WI statutes and WI Administrative Code ch. ATCP 20 regarding noxious weed seed content and labeling.
- Use seed within one year of test date appearing on the label.
- Store seed to protect it from damage by heat, moisture, rodents. Discard and replace previously tested and accepted seed that becomes damaged.

SEEDING INSTALLATION

Seedbed Preparation

- Permanent seeding needs a seedbed of at least 4 inches of loose topsoil.
- Necessity of fertilizer application should be based on soil testing results. Prior to seeding, work the area being seeded with appropriate equipment to prepare a tilled fine, but firm, seedbed. Remove rocks, twigs, foreign materials, and dirt clods >2 inches diameter that cannot be broken down.

Sowing

- Apply uniformly over the seedbed at the correct seeding rate. Appropriate seed mixes should be lightly incorporated into the seedbed.

DOT Seed Mixture	Sowing Rate [pounds/1,000 square feet]
10	1.5
20	3
30	2
40	2
60	equivalent seeding rate of 1.5
70 and 70A	0.4
75	0.7
80	0.8
Temporary Seeding	3
Nurse Crop Seeding	0.8

- Seed when soil temperatures remain consistently above 53° F. Avoid seeding during periods where seedlings could be damaged or killed by frost (usually late September to early November).
- Dormant seed after November 1. Do not sow seeds over snow cover.

Seed Protection

- Protect seed using mulch (WDNR T.S. 1058) or erosion mat (WDNR T.S. 1052). Limit vehicle traffic in areas that have been permanently seeded.

INSPECTION AND MAINTENANCE

Inspect per permit requirements. Verify seed germination and vegetation establishment. Maintenance includes reapplying mulch and matting, irrigating, regrading, and reseeding.

Storm Drain Inlet Protection (WDNR T.S. 1060)

DEFINITION

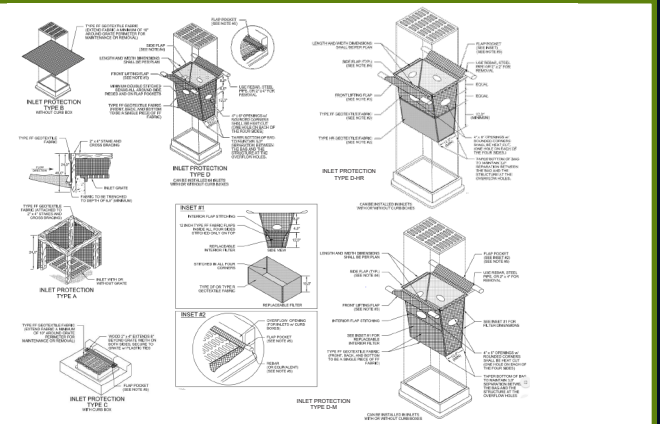
A temporary device installed around a storm drain inlet, drop inlet or curb inlet.

PURPOSE

To minimize sediment from entering storm drainage systems where the contributing drainage area is temporarily disturbed.

STORM DRAIN INLET PROTECTION GENERAL CRITERIA

- Inlet protection devices are for drainage areas of one acre or less.
- Runoff from areas >1 acre should be routed through a properly designed sediment trapping or settling practice upstream of the inlet.
- Inlet protection devices shall not interfere with the flow of traffic, create a safety hazard, or cause property damage.
- All devices shall have provisions such as overflow holes or “emergency spillways” to safely pass water if the device becomes clogged.
- No gaps shall be left in the material that would allow the flow of water to bypass the inlet protection device, except for overflow holes.
- All fabrics used as part of an inlet protection device must be selected from the list of Geotextile Fabric, Type FF in the WisDOT PAL. For Types D-M and D-HR inlet devices select Type F, R, DF or HR fabric inserts based on soil type.



TYPES B AND C

- Include a method of maintenance, using a sewn flap, hand holds, or other method to prevent sediment from entering the inlet.
- An additional 18 inches of fabric is wrapped around the wood and secured with staples. Wood shall not block the height of the curb box.

TYPE D, D-HR, & D-M

- Side flaps shall be a maximum of 2 inches long.
- Install >3 inch side clearance between the inlet walls and bag, measured at the bottom of the overflowing holes. Where necessary cinch the bag to achieve the 3 inch clearance. Place ties <4 inches from bottom of the bag.

INSPECTION AND MAINTENANCE

When removing or maintaining inlet protection, trapped sediment must not fall into the inlet. Remove fallen sediment immediately. Maintain when device is no longer functioning and dispose of sediment properly.

Dewatering (WDNR T.S. 1061)

DEFINITION

A practice or combination of practices that are used to prevent or reduce the discharge of sediment-laden water from dewatering operations.

PURPOSE

Land-disturbing construction activity can create conditions where runoff and/or groundwater accumulates in ponds, pits, trenches or other excavations and needs to be removed by pumping or other means of dewatering. The purpose of this standard is to identify common methods which may be used to prevent or reduce the discharge of sediment-laden water from dewatering operations.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies where sediment-laden water needs to be removed by pumping or other means for construction operations or maintenance activities.

Dewatering practices shall meet criteria in the WDNR T.S. Dewatering (1061) Dewatering Practice Selection Matrix.

This practice does not apply to water being discharged directly to groundwater or karst features (see NR140) or well dewatering systems (see NR 812).

CONSIDERATIONS

- Municipal storm drainage system may need cleaning prior to/after discharging to prevent scouring solids from the drainage system.
- Do not use geotextile bags when discharging to Exceptional Resource Waters, Outstanding Resource Waters, waterbodies supporting cold water communities, trout streams, or susceptible wetlands.
- Pressurized filtration is most efficient for removing fine sediments.
- Portable sediment tanks may be appropriate when other sediment trapping practices cannot be installed.
- Filtration is not an efficient treatment of water with heavy sediment loads. Use a settling tank or sand filter as pretreatment when possible.
- Practices may need to be combined to achieve intended results.

DEWATERING INSTALLATION

- Select practices based on soil texture at the dewatering site with consideration of pumping or flow rates, volumes and device effectiveness.
- WDNR T.S. Dewatering (1061) Dewatering Practice Selection Matrix illustrates acceptable dewatering options and their effective ranges.
- Practices selected that are not on the matrix must provide an equivalent level of control, with justification provided to the reviewing authority.

INSPECTION AND MAINTENANCE

- If the dewatering effluent is discolored, has an odor, an oily sheen, or other toxins are present, notify the DNR immediately:
  - » **24 Hours Spills Reporting Hotline 1-800-943-0003**
- Remove sediment from devices. Properly dispose of all sediment collected.
- Document test results on a daily log and keep on site:
  - » Discharge duration and specified pumping rate;
  - » Observed water table at time of dewatering;
  - » If used, type and amount of chemical used for pH adjustment;
  - » If used, type and amount of polymer used for treatment;
  - » Maintenance activities.

DEWATERING PRACTICE SELECTION MATRIX Type of Device	Soil and Particle Size Classification		
	Coarse to Medium Sand, Loamy Sands, and Sandy Loams	Medium to Fine Loams, Silt Loams, and Silts	Fine to Very Fine Clay Loams, Silty Clays, and Clay
Clay Geotextile Bags			
Type I			
Type II			
Gravity Based Settling			
Sediment Tank (Portable)			
Sediment Trap (Temporary)			
Sediment Basin (Temporary)			
Wet Detention Basin (Permanent)			
Passive Filtration			
Filter Tank (Portable)			
Filter Basin			
Vegetative Filter			

Effective range of device:
Device applicable, may not be cost effective:
Effective range with addition of polymer:

(1) The effectiveness of many practices can be enhanced through the use of polymer mixture.
(2) Soil classification shall be done in accordance to an accepted method (i.e. USDA, AASHTO)

DEWATERING PRACTICE SELECTION MATRIX **Type of Device**	**Soil and Particle Size Classification**		
	Coarse to Medium Sand, Loamy Sands, and Sandy Loams	Medium to Fine Loams, Silt Loams, and Silts	Fine to Very Fine Clay Loams, Silty Clays, and Clay
Pressurized Filtration			
Portable Sand Filter			
Wound Cartridge Units			
Membranes and Micro-filtration			
Other Practices			
Sanitary Sewer Discharge			
Pump Truck			
Alternative Method	Discuss with regulatory authority.		

Effective range of device:
Device applicable, may not be cost effective:
Effective range with addition of polymer:

(1) The effectiveness of many practices can be enhanced through the use of polymer mixture.
(2) Soil classification shall be done in accordance to an accepted method (i.e. USDA, AASHTO)

Ditch Check (WDNR T.S. 1062)

DEFINITION

A temporary dam constructed across a swale, drainage ditch, channel or other area of concentrated flow to reduce the velocity of water. Ditch checks can be constructed out of stone, a double row of straw bales or from manufactured products found on the WisDOT PAL.

PURPOSE

To reduce flow velocity and to pond water, thereby reducing active channel erosion and promoting settling of suspended solids behind the ditch check.

GENERAL CRITERIA

- Ditch checks shall have a minimum height of 10 inches after installation.
- Ditch checks shall not cause ponding that adversely impact or damage adjacent areas.
- Design and install ditch checks to be capable of withstanding anticipated flow, volume and velocity.
- Do not use silt fencing or single rows of straw bales as ditch checks.
- Under no circumstance shall ditch checks be placed in intermittent or perennial stream without permission from WDNR. This practice may not be substituted for sediment control measures such as sediment basins.
- Do not use steel posts or rods to stake ditch checks to avoid safety hazards.

DESIGN CRITERIA

Use the following equation to calculate ditch check spacing in channels:

L = H / S

Where:

L = distance between ditch checks, in feet

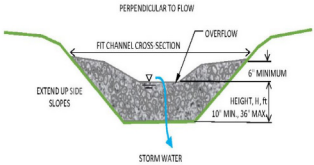
H = height of the ditch check measured from the ditch check overflow invert to the channel bottom on the downslope side of the ditch check, in feet.

S = longitudinal slope of the channel in decimal form (e.g. 2% = 0.02)

MANUFACTURED DITCH CHECKS

- Use products identified on the WisDOT PAL
- Shall be installed in accordance with manufacturer's recommendations
- Entrench manufactured products at least 2 inches or install over erosion matting

STONE DITCH CHECKS



Shall have a minimum top width of 2-ft with a maximum slope of 2:1 on the upslope and downslope sides. Stone shall meet any of the following criteria:

1. Well-graded angular stone with a D_{50} of 3 inches or greater with no more than 5% passing the #4 sieve.
2. 1-foot layer of 1-inch (#2) washed stone over 3 to 6-inch clear stone.
3. Angular stone meeting the gradation for WisDOT Specification 312 select crush or local equivalent.

Stone ditch checks may be constructed using bags or socks filled with stone.

INSPECTION AND MAINTENANCE

Look for indicators that water is eroding around the ends, undercutting, or erosion is occurring downslope. Remove sediment from behind ditch check when reaching 1/2 the height. Remove when channel permanent vegetation is established, unless part of a permanent plan.

Sediment Trap (WDNR T.S. 1063)

DEFINITION

A temporary sediment control device formed by excavation and/or embankment to intercept sediment-laden runoff and to retain the sediment.

PURPOSE

To detain sediment-laden runoff from disturbed areas for sufficient time to allow the majority of the sediment to settle out.

CONDITIONS WHERE PRACTICE APPLIES

- Areas of concentrated flow or points of discharge during construction activities. Construct sediment traps at locations accessible for clean out.
- Sediment traps are designed to be in place until the contributory drainage area has been stabilized.
- The contributory drainage area shall be a maximum of five acres. For concentrated flow areas smaller than one acre, ditch checks may be installed; refer to WDNR T.S. Ditch Check (1062).
- For larger drainage areas and/or for sediment basins requiring an engineered outlet structure refer to WDNR T.S. Sediment Basin (1064) or Wet Detention Basin (1001).

SEDIMENT TRAP CRITERIA

Timing

- Constructed prior to disturbance of up-slope areas and placed so they function during all phases of construction and in locations where runoff from disturbed areas can be diverted into the traps.
- Remove and stabilize the sediment trap after the disturbed area draining to sediment trap is stabilized.

Sizing Criteria

- Properly sized sediment traps are relatively effective at trapping medium and coarse-grained particles.
- To effectively trap fine-grained particles, the sediment trap must employ a large surface area or polymers.
- See WDNR T.S. Sediment Trap (1063) for specific design criteria. Based on:
  - » Surface area;
  - » Depth;
  - » Shape;
  - » Side slopes.

Embankments

- Not to exceed five feet in height measured from the downstream toe of the embankment to the top of the embankment. Construct with a minimum top width of four feet, and side slopes of 2:1 or flatter.
- Earthen embankments shall be compacted.
- Where sediment traps are employed as a perimeter control, the embankments shall have stabilization practices in place prior to receiving runoff.

Outlet

- Need both a principal outlet and emergency spillway and shall meet WDNR T.S. Sediment Trap (1063) design criteria.

INSPECTION AND MAINTENANCE

Remove and properly dispose of sediment deposits when it accumulates to a depth of one foot. Clean outlet when clogged.

Sediment Basin (WDNR T.S. 1064)

DEFINITION

A temporary or permanent device constructed with an engineered outlet, formed by excavation or embankment to intercept sediment-laden runoff and retain sediment.

PURPOSE

Detain sediment-laden runoff from disturbed areas for sufficient time to allow the majority of the sediment to settle out.

CONDITIONS WHERE PRACTICE APPLIES

- Utilize in areas of concentrated flow or points of discharge during construction activities. Construct at locations accessible for clean out.
- Site conditions must allow for runoff to be directed into the basin.
- Sediment basins are designed to be in place until the contributory drainage area has been stabilized. Temporary sediment basins serve drainage areas <100 acres (other practices are often more economical).
- For drainage areas <5 acres, sediment traps or ditch checks may be applicable; for design criteria refer to WDNR T.S. Sediment Trap (1063) or Ditch Check (1062). Design to WDNR T.S. Wet Detention Basin (1001) when a permanent stormwater basin is required.
- Minimum standards for design, installation and performance requirements are deemed 80% effective by design in trapping sediment.

SEDIMENT BASIN CRITERIA

Timing

- Construct prior to disturbance and place to function during all phases of construction, and in locations where runoff can be diverted into the basin.

Sizing Criteria

- Specific trapping efficiency varies based on the surface area and the particle size distribution of the sediment entering the device.
- Permanent sediment basins must be designed by an engineer.
- See WDNR T.S. Sediment Basin (1064) for specific design criteria. Based on:
  - » Treatment surface area and depth below treatment surface area;
  - » Active storage volume and shape.

Embankments

- Design earthen embankments to address potential risk and structural integrity issues such as seepage and saturation, and meet WDNR T.S. Sediment Basin (1064) design criteria.

Outlet

- Need both a principal outlet and an overflow spillway meeting WDNR T.S. Sediment Basin (1064) design criteria.

Inlet Protection

- Designed to prevent scour and reduce velocities during peak flows.
- Possible design options include flow diffusion, plunge pools, directional berms, baffles, or other energy dissipation structures.

Location

- Located to provide access for cleanout and disposal of trapped sediment.

Removal

- After the contributing drainage area has been stabilized, if temporary.
- Complete final grading and restoration according to the site plans. If standing water needs to be removed see WDNR T.S. Dewatering (1061).

INSPECTION AND MAINTENANCE

Remove and properly dispose of sediment to maintain three foot depth of the treatment surface area. Clean outlet when clogged.

Construction Site Diversion (WDNR T.S. 1066)

DEFINITION

A temporary berm or channel constructed across a slope to collect and divert runoff.

PURPOSE

To intercept, divert, and safely convey runoff at construction sites in order to divert clean water away from disturbed areas, or redirect sediment laden waters to an appropriate sediment control facility.

CONDITIONS WHERE PRACTICE APPLIES

- Where temporary surface water runoff control or management is needed.
- Locations and conditions include:
  - » Above disturbed areas, to limit runoff onto the site;
  - » Across slopes to reduce slope length;
  - » Below slopes to divert excess runoff to stabilized outlets;
  - » To divert sediment-laden water to sediment control facilities;
  - » At or near the perimeter of the construction area to keep sediment from leaving the site.
- Does not pertain to permanent diversions. Refer to appropriate design criteria and local regulations when designing permanent diversions.

CONSTRUCTION SITE DIVERSION INSTALLATION

- Shall have stable side slopes and shall not be overtopped during a 2-year frequency, 24-hour duration storm.
- The minimum berm cross section shall be as follows:
  - » Side slopes of 2:1 (horizontal:vertical) or flatter;
  - » Top width of two feet;
  - » Berm height of 1.5 feet.
- Sediment-laden runoff from disturbed areas shall be diverted into a sediment control practice. For typical sediment control practices see WDNR T.S. Sediment Trap (1063) or Sediment Basin (1065) for design criteria.
- When diverting clean water, the diversion channel and its outfall shall be immediately stabilized for the 2-year frequency, 24-hour duration storm.
- Build and stabilize clean water diversions before initiating down slope land-disturbing activities.
- Diversions shall be protected from damage by construction activities.
- At all points where diversion berms or channels will be crossed by construction equipment, the diversion shall be stabilized or shaped appropriately.
- Temporary culverts of adequate capacity may be used.
- For diversions that are to serve longer than 30 days, the side slopes including the ridge, and down slope side of the diversion shall be stabilized as soon as they are constructed.
- For diversions serving less than 30 days, the down slope side of the diversion shall be stabilized as soon as constructed.
- The diversion channel should be stabilized (i.e. erosion mat) or an additive sediment control practice, such as ditch checks, shall be installed.

INSPECTION AND MAINTENANCE

Remove sediment from behind diversion berm when reaching 1/2 the height.

Grading Practices for Erosion Ctrl. (WDNR T.S. 1067)

DEFINITION

Temporary grading practices used to minimize construction site erosion. These practices include, but are not limited to surface roughening (directional tracking and tillage) and temporary ditch sumps.

PURPOSE

To minimize erosion and sediment transport during grading operations on construction sites.

CONDITIONS WHERE PRACTICE APPLIES

Where land disturbing activities occur on construction sites, to be used in conjunction with other erosion control practices.

TEMPORARY GRADING PRACTICES INSTALLATION

- These interim practices may be employed in addition to the approved grading plan to reduce erosion and sediment transport.

Surface Roughening

- Abrading the soil surface with horizontal ridges and depressions across the slope to reduce runoff velocities.
    - » Directional tracking: the process of creating ridges with tracked vehicles by driving up and down unvegetated slopes, used for short durations on sites actively being graded. Use in conjunction with other practices, and place at the end of each workday;
    - » Tillage: utilizing conventional tillage equipment to create a series of ridges and furrows on the contour no more than 15 inches apart.

Temporary Ditch Sump

- » Temporary ditch sumps are ½ to 5 cubic yard excavations made in a drainageway during earthmoving operations. Their purpose is to slow and pond runoff during the time that drainageways are being graded;
- » Place sumps prior to anticipated rain events;
- » Construction involves excavating sumps in the rough ditch grade, and using the excavated material to form a dike on the downstream side of the sump;
- » Temporary ditch sumps are not effective perimeter controls. Utilize other sediment control practices prior to channels discharging into public waterways.

INSPECTION AND MAINTENANCE

Inspect and repair/reinstall after every runoff event.

Dust Control (WDNR T.S. 1068)

DEFINITION

Dust control includes practices used to reduce or prevent the surface and air transport of dust during construction. Includes minimization of soil disturbance, applying mulch and establishing vegetation, water spraying, surface roughening, applying polymers, spray-on tackifiers, chlorides, and barriers.

PURPOSE

- Reduce wind erosion and dust.
- Minimize deposition of dust and wind transported soils into water bodies through runoff or wind action.
- Reduce respiratory problems.
- Minimize low visibility conditions caused by airborne dust.

CONDITIONS WHERE PRACTICE APPLIES

At any construction site, but is particularly important for sites with dry exposed soils which may be exposed to wind or vehicular traffic.

DUST CONTROL INSTALLATION

- Implementation limits the area exposed for dust generation.
- Asphalt and petroleum based products cannot be used.

Mulch and Vegetation

- Mulch or seed and mulch may be applied to protect exposed soil from both wind and water erosion. Refer to WDNR T.S. Mulching (1058) and Seeding (1059) for criteria.

Water

- Water until the surface is wet and repeat as needed, applied at rates so that runoff does not occur. Treated soil surfaces that receive vehicle traffic require a stone tracking pad or tire washing at all point of egress. Refer to WDNR T.S. Trackout Control Practices (1057) for criteria.

Tillage

- Performed with chisel type plows on exposed soils, beginning on the windward side of the site. Only applicable to flat areas.

Additives

- Can be effective for areas that do not receive vehicle traffic. Dry applied additives must be initially watered for activation to be effective for dust control. Refer to WDNR T.S. Land Applied Additives for Erosion Control (1050) for criteria.

Tackifiers and Soil Stabilizers Type A

- Products must be selected from and installed at rates conforming to the WisDOT PAL. Example products include Latex-based and Guar Gum.

Chlorides

- Apply according to the Wis DOT Standard Specifications for Highway and Bridge Construction.

Barriers

- Place barriers at right angles to prevailing wind currents at intervals of about 15 times the barrier height. Solid board fences, snow fences, burlap fences, crate walls, bales of hay and similar material can be used to control air currents and blown soil.

INSPECTION AND MAINTENANCE

Inspect daily at a minimum.

Turbidity Barriers (WDNR T.S. 1069)

DEFINITION

A temporary fabric barrier with low permeability, installed parallel to the flow in or near the bed of a waterway or waterbody to minimize sediment transport.

PURPOSE

To provide sediment containment while construction activities are occurring in or directly adjacent to a waterway or waterbody.

CONDITIONS WHERE PRACTICE APPLIES

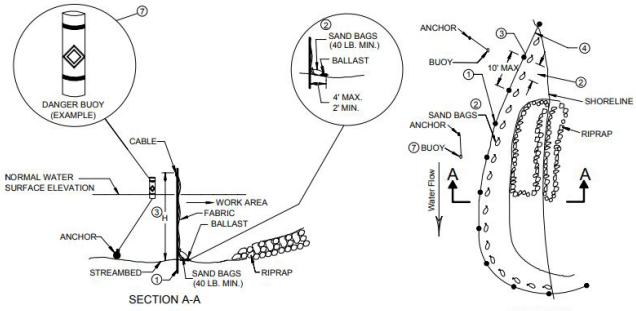
Where construction activities intrude or are directly adjacent to a waterway or waterbody. This includes but is not limited to bridge construction, rip rap placement, utility work, streambank restoration, boat launches and dredging. Use in conditions with fine soils and flow velocities not exceeding 5 feet per second, unless additional reinforcement is installed.

MATERIAL NOTES

- Reusable components of the turbidity barrier shall be clean and free of potential exotic species. Fabric cannot be reused.
- See WDNR T.S. Turbidity Barrier (1069) for detailed material specifications, per Wis DOT Spec 628.2.10.

TURBIDITY BARRIERS INSTALLATION

- Refer to WDNR T.S. Turbidity Barriers (1069) for specific criteria.
- Install before construction activities are initiated in, or adjacent to the waterway or waterbody, as close to the construction as practical.
- The ends of the barrier shall be securely anchored and keyed into the shoreline to fully enclose the area where sediment may enter the water.
- Follow guidelines outlined in WDNR T.S. Turbidity Barriers (1069) regarding posts and spacing, flotation devices, height, anchorage, and danger buoys.
- Turbidity barriers shall be installed parallel to the direction of flow and shall not be installed across channels.
- Keep in place and maintain until the construction activity is completed and the disturbed area stabilized.
- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Inspect daily and repair if necessary. Do not remove until the water behind the barrier has equal or greater clarity than the waterbody (minimum of 24 hours). When removing the silt curtain, minimize the release or re-suspension of accumulated sediment.

Silt Curtain (WDNR T.S. 1070)

DEFINITION

A temporary permeable fabric installed in a waterway or waterbody to minimize sediment transport. A silt curtain does not extend to the bottom of the channel and is placed parallel or perpendicular to the direction of flow. Use in calm, slow-moving water conditions.

PURPOSE

To provide sediment containment while construction activities are occurring in or directly adjacent to a waterway or waterbody.

CONDITIONS WHERE PRACTICE APPLIES

- Calm water conditions, not subjected to wind, wave, or current.
- To settle out coarse and granular soils where water depth at the time of construction is greater than or equal to 4 feet.
- For applications in finer sediment or moving water see WDNR T.S. Turbidity Barrier (1069).

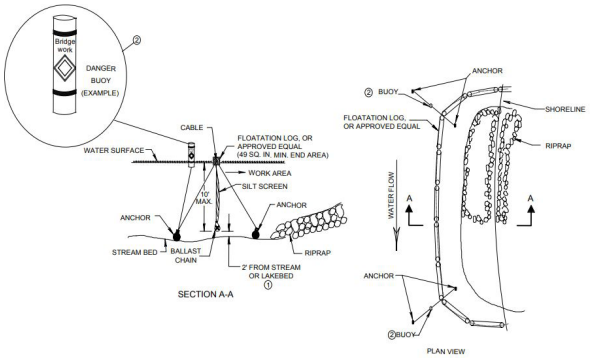
MATERIAL NOTES

- Reusable components of the silt curtain system shall be clean and free of potential exotic species. Fabric cannot be reused.
- See WDNR T.S. Silt Curtain (1070) for detailed material specifications.

SILT CURTAIN INSTALLATION

Installation

- Refer to WDNR T.S. Silt Curtain (1070) for specific criteria.
- Install in or adjacent to the waterway or waterbody before construction activities begin. Install as close to the construction as practical.
- Maintain a 2-foot gap between the weighted lower end of the curtain and the bottom of the waterway or waterbody.
- Follow guidelines outlined in WDNR T.S. Silt Curtain (1070) regarding anchorage and danger buoys.
- Must remain in place and be maintained until the construction activity is completed and the disturbed area is stabilized.
- This detail is an example of typical installation guidance.



INSPECTION AND MAINTENANCE

Inspect daily and repair if necessary. Do not remove until the water behind the curtain has equal or greater clarity than waterbody (minimum 24 hours). When removing the silt curtain, minimize the release or re-suspension of accumulated sediment.

Manufactured Slope & Perimeter (WDNR TS. 1071)

DEFINITION

Manufactured perimeter control and slope interruption products are designed to detain or slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil.

PURPOSE

To reduce uninterrupted slope length to slow the velocity of runoff so as to retain transported sediment from disturbed areas.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to the following:

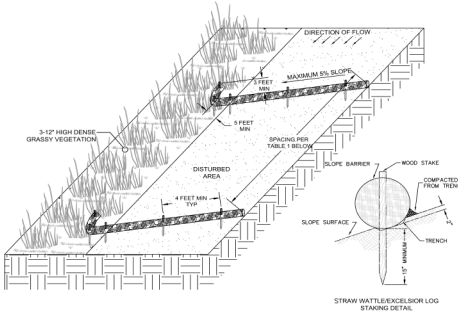
- Where only sheet and rill erosion occurs unless the product is approved for use in concentrated flow areas as a ditch check on Wis DOT PAL and is designed/installed in accordance with WDNR T.S. Ditch Checks (1062).
- Products not approved for concentrated flow that are installed on slopes that terminate in a channel shall be installed no lower than 6 inches above the design flow depth of the channel, limited to 12 months.
- Proper installation (Criteria Section V) and maintenance (Criteria Section VIII) in WDNR T.S. Temporary Slope Break (1071) must be present.

Under no circumstance should products be used in the following:

- Below ordinary high watermark or placed perpendicular to flow in streams.
- Where the maximum gradient upslope of product is greater than 50% (2:1).

TEMPORARY SLOPE BREAKS INSTALLATION

- Proprietary products shall be installed per manufacturer's requirements.
- Installed to intercept sheet water flow and direct to an undisturbed area stabilized with grassy vegetation. Entrench 2 inches with the ends facing upslope. Configure lower end to provide sediment containment.
- The sediment barrier shall be secured with wooden stakes spaced every 4 lineal feet across the length of the barrier. The stakes shall be driven through the center of the barrier into the ground a minimum of 15 inches
- This detail is an example of typical installation guidance.



Slope	Slope Break Spacing
< 2 %	100 feet
2 - 5 %	75 feet
5 - 10 %	50 feet
10 - 33 %	25 feet
33 - 50 %	20 feet
>50 %	Not Permitted

INSPECTION AND MAINTENANCE

Remove sediment from behind ditch check when reaching 1/2 the height.

Channel Erosion Control Matrix

CHANNEL EROSION CONTROL MATRIX	Ditch Grade								
	4% - 6%			6% - 9%			9% - 12%		
	Max Length [feet]			Max Length [feet]			Max Length [feet]		
Type of Device	300	600	1200	300	600	1200	300	600	1200
Seed with properly anchored mulch									
Sod ditch checks with seed and mulch									
Temporary ditch checks (hay bales or approved alternatives in WisDOT PAL)									
Sod ditch liner									
Double netted light duty (WisDOT Class I Type B) erosion mat	🟧								
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat									
Stone or rock ditch checks, or rock-filled filter bag	🟧	🟧	🟧						
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	🟧	🟧	■	🟦					

Effective range of device for Sandy or Clayey Soil: 🟧

Device applicable, may not be cost effective: 🟦

Not applicable. Use in conjunction with other BMP's: ■

* For ditch grades over 9% special design considerations may be required.

*Use matrix in conjunction with notes on Page 57.

CHANNEL EROSION CONTROL MATRIX

Type of Device

Type of Device	Permissible Shear [lbs/ square foot]	Ditch Grade <2% Max Length [feet] 300	<2% Max Length [feet] 600	<2% Max Length [feet] 1200	2% - 4% Max Length [feet] 300	2% - 4% Max Length [feet] 600	2% - 4% Max Length [feet] 1200
Seed with properly anchored mulch	0.6						
Sod ditch checks with seed and mulch	N/A					effective for clayey soil only	
Temporary ditch checks (hay bales or approved alternatives in WisDOT PAL)	N/A						
Sod ditch liner	1.0						
Double netted light duty (WisDOT Class I Type B) erosion mat	1.5						
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	1.5						
Stone or rock ditch checks, or rock-filled filter bag	N/A						
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	2.0						

Effective range of device for Sandy or Clayey Soil:
Device applicable, may not be cost effective:
Not applicable. Use in conjunction with other BMP's:

* For ditch grades over 9% special design considerations may be required.
*Use matrix in conjunction with notes on Page 57.

Channel Erosion Control Matrix

CHANNEL EROSION CONTROL MATRIX **Type of Device**	Ditch Grade								
	4% - 6%			6% - 9%			9% - 12%		
	Max Length [feet]			Max Length [feet]			Max Length [feet]		
	300	600	1200	300	600	1200	300	600	1200
Heavy duty synthetic (WisDOT Class III Type A) erosion mat or turf reinforcement mat (WisDOT Class III Type B)	🟧	🟧	🟧	🟧					
Heavy duty synthetic turf reinforcement (WisDOT Class III Type C) mat	🟦	🟦	🟦	🟧	🟧	🟧	🟧		
Riprap ditch checks	🟦	🟦	🟦	🟧	🟧	🟧	🟧	🟧	
Heavy duty synthetic turf reinforcement (Class III Type D) mat	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧
Light riprap	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Medium riprap	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
Heavy riprap	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
Grouted riprap	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦

Effective range of device for Sandy or Clayey Soil: 🟧
Device applicable, may not be cost effective: 🟦
Not applicable. Use in conjunction with other BMP's: ■

* For ditch grades over 9% special design considerations may be required.

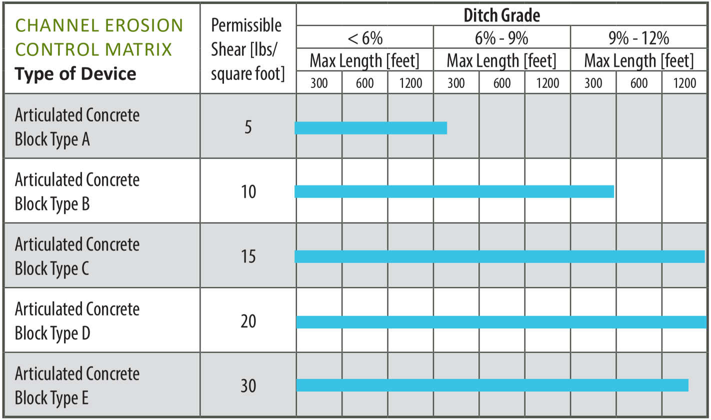
*Use matrix in conjunction with notes on Page 57.

CHANNEL EROSION CONTROL MATRIX **Type of Device**	Permissible Shear [lbs/ square foot]	Ditch Grade					
		<2%			2% - 4%		
		Max Length [feet]			Max Length [feet]		
		300	600	1200	300	600	1200
Heavy duty synthetic (WisDOT Class III Type A) erosion mat or turf reinforcement mat (WisDOT Class III Type B)	2.0						
Heavy duty synthetic turf reinforcement (WisDOT Class III Type C) mat	3.5						
Riprap ditch checks	N/A						
Heavy duty synthetic turf reinforcement (Class III Type D) mat	5						
Light riprap	4						
Medium riprap	5						
Heavy riprap	8						
Grouted riprap	N/A						

Effective range of device for Sandy or Clayey Soil:
Device applicable, may not be cost effective:
Not applicable. Use in conjunction with other BMP's:

* For ditch grades over 9% special design considerations may be required.
*Use matrix in conjunction with notes on Page 57.

Channel Erosion Control Matrix



CHANNEL EROSION CONTROL MATRIX **Type of Device**	Permissible Shear [lbs/ square foot]	Ditch Grade								
		< 6%			6% - 9%			9% - 12%		
		Max Length [feet]			Max Length [feet]			Max Length [feet]		
		300	600	1200	300	600	1200	300	600	1200
Articulated Concrete Block Type A	5	🟦	🟦	🟦						
Articulated Concrete Block Type B	10	🟦	🟦	🟦	🟦	🟦	🟦	🟦		
Articulated Concrete Block Type C	15	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
Articulated Concrete Block Type D	20	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
Articulated Concrete Block Type E	30	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦

Effective range of device for Sandy or Clayey Soil: 🟧

Device applicable, may not be cost effective: 🟦

Not applicable. Use in conjunction with other BMP's: ■

* For ditch grades over 9% special design considerations may be required.

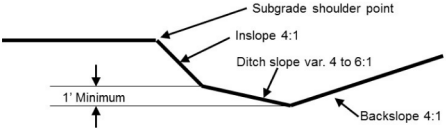
*Use matrix in conjunction with notes on Page 57.

NOTES FOR THE CHANNEL EROSION CONTROL MATRIX

1) Ditch flow rates used to develop bar chart are based on a 60 foot right of way (ROW) from pavement centerline and a 2-year rainfall event for temporary liners or a 25-year rainfall event for permanent (Class III mat or riprap) liners. If the drainage area extends outside the 60 foot ROW or unusual flows are expected, use the shear stress column values to determine the suitablity of a liner. See FDM procedures in Chapter 10 and in Section 13-30-10.
2) Erosion mats shall extend upslope 1 foot minimum vertically from the ditch bottom or 6" higher than the design flow depth. There shall be no joints within 18" of the low point.
3) Cost shall be a consideration in the selection of these devices.
4) Add sediment traps at the bottom of channel slopes.
5) Refer to FDM Chapter 10 for any channels exceeding the limits shown.
6) Approved materials for erosion products are referenced from the Wis DOT PAL: https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/pal/default.aspx
7) On long or steep channels that require a higher class mat, use the appropriate lower class mat for the first 300-600 feet of the channel.
8) Effective erosion control involves minimizing the amount of time soil is exposed and the selection of a combination of practices, and not reliance on just one practice.

STANDARD DITCH SECTION

Erosion control for ditches not conforming to the typical at right, that complies with FDM procedures 11-15-1 Figures 6 & 7 should be designed according to FDM Chapter 13.



Slope Erosion Control Matrix

SLOPE EROSION CONTROL MATRIX **Type of Device**	**Slope**								
	2.5:1			2:1			1:1		
	Slope Length [feet]			Slope Length [feet]			Slope Length [feet]		
	0-30	30-60	60-120	0-30	30-60	60-120	0-30	30-60	60-120
Seed with properly anchored mulch									
Single netted light duty (WisDOT Class I Type A) erosion mat	🟧	🟧							
Light duty single netted 100% biodegradeable (WisDOT Urban Type A) erosion mat									
Light duty double netted 100% biodegradeable (WisDOT Urban Type B) erosion mat	🟦								
Bonded Mulch (WisDOT Type A Soil Stabilizer)									
Polymer (WisDOT Type B Soil Stabilizer)	Used in conjunction with other BMPs effective up to a 2:1 slope. Not effective in sand. When used alone effective up to a 3:1 slope. Stand alone use appropriate for earthen stock piles, temporary, and late season applications.								
Double netted light duty (WisDOT Class I Type B) erosion mat	🟧	🟧	■	🟧					
Sod	🟧	🟧	■	🟧					

Effective range of device for Sandy or Clayey Soil: 🟧

Device applicable, may not be cost effective: 🟦

Not applicable. Use in conjunction with other BMPs: ■

* For ditch grades over 9% special design considerations may be required.

*Use matrix in conjunction with notes on Page 62.

SLOPE EROSION CONTROL MATRIX

Type of Device	Slope								
	6:1 or flatter			4:1			3:1		
	Slope Length [feet]			Slope Length [feet]			Slope Length [feet]		
	0-30	30-60	60-120	0-30	30-60	60-120	0-30	30-60	60-120
Seed with properly anchored mulch									
Single netted light duty (WisDOT Class I Type A) erosion mat									
Light duty single netted 100% biodegradeable (WisDOT Urban Type A) erosion mat									
Light duty double netted 100% biodegradeable (WisDOT Urban Type B) erosion mat									
Bonded Mulch (WisDOT Type A Soil Stabilizer)									
Polymer (WisDOT Type B Soil Stabilizer)	Used in conjunction with other BMPs effective up to a 2:1 slope. Not effective in sand. When used alone effective up to a 3:1 slope. Stand alone use appropriate for earthen stock piles, temporary, and late season applications.								
Double netted light duty (WisDOT Class I Type B) erosion mat									
Sod									

Effective range of device for Sandy or Clayey Soil:
Device applicable, may not be cost effective:
Not applicable. Use in conjunction with other BMPs:

* For ditch grades over 9% special design considerations may be required.
*Use matrix in conjunction with notes on Page 62.

Slope Erosion Control Matrix

SLOPE EROSION CONTROL MATRIX **Type of Device**	**Slope**								
	2.5:1			2:1			1:1		
	Slope Length [feet]			Slope Length [feet]			Slope Length [feet]		
	0-30	30-60	60-120	0-30	30-60	60-120	0-30	30-60	60-120
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	🟧	🟧	🟧	🟧	🟧				
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	🟧	🟧	■	🟧	🟧				
Heavy duty synthetic erosion control revegetation mat (WisDOT Class III Type A)	🟦	🟦	🟦	🟧	🟧	🟧			
Riprap	🟦	🟦	🟦	🟧	🟧	🟧			
Heavy duty synthetic turf reinforcement (WisDOT Class III Type B or C) mat	🟦	🟦	🟦	🟧	🟧	🟧	🟧		
Heavy duty synthetic turf reinforcement (WisDOT Class III Type D) mat	🟦	🟦	🟦	🟧	🟧	🟧	🟧	🟧	🟧
Slope paving or grouted riprap	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦

Effective range of device for Sandy or Clayey Soil:	🟧
Device applicable, may not be cost effective:	🟦
Not applicable. Use in conjunction with other BMPs:	■

* For ditch grades over 9% special design considerations may be required.

*Use matrix in conjunction with notes on Page 62.

SLOPE EROSION CONTROL MATRIX **Type of Device**	Slope								
	6:1 or flatter			4:1			3:1		
	Slope Length [feet]			Slope Length [feet]			Slope Length [feet]		
	0-30	30-60	60-120	0-30	30-60	60-120	0-30	30-60	60-120
Medium duty coconut erosion mat (WisDOT Class II Type B or C)									
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat									
Heavy duty synthetic erosion control revegetation mat (WisDOT Class III Type A)									
Riprap									
Heavy duty synthetic turf reinforcement (WisDOT Class III Type B or C) mat									
Heavy duty synthetic turf reinforcement (WisDOT Class III Type D) mat									
Slope paving or grouted riprap									

Effective range of device for Sandy or Clayey Soil:
Device applicable, may not be cost effective:
Not applicable. Use in conjunction with other BMPs:

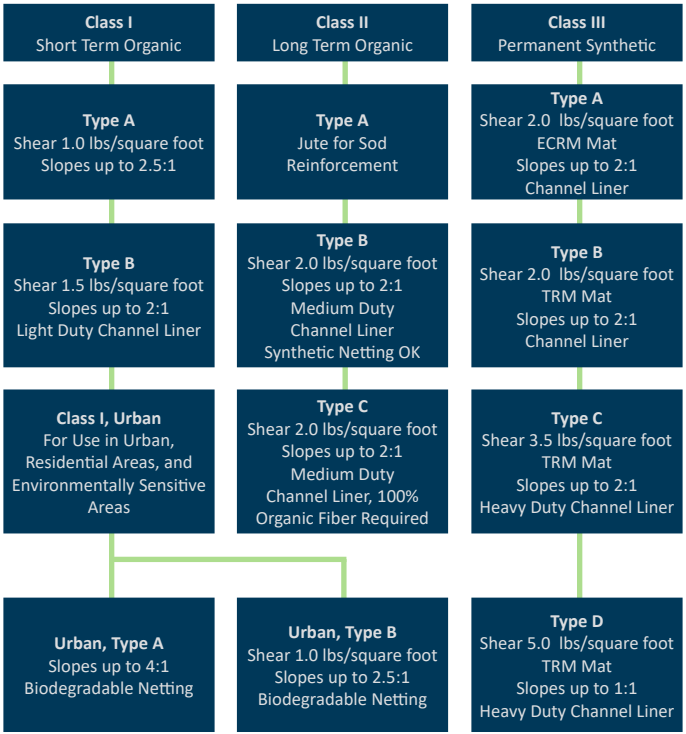
* For ditch grades over 9% special design considerations may be required.
*Use matrix in conjunction with notes on Page 62.

SLOPE EROSION CONTROL MATRIX	**Erosion Control**
Benches	Consider benches when cuts exceed 20', bench at approximately 15' vertical intervals to collect and drain water. Treat benches as channels (ditches). Adjust elevations to provide drainage. Consider flumes at transitions.
Intercepting embankments	Used to intercept runoff from abutting lands. Flumes may be necessary to direct runoff.
Silt fence	Used at toe of slopes to intercept and detain small amounts of sediment. Use only Wis DOT approved silt fence as listed in the PAL.
Temporary ditch checks or erosion bales	Used at toe of slopes to intercept and detain small amounts of sediment.
Slope drains/flumes	May be necessary on slopes (see channel matrix for design guidance).
Sediment traps	Used to trap sediment laden runoff. Could be used at the inlet or outlet end of slope drain.

NOTES FOR THE SLOPE EROSION CONTROL MATRIX

1) Cost shall be a consideration in the selection of these devices.
2) Designers should review FDM Chapter 10 prior to selection of erosion mats.
3) Install intercepting ditches to limit slope lengths to 15' vertical intervals (see FDM Chapter 10).
4) Refer to FDM Chapter 10 for any slopes exceeding the limits shown.
5) Approved materials for erosion products are referenced from the Wis DOT PAL: https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/pal/default.aspx
6) On steeper slopes that require a higher class mat, use the appropriate lower class mat or seed and mulch for the first 30-60 feet of the slope.
7) Unless project conditions require otherwise, seed and mulch all slopes that are flatter than a 5% grade, regardless of length. If practicable, bench the slopes.
8) Effective erosion control involves minimizing the duration of soil exposure and the selection of a combination of practices, and not reliance on just one practice.

WisDOT Erosion Mat Categories



General Inspection and Maintenance Guidance

- The environmental monitor will inspect erosion and sediment control practices a minimum of:
  - Once a week;
  - Within 24 hours following a rainfall of 0.5 inches or more.
- Take corrective action as soon as possible with consideration of site conditions, at the most within 24 hours of the inspection.
- Maintain written documentation of the inspection at the construction site describing:
  - Date, time, and location of construction site inspection;
  - Name of individual performing inspection;
  - Assessment of the condition of erosion and sediment controls;
  - Description of any corrective erosion and sediment control implementation or maintenance performed;
  - Description of the current location and phase of land disturbing activity.
- For a sample construction site inspection report form: **https://dnr.wi.gov/files/PDF/forms/3400/3400-187.pdf**

State of Wisconsin
Department of Natural Resources (DNR)
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

CONSTRUCTION SITE INSPECTION REPORT

Form 3400-187 (R 11/16)

Notice: This form was developed in accordance with s. NR 216.48 Wis. Adm. Code for WPDES permittees' convenience; however, use of this specific form is voluntary. Multiple copies of this form may be made to compile the inspection report. Inspections of the construction site and implemented erosion and sediment control best management practices (BMPs) must be performed weekly and within 24 hours after a rainfall event 0.5 inches or greater.

Construction Site Name and Location (Project, Municipality, and County):	**Site/Facility ID No. (FIN):**
Onsite Contact/Contractor:	**Onsite Phone/Cell:**

Note: Inspection reports, along with erosion control and storm water management plans, are required to be maintained on site in accordance with s. NR 216.48 (4) and made available upon request. PLEASE PRINT LEGIBLY.

Date of inspection:	**Time of inspection:** **Start:** _____ ◯ **am** ◯ **pm** **End:** _____ ◯ **am** ◯ **pm**	**Type of inspection:** ◯ **Weekly** ◯ **Precipitation Event** ◯ **Other (specify)**
Weather/Site Conditions: **Temp.** _____ **°F** **Antecedent Soil Moisture** **Last Rainfall Depth:** _____ **inches** **Last Rainfall Date:** _____	◯ **Dry** ◯ **Variable** ◯ **Wet** ◯ **Frozen or snow covered** ◯ **Frozen (Thaw predicted in next week)** ◯ **Melting Snow/slush**	**Describe current phase of construction:** Scheduled Final Stabilization Date for Universal Soil Loss Equation (USLE) [1] : **Project on Schedule[2]?** ◯ **Yes** ◯ **No**
Name(s) of individual(s) performing inspection:		**Inspector Phone/Cell:**

I certify that the information contained on this form is an accurate assessment of site conditions at the time of inspection:

Inspector Signature _____ **Date:** _____

Inspection Questions:	**Yes**	**No (Identify Actions Required):**	**Location/Comments:**	**Actions Completed by Date & Initials**
1. Is the erosion control plan accessible to operators?	☐	☐ Provide onsite copy		
2. Is the permit certificate posted where visible?	☐	☐ Post certificate		
3. Is the current phase of construction on sequence with the site-specific erosion and sediment control plan, including installation/stabilization of ponds and ditches?	☐	☐ Add sediment control ☐ Install missing ditch/pipe/pond ☐ Stabilize bare soil		
4. Are all erosion and sediment control BMPs shown on plan properly installed and in functional condition?	☐	☐ Repair ☐ Modify ☐ Install/Replace		
5. Is inlet protection properly installed and functioning in all inlets likely to receive runoff from the site?	☐	☐ Clean ☐ Replace ☐ Install		
6. Is the air free of fugitive dust resulting from construction activity and bare soil exposure?	☐	☐ Apply water ☐ Apply dust control product		

[1] The Universal Soil Loss Equation (USLE) model and the Construction Site Soil Loss and Sediment Discharge Guidance are available at: http://dnr.wi.gov/topic/stormwater/standards/const_standards.html
[2] If the project is not on schedule then the soil loss summary for the project should be reviewed and schedule, plan or practices modified accordingly.

Many thanks to Emmons and Olivier Resources for donating staff time and resources to develop this guide.

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APPENDIX E-36 Boat, Gear, and Equipment Decontamination and Disinfection Protocol

State of Wisconsin
Department of Natural Resources
Manual Code # 9183.1 Boat, Gear, and Equipment Decontamination and Disinfection Protocol

Ed Eberle 06/16/2016
Ed Eberle, Assistant Deputy Secretary Date

Rescinds and replaces: 9183.1 Date 04-10-2015 Approved by OMT: 04-10-2015

I. SCOPE

This manual code applies to all Department of Natural Resources employees moving boats, gear, and equipment between waterbodies and/or crossing a barrier while moving from downstream to upstream on the same waterbody or a connected waterbody, whether or not the presence of aquatic invasive species is known. This manual code outlines the minimum requirements to be followed by employees, and **does not preclude employees from taking additional actions**.

Employees will require any agents or service providers through the specific contract or agreement confering that agency status or engaging that service provision to follow this manual code. Compliance with this manual code may be considered reasonable precautions as defined by s. NR 40.02(44), Wis. Adm. Code. Manual Code 9183.1 was developed in 2007 to provide department employees boat and gear disinfection guidelines. Based on new research and discoveries, Manual Code 9183.1 was amended in 2015 to improve the department decontamination/disinfection policy. This manual code will be effective on June 16, 2016.

Employees are advised to include this manual code and associated BMPs requirements in applicable permits where allowed by the underlying regulatory authority or agreed to with the permitte. Each permitting program is subject to its own statutory and code standards that must be assessed when considering decontamination/disinfection requirements.

II. POLICY

It is the department's policy to follow proper protocol for decontamination/disinfection to ensure that employees are minimizing or eliminating the risk of spreading aquatic invasive species and/or pathogens through work activities, and to comply with ch. NR 40, Wis. Adm. Code, s. NR19.055, Wis. Adm. Code, and ch. 23, Wis. Stats.

III. DEFINITIONS

"Agent" a department or agency of this or another state, federal agency, county, town, corporation or individual that has been expressly delegated by statute, rule or written contract to act under full or partial authority of the department.
"Aquatic invasive species" has the meaning given in s. NR 40.02 (3m), Wis. Adm. Code, that aquatic invasive species are any invasive species that dwells in water or wetlands.
"Barrier" is a natural or human made structure which does not allow the migration of aquatic organisms up to the 100 year event. Examples include dams or waterfalls. Dams with locks are excluded from this definition as they allow for migration.
"Connected waterbody" A series of lakes or flowages which have a connection which is commonly navigated by motorized craft and which have a common water level shall be considered a single connected waterbody.

"Decontamination" is the process of removing invasive species or materials that may contin or transmit invasive species.
"Disinfection" is a method of decontamination that destroys or kills all forms of an invasive species that may be present, whether or not the presence is known.
"Employee" An employee is any person who receives remuneration for services rendered to the state under an employer-employee relationship (e.g. permanent classified, limited term employee (LTE), project, seasonal, unclassified employees).
"**Invasive species**" has the meaning given it in s. 23.22(1)(c), Wis. Stats., and s. NR 40.02 (24), Wis. Adm. Code, where "invasive species" means nonnative species including hybrids, cultivars, sub specific taxa, and genetically modified variants whose introduction causes or is likely to cause economic or environmental harm or harm to human health, and includes individual specimens, eggs, larvae, seeds, propagules and any other viable life-stages of such species. For "invasive species" fish, s. NR 40.04 (12a), Wis. Adm. Code, includes all nonnative species, but excludes established nonnative fish species.
"Locks" a device used for raising and lowering boats, ships, and other watercraft between stretches of water or different levels on river and canal waterways.
"Service provider" includes contractors, volunteers, intern, any non-DNR employee that requires access to networks, Information systems, data or facilities.
"Waterbody" means any spring, stream, pond, lake, or wetland.

IV. PROCEDURE

A. The following decontamination and disinfection steps are to be taken every time a boat, equipment, or gear is moved between waterbodies, wetlands, and/or crosses a barrier while moving from downstream to upstream on the same waterbody.
    1. Decontamination: The following processes must be used to clean equipment prior to moving boats, gear, and equipment from a waterbody.
        a. Inspect and manually or mechanically (preferably using a stiff bristled brush) remove aquatic plants, animals, and mud from your boat, trailer, equipment, boots, and gear.
        b. Drain all water from your boat, motor, live well, bilge, and transom wells, as well as from your equipment and gear, including but not limited to tracked vehicles, barges, silt or turbidity curtain, hoses, sheet pile and pumps.
        c. Dispose of unwanted plants and animals in an appropriate way (e.g. compost, bag and landfill, etc.). Disposal methods must ensure that no living plants, animals, or propagules are transported to other waterbodies, or rereleased into the waterbodies they came from.
    2. Disinfection: One of the below disinfection processes (a. – d.) must be used following decontamination. When working in wetlands on foot, disinfection is mandatory after returning to the vehicle and employees must be cognizant of open waters. **When working in waterbodies known to contain specific invasive species, it is mandatory to use a disinfection method that is effective for that species. See the BMPs for information on species-specific disinfection.** To determine what invasive species are present, follow the guidance on the manual code website: http://dnr.wi.gov/topic/Invasives/disinfection.html. The best disfection methods should be used when a species is suspected, but not yet confirmed. When there are no specific AIS listed on the web site for the waterbody, and there are no other AIS

suspected where work or an activity will be conducted, compliance with any of the disinfection methods below (IV.2.a.-IV.2.d.) is sufficient.

a. Store dry for 5 consecutive days after cleaning with soap and water and/or high pressure water;
b. Wash with ~212º F water (steam) or ≥140 º F water;
c. Apply a 500 ppm Chlorine (sodium hypochlorite) solution for 10-minute contact time. Household bleach is generally 5.25% sodium hypochlorite so mix 1.22 fl oz or 2.44 tablespoons per gallon water. Consult the chlorine directions in the B MP document for guidance on measuring products with different sodium hypochlorite concentrations: https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=126473962 or
d. Apply a 2:100 solution (2.7 ounces or 5.4 tablespoons per gallon water) of Virkon Aquatic® for 20 minute contact time.

B. Safety Precautions for disinfectant use:

1. All employees who handle steam cleaners shall:
   a. Wear heat resistant gloves.
   b. Depending on the type of steamer used, use additional heat resistant personal protective equipment (PPE) as recommended.
   c. Refer to the equipment's operation manual for recommended PPE.
2. All employees who handle, mix, or use chlorine solution shall:
   a. Receive and be required to read a copy of the product Safety Data Sheet.
   b. Wear nitrile gloves.
   c. Have an emergency eyewash station or eye wash solution readily available in the immediate area. A permanent is preferred, but a temporary is acceptable.
   d. Wear eye protection meeting ANSI Z87 (safety glasses) while mixing and spraying solution. Safety sunglasses are acceptable.
   e. Stay upwind from the spray.
3. All employees who handle, mix, or use Virkon® Aquatic shall:
   a. Follow the same precautions listed above for the handling of chlorine solution and also splash goggles and/or a face shield while mixing and spraying solution.
   b. All employees who choose to wear a dust mask respirator when handling Virkon® Aquatic in powder form, may do so in compliance with the DNR Respiratory Protection Program Handbook MC 9180.5 Voluntary Use requirements. Specifically, Appendix D. Review entire DNR Respiratory Protection Handbook MC 9180.5 (http://intranet.dnr.state.wi.us/int/mb/hBooks/HB9180-5.pdf). These employees must complete the Dust-Mask Respirator Voluntary Use Agreement: http://intranet.dnr.state.wi.us/formscatalog/ffDispFormImage.aspx?FormID=13869.
   c. Be aware that sulfamic acid is an active ingredient in Virkon® Aquatic. Employees with allergies to sulfamic acids should consult a physician.
4. Employees working with agents, service providers, or applicable permitees, will require through permit, contracts or agreement, compliance with disinfection safety practices that meet applicable state and federal laws.

C. Special Instructions and Supplemental Information

1. Disinfection measures are not needed for law enforcement or fire suppression equipment in emergency situations.

2. In cases where boats and gear return to state hatcheries, disinfection should be done in a location away from ponds and water supplies to prevent disinfectant or untreated water from entering those areas.
3. Every effort should be made to keep debris, disinfection solution, and rinse water out of surface waters, as well as potential transport routes (e.g. ditches, storm drains, etc.). Rinse water should be obtained from a clean source (i.e. municipal, bottled, well, etc.).
4. For chlorine solution:
    a. Once mixed with water, chlorine breaks down within 24 hours and more quickly in sunlight and when in contact with organic material. Because of this, chlorine solutions must be mixed the same day they are to be used.
    b. Chlorine solutions are corrosive to metal and rubber.
    c. Chlorine solutions are toxic to fish at the required concentration, so rinse equipment after disinfection or neutralize the chlorine solution. To neutralize, spray sodium thiosulfate in an 800 ppm solution (3 grams per gallon of water) on all surfaces of equipment after the disinfection period is over. Rinse with clean water to remove any remaining sodium thiosulfate. Use the same safety measures for sodium thiosulfate as required for chlorine solution.
5. For Virkon® Aquatic solution:
    a. Virkon® Aquatic solutions are stable for seven days, but will gradually lose activity over time, especially in the presence of organic debris and UV light. Therefore, remove all sediment from equipment before disinfection, soak equipment when possible, and mix solutions once per week. Virkon® Aquatic concentration test strips are available.
    b. Virkon® Aquatic is not corrosive at the working concentration according to product labeling.
    c. Because Virkon® Aquatic contains an acid, it should not be mixed with alkaline compounds such as chlorine solutions. A clean water rinse should be applied between treatments if both methods are used.
    d. Virkon ® Aquatic does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
    e. Virkon-S is not recommended for use in aquaculture and its label will no longer carry EPA approval for aquaculture claims.

D. Sources of disinfectants and personal protective equipment (PPE) for state employees:
1. State employees should check WISBUY: (https://solutions.sciquest.com/apps/Router/Login?OrgName=WisconsinMarketPlace&tmstmp=1410786596784) to see if the product needed is available from one of the contracts.
2. If the product cannot be obtained from a contract on WISBUY, check VendorNet at: (http://vendornet.state.wi.us/vendornet/procman/prob2b.asp), to see if there is a contract that can supply the product.
3. If there is no mandatory contract or contract of convenience that can supply the products, state employees should follow the guidelines found on the DNR Purchasing Website. (http://intranet.dnr.state.wi.us/int/at/fn/pc/how/index.html)
4. Employees needing assistance navigating the systems above may contact one of the DNR the Best Management Practices document Agents at: (http://intranet.dnr.state.wi.us/int/at/fn/staff/pa/index.html)

5. See the Best Management Practices document for additional guidance and supporting references: https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=113967385.

E. Further information on decontamination safety and the efficacy of disinfection methods can be found within the manual code supplemental documents located at the following link: : http://dnr.wi.gov/topic/Invasives/disinfection.html. Information on this page will be updated independently from manual code revisions whenever new information on decontamination methods becomes available