Document Accession #: 20200713-5110 Filed Date: 07/13/2020

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Summary of Study Comments and Responses

Cornell Hydroelectric Project

FERC Project No. 2639

Chippewa River
Chippewa County, Wisconsin

Report prepared for

Eau Claire, Wisconsin

Report prepared by

www.meadhunt.com

May 2020

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Appendices

1. Study Requests Received[1]

- City of Cornell (City)
- National Park Service (NPS)
- River Alliance of Wisconsin (RAW)
- Wisconsin Department of Natural Resources (WDNR)[2]

2. Summary of Study Comments and Action Items

A. Wildlife Habitat

WDNR Comments:

Provide Information in the license application to document current wildlife diversity, habitat types, and general abundance within the project area. This information may be used to evaluate the effects of the distribution and composition of vegetation and wildlife habitats, including wetlands, and the effects operations of those actions on wildlife inhabiting those habitats.

NPSW Response:

According to a GIS mapping exercise completed by NPSW, there are approximately 532 acres of upland (including wetlands) within the project boundary. NPSW has ownership of roughly 28 acres, or 5.3 percent, of upland acreage within the current project boundary; wildlife management cannot easily be considered a project purpose for this hydroelectric project. The State of Wisconsin is the primary landowner of upland acreage within the project boundary and is responsible for wildlife management on their properties.

NPSW is not proposing a change in the operation of the hydroelectric project. No nexus between the project operations and wildlife management has been established by the WDNR. Therefore, there is no need to analyze the effects of operations on upland wildlife. The license application will include general information on the composition of wildlife and wildlife habitat types from existing information and no additional studies for wildlife and wildlife habitat are proposed.

B. Aquatic and Terrestrial Invasive Species Studies

WDNR Comments:

The invasive species survey is to provide baseline data on the presence/absence of NR 40 listed aquatic invasive species. This data will be used to understand the baseline of native species, diversity and density of invasive species, and prevent the spread of other nearby invasive species. Additionally, this information will be used to better understand the impacts associated with water level manipulations.

Limited information is available. A comprehensive survey will provide needed information to understand the relationship between native and non-native plants, and other aquatic invasive species to determine the appropriate short-term and long-term management of the river, along with impacts associated with water level manipulation, and best management practices for dam operations.

[1] Actual Study Request Letters are enclosed in Appendix A.
[2] WDNR provided study explanation sheets for several of their requests prior to their formal request on May 17, 2019. The information is available in Appendix B.

Please work with the department to determine which department protocols are appropriate for both the impoundment and the riverine portions of the project area. The department protocols for Point-Intercept Survey and Lakes Early Detection Protocols to ensure scientific integrity (sic). The information collected from this study includes an assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plan colonization.

RAW Comments:
Conduct an aquatic and terrestrial Invasive species study (ATIS) within the Cornell Flowage and in the tailwater. The species to be sampled should include Restricted Species per Wisconsin Administrative Code (NR 40): invasive species already established in Wisconsin. We note from page 37 of the PAD that Cornell is currently being monitored for purple loosestrife as part of a larger effort on the Chippewa River pursuant to an Exotic Control Plan. However, there are many other invasive species to consider.

NPSW Response:
NPSW has consulted with the WDNR and RAW to complete an aquatic invasive species survey on the project reservoir and in the tailrace. A point-intercept survey and a rapid-response survey will be completed on the reservoir according to published WDNR protocols. A safe rapid-response plan will be developed and implemented for the tailwater according to published WDNR protocols.

NPSW will complete a terrestrial aquatic invasive species survey on land owned by NPSW within the project boundary. The survey will consist of a meandering survey to identify, locate, and define the perimeter of occurrences of terrestrial plant species listed in NR 40.

Reporting will include mapping identified colonies of species listed in NR 40 on an aerial photo background with bathymetric data, an estimation of abundance of plants, and a relative density of species in each mapped location. The study plan has been developed in consultation with the WDNR and RAW and is included in Appendix C. The study will be completed in 2020.

C. Water Quality

WDNR Comments:
The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions. To adequately assess any impacts of the dam operations on water quality, sampling must occur within the impounded area (in-lake) as well as up and down stream of the impounded area (riverine). Data is necessary to understand if state water quality standards are being met.

The water quality study should determine if the public waters within the project area are meeting state water quality standards; and determine how their water quality profile may impact the downstream riverine areas.

The department protocols should be used as they have been determined to meet the expectations of the Environmental Protection Agency, including guidelines established within the Clean Water Act to ensure that the department is providing appropriate management of public waters and meeting state standards. WisCALM or other department approved protocols shall be used and provides consistent comparison across resource assessments.

- *Impounded Area: Changes in retention times can affect water temperature and nutrient release which can have detrimental effects downstream. Impoundments can influence various water quality parameters that impact downstream DO levels. DO is critical to health and survival of aquatic organisms. Baseline data is needed to determine effects of dam operations on water quality. The assessment should establish baseline data for total phosphorus (TP), chlorophyll a, secchi depth, DO, temperature, conductivity and pH profiles.*

- *Riverine Area Above and Below the Impoundment: There is currently no information relating to DO levels, and other water quality parameters, downstream of impoundment. Please assess the TP concentrations, DO, conductivity, and temperature in the riverine portions of the project area.*

NPSW Response:
NPSW will complete water quality monitoring for the parameters outlined above, as well as those enclosed in the WDNR Study Justifications (Appendix A). The study plan has been developed in consultation with the WDNR and is included in Appendix D. The study will occur in 2020.

D. Mussel Survey

WDNR Comments:
The qualitative and quantitative survey of mussels will provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Cornell hydro dam; and any appropriate management to protect or enhancement the existing freshwater mussel population.

There is limited information on freshwater mussel species within the project area. The following two species have been historically reported, Salamander Mussel and Purple Wartyback mussels. Salamander Mussel requires specific habitat, thus the department would need to review the sampling plan prior to any field data collection.

The change in water levels in the project area associated with operations, and the outflows of the hydro dam could affect mussel species and habitat. The results of the freshwater survey will help FERC and the department determine if any protection, mitigation, or enhancements would be necessary for the freshwater mussel population; and the information will be beneficial for best management practices associated with future drawdowns and repairs.

Methods should follow the WDNR's Guidelines for Sampling Freshwater Mussels in Wadable Stream. A formal study plan should be approved by the department prior to field data collection.

RAW Comments:
In consultation with the Wisconsin DNR and U.S. Fish and Wildlife Service (FWS) conduct a mussel study in the Cornell Flowage and in the tailwater of the dam.

NPSW Response:
NPSW will complete the mussel survey outlined above. The protocol has been developed in consultation with the WDNR and RAW. The proposed study plan is included in Appendix E.

The RAW provided comments on the proposed study plan that included a request for a littoral zone survey to determine the effects of project operations on the mussel community. There is no need to survey the mussel community at elevations below the current reservoir level fluctuation because NPSW is not proposing a change in project operations as part of the relicense. In addition, a survey within the reservoir level fluctuation zone is not expected to identify the presence of any mussels. If mussels were determined to be present in the fluctuation zone, they would not be adversely impacted by the current reservoir fluctuation zone because their presence would indicate they have adapted their mobility to exist in this zone.

The littoral zone study proposed by RAW will not provide information that has a nexus to the existing or proposed project operations. The study, without review of the littoral zone, will be completed in 2020.

E. Flashboard Failure and Replacement, including alternatives to minimize or reduce flashboard failure

WDNR Comments:

Drawdowns for flashboard replacement can have negative effects on aquatic vegetation, invertebrates and fish species. As part of the license application, please identify alternative flashboard options. Evaluate the drawdown frequency, duration, and other negative environmental impacts associated with each option. Identify flashboard alternatives that would minimize drawdown frequency, duration, and resource impacts.

NPSW Response:

NPSW will provide this information as part of the draft license application (DLA) in 2021.

F. Assessment of Impacts Associated with Water Level Fluctuations with Current Operational Range

WDNR Comments:

The existing Lower Chippewa River Settlement Agreement (Agreement) was established January 17, 2001. This Agreement sets forth operational requirements for the Cornell hydroelectric dam. When the Agreement expires, operations associated with Cornell may need further review and modification.

Per the Agreement "The parties recognize, however, that the existing 50-year license for the Cornell Project is not synchronized with the license expiration dates for the other five projects and it is impossible at this time to rectify that difference. Therefore, the parties agree that the term of this settlement should extend to September 30, 2033 which is the license expiration date for the Jim Falls Project and is nearly the same as the January 13, 2034 license expiration date for the Chippewa Falls Project."

Per the Agreement, the Cornell Project is bound to maintain the following operational requirements. NSPW may operate the Cornell Project in a daily peaking mode providing that an instantaneous minimum flow of 400 cubic feet per second (cfs) shall be released from the project at all times.

Additionally, NSPW shall maintain the surface water elevation of the Cornell Flowage in accordance with Article 13 of the current FERC license, as issued December 26, 1973, except for the following time period: From April 1 to June 7, the flowage shall be maintained within 0.5 ft of full pool (elevation 1001.5 to 1002.0 ft) to enhance fish spawning.

Cornell hydro has the largest operating range of the six lower Chippewa River dams owned by Xcel which can lead to extensive dewatering of backwater areas that can have negative effects on aquatic and semiaquatic organisms. The Department would like to see a wetted perimeter assessment completed to determine the extent of dewatering in the impoundment at various operating conditions up to 2ft fluctuation. Bathometry and Lidar data would be preferred to be able to understand the dynamics of water level changes affecting the rivers edges.

If the operating range is determined to lead to extensive dewatering of backwater areas, then the operating range will need to be modified when the Settlement Agreement expires in 2033.

NPSW Response:
As stated by the WDNR, the operations of the Cornell Hydroelectric Project are subject to the requirements of the Settlement Agreement and are to remain consistent until 2033. Any changes to the operating regime would impact the operation of the upstream and downstream hydroelectric projects. NPSW is not proposing a change in the operating regime.

Studying the effects of the current operations at the Cornell Hydroelectric Project would be premature at this time since environmental or regulatory conditions, technology, and species of concern may change between now and when the upstream and downstream hydroelectric projects begin relicensing (2028). In lieu of evaluating current operations at Cornell, NPSW will propose in their license application to evaluate the operational impacts of the Cornell Hydroelectric Project concurrent with the relicensing process for the remaining Lower Chippewa River hydroelectric projects starting no later than 2028. This proposal will ensure that current information is being used to make comprehensive operational decisions for all six Lower Chippewa River hydroelectric projects. The resulting information from the comprehensive study can then be used to assess the need to modify the operation of the Cornell Hydroelectric Project (if necessary) concurrent with any operational changes required in the new licenses for the upstream and downstream hydroelectric projects.

G. Minimum Flows and Operational Impacts

WDNR Comments:
Rapid or frequent changes in water levels can have negative impacts on water resources. Additionally, low water conditions and dewatering of critical habitat can lead to declines in fish populations.

An Instream Flow Incremental Methodology (IFIM) study was conducted in 1997 during the relicensing of other hydro facilities on the Chippewa River. The results should be evaluated to determine if the current minimum flow is allowing for optimal habitat utilization.

Please review the IFIM summary from 1997 to evaluate habitat suitability at a range of minimum flows for smallmouth bass, walleye, lake sturgeon, and redhorse suckers. Using the IFIM, determine habitat utilization of smallmouth bass, walleye, lake sturgeon, and redhorse suckers at different minimum flows (400 cfs and above). The minimum flow permitted is 400 cfs which may not allow optimal habitat utilization for many aquatic species.

If higher minimum flows allow for substantially greater habitat utilization, then a higher minimum flow may be required.

NPSW Response:

As previously stated by the WDNR, the operations of the Cornell Hydroelectric Project are subject to the requirements of the Settlement Agreement and are to remain in force until 2033. NPSW is not proposing any changes to the operating regime as this would impact the operation of the upstream and downstream hydroelectric projects. Therefore, NPSW does not believe a study of the current operation of the Cornell Hydroelectric Project is warranted at this time. To study the effects of the current operation would be premature at this time since environmental or regulatory conditions, technology, and species of concern may change between now and when the upstream and downstream hydroelectric projects begin relicensing (2028).

NPSW will propose in their license application to evaluate the operational impacts of the Cornell Hydroelectric Project concurrent with the study of any operational changes with the upstream and downstream hydroelectric projects during their relicensing process beginning no later than 2028. This proposal will ensure that current information is being used to make comprehensive operational decisions to assess the impacts to operation of the upstream and downstream hydroelectric projects also. The resulting information from the comprehensive study can then be used to assess the need to modify the operation of the Cornell Hydroelectric Project (if necessary) concurrent with any operational changes required in the new licenses for the upstream and downstream hydroelectric projects.

As a result of the Settlement Agreement condition to pass a minimum flow of 400 cfs, NPSW changed the turbine runner in the minimum flow unit to pass the 400 cfs minimum flow. Any adjustments to minimum flow requirements would need to account for any equipment changes necessary at the time a minimum flow change (if any) is implemented. The operation of the Cornell Hydroelectric Project large generating units cannot be easily adjusted. The units are not designed with wicket gates and the flow into the large units is controlled by the opening and closing of a radial head gate. The small generating unit is operated to pass the minimum flow.

H. Estimate Fish Entrainment Mortality and Determine Methods to Minimize Impacts to Large Riverine Fish Species

WDNR Comments:

Entrainment through hydro facilities can lead to high mortality especially in adult fish. The Cornell hydro dam has the largest trash rack spacing of any of the dams on the lower Chippewa River at 5 3/8" allowing all life stages of fish, including lake sturgeon up to 40", to become entrained which may be preventing the fishery from reaching its full potential. Specifically, the department is concerned with species impacts to lake sturgeon, muskellunge, walleye and redhorse suckers.

Through desktop models, determine the probability of entrainment mortality for lake sturgeon, muskellunge, walleye, and redhorse suckers for all lengths that can pass through the existing trash racks. The study should evaluate and determine the size of fish that would be excluded and the approach velocities for 2.5" trash rack spacing. If desktop modeling suggests substantial entrainment mortality of the previously mentioned fish species at the current trash rack spacing, then follow up studies will be needed to confirm entrainment or measures will need to be taken to minimize entrainment mortality.

RAW Comments:
We believe reducing the clear spacing at the Cornell trash rack to two inches would exclude many larger round bodies fish and help considerably to minimize injury or death to them.

NPSW Response:
NPSW will complete a desktop analysis of fish entrainment for the large generating units. The feasibility of fish protection measures (if substantial mortality is projected) will also need to consider mitigation in lieu of structural modifications. The study plan has been developed in consultation with the WDNR and RAW and is included as Appendix F. The desktop study will be completed in 2020.

I. Public Access to the Chippewa River

WDNR Comments:
As part of the license application, please identify locations and options to increase and/or improve shore access to the tailrace fishery and to the impoundment.

Improvement identification should include, available and needed parking, access from walkways or trails, public space areas, fishing platforms, handicap accessible options and locations, maps and public awareness of public access features. Costs, land ownership, improvement capabilities, and maintenance should be discussed as part of options to increase or improve public access.

RAW Comments:
Evaluate the existing condition of recreational facilities and needed upgrades. Evaluate the need for additional facilities to adequately serve the public. Update the recreational brochure for the project to reflect new improvements. Prepare a draft Recreation Plan for the project to be reviewed by the resource agencies and other stakeholders.

City of Cornell Comments:
The City is currently updating its Comprehensive Outdoor Recreation Plan. The Plan includes specific improvements in Mill Yard Park, which is adjacent to land owned by Northern State Power and the Chippewa River. We are requesting that recreational improvements be included in the draft license application being submitted by Xcel Energy for the Cornell Hydroelectric Project. We are currently finalizing the Comprehensive Outdoor Recreation Plan and will have it completed by September 30, 2019. It will then be available for review and use by FERC and Xcel Energy.

A few items of interest that are included in our initial draft are:

1. *obtaining shoreline rights along the river:*
    a. *to construct and maintain a trail and trailhead facilities*
    b. *to control invasive plant species*
    c. *to control underbrush to allow for viewing of this beautiful segment of the river (it's been mentioned that this site with the islands in the backdrop provides one of the most beautiful sunsets you'll ever witness);*
2. *improvements of the tail race area for fishing to include possible boat access;*
3. *a kayak/canoe launch area;*
4. *a barrier free fishing pier.*

The City would appreciate working closely with Xcel on these and other potential recreational system improvements.

NPS Comments:

The PAD lacks critical recreation information and needs defined by FERC, clearly indicating the need for a recreation study. This proposed study methodology is in keeping with similar studies required by FERC to collect current recreational information associated with licensing.

Study Methodology

(1) Recreation Demand.

This analysis involves assessing the quality of the visitor's experience through visitor and land manager surveys. The user contact survey would obtain user-feedback assessment on the adequacy of existing recreational facilities including access points, trails and trail network connectivity in the project and to the City of Cornell, camping areas, swimming beach, wayfinding and interpretive signs, and capability of current facilities to meet existing recreation demand. In addition, the surveys should obtain user feedback on facilities or operational measures, e.g., possible impacts of impoundment fluctuation on recreational use and shoreline erosion. Local planners and stakeholder/user group representatives should also be interviewed to collect their assessment of the adequacy of existing facilities and the need for future recreation facilities and opportunities. The parameters and methods of the visitor survey and user group interviews should be developed in collaboration with interested stakeholders.

(2) Recreation Opportunities Inventory and Assessment.

All existing developed and dispersed recreation sites should be inventoried, including formal and informal trails, formal and informal access sites, and scenic viewing locations. The inventory should identify current use, current conditions, and any impacts that the project might have on these. We recommend consulting stakeholders in developing the survey instruments and protocol.

(3) Future and Potential Recreation Needs Assessment and Analysis.

This study element involves assessing what the potential and future recreation needs are. This includes reviewing the recently released Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2019-2023 and other literature reviews of local recreation plans, demographic trends, and site-specific information collected from the study elements outlined above. This needs analysis would compile all the information including stakeholder input and make recommendations on recreation mitigation measures for the project. Needs for those with mobility impairments should be included.

(4) Recreation carrying capacity.

This component would assess the suitability or capacity for various recreation opportunities at the project area to receive visitors without degrading recreational experiences or other resources. This assessment should also integrate the results of other biophysical study results. Various methods to use as a model include "Limits of Acceptable Change" or "Recreation Opportunity Spectrum." These estimates can then be used in development of the Recreation Plan.

(5) Aesthetics.

This component would include collecting baseline information on aesthetics in the area, including entryways to primary recreation areas such as the tail race fishing area from the highway, and also assessing the impacts of the project on this resource, including shoreline erosion.

(6) Final Product.
The final report should include an interim, draft, and final report with sufficient time for review and comment by stakeholders. The report should be used for discussions and decision-making with recreation stakeholders and recreation land managers to develop a draft Recreation Plan. The draft plan should include a provision to (monitor) every five years the recreation facilities condition, meet with local recreation stakeholders and land managers to identify enhancements, and improve facilities as needed throughout the license term.

NPSW Response:
NPSW developed a Recreation Survey Study Plan in consultation with WDNR, RAW, NPS, and the City of Cornell. It is included in Appendix G. The study will be completed in 2020.

The DLA will provide conceptual recreation designs for improvements to the shoreline fishing area downstream on the east bank of the tailwater including access and parking improvements and a barrier-free fishing pier on the shoreline in front of the City of Cornell's Mill Yard Park. As part of the new license, NPSW also plans to cooperate with the City of Cornell on their improvements to Mill Yard Park by granting them property rights to the shoreline in front of Mill Yard Park for park improvements.

J. Archaeological, Cultural, and Historical Resources

NPSW has been consulting with the Wisconsin State Historic Preservation Officer (SHPO) through an independent process. An archaeological survey of the project shoreline was completed in 2019, along with an evaluation of the eligibility of the project structures for inclusion in the National Register of Historic Places (NHRP). Both the archaeological survey report and the NRHP evaluation have been provided to the SHPO.

Mr. Michael LaRonge of the Forest County Potawatomi Community requested to receive a copy of the historic property identification survey. The report was delivered to Mr. LaRonge on February 25, 2020. On March 23, 2020, Mr. LaRonge concurred with the Phase I archaeological survey, which recommended a 5-year future monitoring schedule. He also requested to be involved in the interpretation, treatment, and handling if archaeological materials or human remains are inadvertently exposed during future operations.

K. Study Commitments and Implementation Timing

NPSW has committed to conduct the studies discussed above or provide the necessary information as part of relicensing. The study completion timeframe and the timing of delivery of final information is shown in Table 1 on the following page.

Table 1. Study Commitments and Implementation (Year)

Aquatic & Terrestrial Invasive Species Study	**Implementation**
Study plan developed in consultation with WDNR and RAW	2019/2020
Complete Study	2020
Forward Report for WDNR and RAW comment	2020/2021
Water Quality Study	**Implementation**
Study plan developed in consultation with WDNR and RAW	2019/2020
Complete Study	2020
Forward Report for WDNR and RAW comment	2020/2021
Mussel Study	**Implementation**
Study plan developed in consultation with WDNR and RAW	2019/2020
Complete Study	2020
Provide report to WDNR, RAW, and FWS comment	2020/2021
Flashboard Alternative Study	**Implementation**
Review options and feasibility	2019/2020
Include in DLA	2021
Water Level Fluctuation Study	**Implementation**
Include in License Application: requirement to study concurrent with relicensing of upstream and downstream projects	2021
Minimum Flow Requirement Study	**Implementation**
Include in License Application: requirement to study concurrent with relicensing of upstream and downstream projects	2021
Fish Entrainment Mortality Desktop Study	**Implementation**
Desktop Study plan developed in consultation with WDNR and RAW	2019/2020
Complete Desktop Study	2020
Provide report to WDNR and RAW	2020
Feasibility of Mitigation Measures Determination	**Implementation**
To be completed only if substantial mortality is projected	2020/2021
Recreation Use Study	**Implementation**
Study plan developed in consultation with WDNR, RAW, NPS, and City of Cornell	2019/2020
Complete Recreation Site Inventory and Assessment on Xcel Energy property	2020
Send out questionnaire	2020
Provide legal access to the shoreline near Mill Yard Park	2020/2021
Complete surveys	2020
Provide report to WDNR, RAW, NPS, and City of Cornell	2020/2021
Conceptual Designs Study	**Implementation**
Develop conceptual designs for shoreline fishing area, parking, and access	2020/2021
Provide Conceptual designs to WDNR for comment in DLA	2021

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Appendix A. Study Request Letters

Study request letters have been eFiled as a separate document.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix B. Study Explanation Sheets provided by the Wisconsin Department of Natural Resources

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Aquatic Invasive Species

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell

Name and title of staff requesting study: Jodi Lepsch, Lakes Biologist

Bureau & Division: Water Quality

Type of study being requested: Aquatic Plant

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	**Characterize the aquatic plant community of the Cornell impoundment and identify possible impacts of water level manipulations**
Are these goals and objectives in an existing department management plan?	No
How does the study relate to your program's management goals?	Protect aquatic resources including plant communities
What is the nexus between the dam's project operations and effects on the resource to be studied?	Drawdowns can change an aquatic plant community
How would the study results inform the development of license requirements and/or the state water quality certification?	
Describe existing information related to the study proposal and the need for additional information.	
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	Generally, plant data older than 10 years is not considered current enough to inform management decisions.
Describe study methodology and why it's important to follow DNR protocols.	The Point Intercept protocol must be used as it has been scientifically vetted.
How is the study consistent with generally accepted practices in the scientific community?	The PI protocol is what we use in the DNR and require it of contractors that are funded with state funds.
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	Species composition,
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	As a completed Excel workbook that can be found in the PI protocol guidelines
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats • anticipated number of personnel hours needed (in field and administrative) • number of individuals needed	Boat, GPS unit and sampling rake. The time needed will depend on the skill set of the contractor. It will likely take four to five days

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell

Name and title of staff requesting study: Jodi Lepsch, Lakes Biologist

Bureau & Division: Water Quality

Type of study being requested: Aquatic Invasive Species

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	**Identify any new invaders early enough to increase chances of control**
Are these goals and objectives in an existing department management plan?	No
How does the study relate to your program's management goals?	Protect aquatic resources including plant communities
What is the nexus between the dam's project operations and effects on the resource to be studied?	Water movement can transport AIS downstream
How would the study results inform the development of license requirements and/or the state water quality certification?	
Describe existing information related to the study proposal and the need for additional information.	Curly-leaf pondweed, Eurasian watermilfoil, rusty crayfish and purple loosestrife are currently known to be in the system. Early detection surveys would identify new invasions
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	AIS are constantly changing and absence of a species one year cannot be assumed to mean absence the following year.
Describe study methodology and why it's important to follow DNR protocols.	The Early Detection protocol must be used as it has been scientifically vetted.
How is the study consistent with generally accepted practices in the scientific community?	The Early Detection protocol is what the DNR uses and is required of contractors that are funded with state funds.
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	New AIS
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	Immediate notification of new species to regional lakes biologist
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats • anticipated number of personnel hours needed (in field and administrative) • number of individuals needed	Boat, GPS unit, sampling rake, D-net, data sheets. The time needed will depend on the skill set of the contractor. ED surveys generally take less than one day.

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Water Quality Studies

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell Hydroelectric Project (FERC Project No. 2639)

Name and title of staff requesting study: Chris Willger, Streams Biologist

Bureau & Division: Water Quality Bureau, Environmental Management Division

Type of study being requested: Dissolved Oxygen monitoring below the impoundment.

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	Collect dissolved oxygen data because impoundments can have impacts on downstream dissolved oxygen levels.
Are these goals and objectives in an existing department management plan?	Assess surface waters to ensure waterbody meets dissolved oxygen water quality standards.
How does the study relate to your program's management goals?	State water quality standards for dissolved oxygen.
What is the nexus between the dam's project operations and effects on the resource to be studied?	Impoundments can influence downstream dissolved oxygen levels Dissolved oxygen is critical to health and survival of aquatic organisms.
How would the study results inform the development of license requirements and/or the state water quality certification?	Initial grab DO data is needed to determine effects of dam operations on DO levels downstream.
Describe existing information related to the study proposal and the need for additional information.	There is currently no information relating to DO levels downstream of impoundment
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	Water quality data older than five years is not considered in management decisions.
Describe study methodology and why it's important to follow DNR protocols.	WisCALM protocol is used statewide and provides consistent comparison across resources assessed.
How is the study consistent with generally accepted practices in the scientific community?	WisCALMS protocol is used when making 303d impairment decisions
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	Initial morning grab DO meter reading are needed in summer months, to determine if low DO levels are an issue below the impoundment. If low DO levels are detected, continuous DO meter deployment will be necessary to determine if water is meeting water quality standards.
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	Grab samples can be submitted via email to WQ staff, if continuous DO meter deployment is determined necessary, that data can be uploaded to SWIMs
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats	Labslips, YSI handheld DO meter. Weekly morning grab samples below dam during summer months. 10 minutes a week.

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell Hydroelectric Project (FERC Project No. 2639)

Name and title of staff requesting study: Chris Willger, Streams Biologist

Bureau & Division: Water Quality Bureau, Environmental Management Division

Type of study being requested: Growing season total phosphorous sampling

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	Establish baseline total phosphorous concentrations above and below the flowage, to identify impacts of the impoundment on water quality downstream.
Are these goals and objectives in an existing department management plan?	Assess surface waters to ensure waterbody meets water quality standards.
How does the study relate to your program's management goals?	State water quality standards for total phosphorous.
What is the nexus between the dam's project operations and effects on the resource to be studied?	Impoundments play a role in the transformation of phosphorous and nutrient releases downstream.
How would the study results inform the development of license requirements and/or the state water quality certification?	Baseline data are needed to determine effects of dam operations on water quality.
Describe existing information related to the study proposal and the need for additional information.	No water quality data exists for total phosphorous in locations proposed.
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	Water quality data older than five years is not considered in management decisions.
Describe study methodology and why it's important to follow DNR protocols.	WisCALM protocol is used statewide and provides consistent comparison across resources assessed.
How is the study consistent with generally accepted practices in the scientific community?	WisCALMS protocol is used when making 303d impairment decisions
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	Growing season (May – October) total phosphorous median concentrations above and below the impoundment.
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	State certified lab should provide the water chemistry analysis and upload to DNR SWIMS database.
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats • anticipated number of personnel hours needed (in field and administrative) • number of individuals needed	Labslips, sample bottles, cooler, ice, sample preservative. Monthly sampling at both locations, May through October, ~1 hour of time, for one individual.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell

Name and title of staff requesting study: Jodi Lepsch, Lakes Biologist

Bureau & Division: Water Quality

Type of study being requested: Water Quality

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	**Characterize water quality of the impoundment**
Are these goals and objectives in an existing department management plan?	No
How does the study relate to your program's management goals?	Protect aquatic resources
What is the nexus between the dam's project operations and effects on the resource to be studied?	Changes in retention times can affect water temperature and nutrient release which can have detrimental effects downstream.
How would the study results inform the development of license requirements and/or the state water quality certification?	Baseline data are needed to determine effects of dam operations on water quality.
Describe existing information related to the study proposal and the need for additional information.	No water quality data exist for the impoundment
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	Water quality data older than five years is not considered in management decisions.
Describe study methodology and why it's important to follow DNR protocols.	WisCALMS protocol must be used as it has been scientifically vetted.
How is the study consistent with generally accepted practices in the scientific community?	WisCALMS protocol is used when making impairment decisions
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	Phosphorus, chlorophyll a and secchi depth; Dissolved oxygen, temperature, conductivity and pH profiles
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	Data are uploaded to SWIMS by certified labs
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats • anticipated number of personnel hours needed (in field and administrative) • number of individuals needed	Boat, GPS unit, bottles, acid, secchi disc, integrated sampler, YSI. Three in-lake sampling events are required each growing season for two years. Each sampling event should take less than one hour.

Fish Entrainment Study

Study Request for FERC Hydro Relicensing

Name of FERC dam & Project number: Cornell Hydroelectric Project (FERC Project No. 2639)

Name and title of staff requesting study: Joseph Gerbyshak, Senior Fisheries Biologist

Bureau & Division: WI Department of Natural Resources, Fish, Wildlife and Parks Division

Type of study being requested: Investigate fish entrainment mortality and options for reduction

Purpose: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions.

As specified in FERC's regulations any study request must answer the following criteria:

Identify the goals and objectives of the proposed study.	Goal: Estimate fish entrainment mortality and determine methods for reduction. Objective 1: Through desktop models, determine the probability of entrainment mortality for fish all of lengths that can pass through the existing trashracks. Objective 2: Through desktop models, determine the size of fish that would be excluded and approach velocities with narrower trashrack spacing. Estimate of entrainment morality of fish that can pass through narrowly spaced trashracks Objective 3: If desktop modeling suggests substantial entrainment mortality of large or adult fish, then confirm with an entrainment study and/or take action to reduce fish entrainment mortality. Objective 4: Identify the most effective method of reducing entrainment mortality.
Are these goals and objectives in an existing department management plan?	In the 2000 Lake Sturgeon Management Plan, Sec. 2.3b states a high priority as: Ensure the impacts of dams and habitat needs of species are considered during the FERC relicensing process
How does the study relate to your program's management goals?	A Ten Year Strategic Plan for Fisheries Management in Wisconsin 2015-2025; Goal 1: Use and integrated ecosystem approach to protect, restore, and enhance sustainable aquatic habitat and fish populations.
What is the nexus between the dam's project operations and effects on the resource to be studied?	The existing trashrack spacing maybe allowing for high entrainment mortality of adult fish.
How would the study results inform the development of license requirements and/or the state water quality certification?	If entrainment mortality of adult fish is high, then the license requirement will be to take steps to reduce entrainment mortality.
Describe existing information related to the study proposal and the need for additional information.	Chippewa River Fish Protection Study was conducted by Kleinschmidt Group in 2016 where 1" trashrack spacing was evaluated. The entrainment mortality with the current trashrack spacing was not evaluated. The Lake Wissota Entrainment and Turbine Survival Study was conducted in 1998 and 1999, but Lake Wissota has narrowly spaced trashracks, so direct comparisons can not be made.
Does your program have limits on how long data is beneficial? When is data considered too old to be relevant in characterizing the resource or creating management plans?	Fish populations change overtime, so it is recommended to use fisheries survey information from within the past 20 years.

Change to:
1) Existing
2) 2.5"
3) Adult Fish

Describe study methodology and why it's important to follow DNR protocols.	The DNR does not have a protocol for this evaluation.
How is the study consistent with generally accepted practices in the scientific community?	Without directly measuring entrainment mortality in the field, desktop modeling is the next best option.
Identify information to be provided by the study (e.g. species composition, data, frequency and duration)	1.Maximum length of fish that can pass through the existing trashracks. 2. Entrainment mortality associated with various lengths of fish that that are able to be entrained. 3.Options to reduce entrainment mortality and the effectiveness of each option.
Describe how data should be submitted to DNR. (i.e. through SWIMS or another database)	Report containing all data collected and results from analysis.
Describe the level of effort. • anticipated equipment and supplies, including vehicles and boats • anticipated number of personnel hours needed (in field and administrative) • number of individuals needed	This information depends on how Xcel Energy would like to handle estimating and reducing entrainment mortality.

Additional comments to be considered in the study request:

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix C. Aquatic and Terrestrial Invasive Species Study Plan

The plan has been eFiled as a separate document.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix D. Water Quality Study Plan

The plan has been eFiled as a separate document.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix E. Mussel Study Plan

The plan has been eFiled as a separate document.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix F. Desktop Entrainment Mortality Study Plan

The plan has been eFiled as a separate document.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Appendix G. Recreation Use Study Plan

The plan has been eFiled as a separate document.

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Document Accession #: 20200713-5110 Filed Date: 07/13/2020

United States Department of the Interior

NATIONAL PARK SERVICE
Midwest Region, Wisconsin Field Office
626 E. Wisconsin Ave., Suite 400
Milwaukee, WI 53202

May 13, 2019

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

Electronic Filing

Re: National Park Service Comment on Pre-Application Document and Study Request; Cornell Hydroelectric Project, FERC Project No. 2639; Chippewa River, City of Cornell, Chippewa County, Wisconsin

Dear Secretary Bose:

The National Park Service (NPS) respectfully submits the following comments in response to the filing to the Federal Energy Regulatory Commission (FERC) of a Pre-application Document (PAD) and Notice of Intent for the Cornell Hydroelectric Project, FERC Number P-2639, dated November 29, 2018. The FERC agreed to Xcel Energy's request to use the Traditional Licensing Process (TLP) for relicensing on February 5, 2019. A joint agency meeting was held March 19, 2019.

The Project has an installed capacity of 30.75 megawatts and is licensed to Northern States Power (Xcel Energy). The impoundment (Cornell Flowage) is 897 surface acres with an allowed elevation fluctuation of half a foot in spring; one foot (during certain hours) in summer; and 2 feet at all other times. Minimum flow is 400 cubic feet per second.

Background

We offer the following comments and recommendations pursuant to section 10(a) of the Federal Power Act (18 CFR 4.38(a), 5.41(f)(4)-(6), and 16.8(a); the Outdoor Recreation Act (Public Law 88-29); the National Park Service Organic Act (39 Stat. 535); and the National Wild and Scenic Rivers Act (Section 11(b)).

It is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to relicensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting

for those projects. Identifying opportunities to improve the recreation experience is consistent with NPS policy and FERC guidelines to identify future potential recreation needs.

Comments

The Chippewa River is a highly valued North Central Wisconsin river which provides an important focal point for the region's land and water based recreational opportunities. The Cornell Project is a long, linear impoundment and hosts a variety of recreational opportunities important to the community and visitors seeking an outdoor, natural experience. The project provides a crossroads or network hub of local trails within and linking to the City of Cornell, the Old Abe State Trail, and the federal Ice Age National Scenic Trail.

No recreation study nor enhancements are proposed in the PAD. However, recreation enhancements are needed and a study would provide information on which to base enhancement decisions.

The PAD describes some project-specific recreational facilities but misses important others. One recreation site not mentioned in the PAD is an actively used but informal tailwater fishing area on the east side not far downstream from the spillway. This site lacks safe access causing anglers to tread a narrow, rocky unsafe footpath pressed between a tall fence paralleling the river and a steep slope; the site also lacks signage, a restroom facility, formal parking, etc. In addition, the PAD does not mention the need for new and improved signage within the project boundaries so that recreational facilities are clearly identified from the road and wayfinding is easily made along the various trails. The PAD also lacks mention of an existing informal access point on the upper impoundment, west side near 260th Avenue, where users are eroding the steep slope to gain access. No mention is made of the condition of existing facilities such as boat ramps, waterside camping, trails within the shorelands buffer area, etc., within the project boundary in general and within Brunet Island State Park.

Several existing facilities within the project boundary have outdated management plans, included in the appendices, which identify outdated recreation needs. For example, the City of Cornell identified a need to update their 10-year old recreation plan which includes the Mill Yard Park; the City more recently identified enhancement needs at the park which includes a carry-in access site, riverwalk, a visitor center, a historic wood stacker, etc. Another example of an outdated plan is the 1986 management plan for Brunet Island State Park which includes camping, trails, boat launches, restroom facilities etc. The licensee has not determined current recreational needs at these and other areas within the project boundary.

Study Request

<u>Recreation Study</u>

The Pre-application Document (PAD) states a recreation study will be not be conducted. As indicated above, the PAD lacks critical recreation information and needs defined by FERC, clearly indicating the need for a recreation study. This proposed study methodology is in keeping with similar studies required by FERC to collect current recreational information associated with licensing.

Study Description and Objectives (§5.9(b)(1))

The objective of this study is to obtain subjective assessment of facility condition or measures needed but currently absent; determine capacity of existing facilities to address current and future user

demand; and produce sufficient information to evaluate such impacts as well as provide the basis for making recreation enhancement recommendations.

Resource Management Goals (§5.9(b)(2)

It is within NPS authority to consult with the FERC and applicants concerning a proposed project's effects on outdoor recreation resources under the Federal Power Act (18 CFR §§ 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (PL 88-29) and the NPS Organic Act (16 USC et seq.). The WSR Act (section 11(b)) also directs the NPS to assist, advise, and cooperate with governments, landowners, or individuals to plan, protect, and manage river and river-related resources.

It is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. FERC guidelines and the Federal Power Act also provide direction to give equal consideration to other resources associated with the project.

Relevant Public Interest (§5.9(b)(3))

It is in the public interest to provide a full assessment of the project's impacts on recreation resources and opportunities as well as identify potential mitigation and enhancements to address those impacts.

The FERC requires that license applications must be consistent with comprehensive plans, one of which is the Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP), recently updated for 2019-2023. The SCORP mentions trails as the largest need statewide, stating that more trails would "enable people to experience natural setting… and access favorite sites." The 2019-2023 SCORP states "Access to water remains a universal need throughout the state" and identifies the demand for more camping opportunities. In addition, this SCORP states specifically for the Western Sands Region a need for several water and land based recreation demands including canoeing/kayaking, fishing, swimming in lakes and rivers, bird or wildlife viewing, trail use such as hiking and walking.

The Draft Ice Age Trail Chippewa County Corridor and Environmental Assessment states that the City of Cornell met with planners and managers of the Ice Age Trail and of the Old Abe Trail and identified their desire to better connect with trail users via wayfinding signage and other amenities to foster their desire to become a "Trail Town". The draft report states that "there is "strong opportunity for growth and demand," and that "Region 4 has a relatively low level of recreational land but receives heavy recreational use due to its proximity to the Twin Cities and the growing population of the region itself." Region 4 population has grown about twice as fast as the state of Wisconsin overall, yet has less than 6% of land in public ownership, relatively few compared to the rest of the state.

The study will identify opportunities such as improving access points, enhancing trails, enhancing campgrounds, beach areas, developing and installing wayfinding and interpretive signage, etc., among other needs currently lacking.

Existing Information (§5.9(b)(4))

The PAD includes several outdated recreation plans which further emphasize the need for a recreation study to provide current information:

- City of Cornell Recreation Plan, 2010; although the City of Cornell has no up to date recreation plan, it has identified potential improvements to Mill Yard Park. These include a riverwalk, possible handicapped accessible (barrier-free) fishing pier along river, and canoe/kayak boat dock with access to water. Future development of the Mill Yard Park may also include an area for outdoor concerts and additional trails.
- Brunet Island State Park Concept Plan, 1986
- Chippewa County Outdoor Recreation Plan, 2010-2015; data from before 2010.

Other plans to reference:

- Updated Wisconsin SCORP 2019-2023, mentioned above
- Regional and Property Analysis: Chippewa Moraine State Recreation Area (Jan. 4, 2017 version); includes references to recreation demand in the project area such as Brunet Island, Ice Age Trail, City of Cornell, etc.
- Ice Age Trail Chippewa County Corridor and Environmental Assessment (currently in Draft form; estimated availability in December 2019

Nexus to Project (§5.9(b)(5))

A clear nexus exists between project facilities that affect recreation opportunities and the proposed study; this study would fully describe existing conditions and enhancement opportunities to inform decision making and license application preparation.

Study Methodology (§5.9(b)(6))

(1) Recreation Demand. This analysis involves assessing the quality of the visitor's experience through visitor and land manager surveys. The user contact survey would obtain user-feedback assessment on the adequacy of existing recreational facilities including access points, trails and trail network connectivity in the project and to the City of Cornell, camping areas, swimming beach, wayfinding and interpretive signs, and capability of current facilities to meet existing recreation demand. In addition, the surveys should obtain user feedback on facilities or operational measures, e.g., possible impacts of impoundment fluctuation on recreational use and shoreline erosion. Local planners and stakeholder/user group representatives should also be interviewed to collect their assessment of the adequacy of existing facilities and the need for future recreation facilities and opportunities. The parameters and methods of the visitor survey and user group interviews should be developed in collaboration with interested stakeholders.

(2) Recreation Opportunities Inventory and Assessment. All existing developed and dispersed recreation sites should be inventoried, including formal and informal trails, formal and informal access sites, and scenic viewing locations. The inventory should identify current use, current conditions, and any impacts that the project might have on these. We recommend consulting stakeholders in developing the survey instruments and protocol.

(3) Future and Potential Recreation Needs Assessment and Analysis. This study element involves assessing what the potential and future recreation needs are. This includes reviewing the recently released Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2019-2023 and other literature reviews of local recreation plans, demographic trends, and site-specific information collected from the study elements outlined above. This needs analysis would compile all the information

including stakeholder input and make recommendations on recreation mitigation measures for the project. Needs for those with mobility impairments should be included.

(4) Recreation carrying capacity. This component would assess the suitability or capacity for various recreation opportunities at the project area to receive visitors without degrading recreational experiences or other resources. This assessment should also integrate the results of other biophysical study results. Various methods to use as a model include "Limits of Acceptable Change" or "Recreation Opportunity Spectrum." These estimates can then be used in development of the Recreation Plan.

(5) Aesthetics. This component would include collecting baseline information on aesthetics in the area, including entryways to primary recreation areas such as the tail race fishing area from the highway, and also assessing the impacts of the project on this resource, including shoreline erosion.

(6) Final Product. The final report should include an interim, draft, and final report with sufficient time for review and comment by stakeholders. The report should be used for discussions and decision-making with recreation stakeholders and recreation land managers to develop a draft Recreation Plan. The draft plan should include a provision to every five years monitor the recreation facilities condition, meet with local recreation stakeholders and land managers to identify enhancements, and improve facilities as needed throughout the license term.

Level of Effort and Cost (§5.9(b)(7))

This study request addresses the Federal Power Act Section 10(a) direction and the methodology is consistent with generally accepted practice in the professional outdoor recreation community. It would include field work, community/stakeholder outreach, and professional assessment. Study costs would depend on consultant fees (rate unknown), volunteer or student contributions, and the amount of available information. A rough estimate depending on limited existing information and sourcing of labor may range between $10,000 and $20,000.

CONCLUSION

We appreciate the opportunity to provide comments on the PAD and provide study recommendations for the project. We look forward to working with the licensee, stakeholders, and the Federal Energy Regulatory Commission on this license application. Should you have any questions regarding these comments, please contact me at 414.297.3605 or angie_tornes@nps.gov.

Sincerely,

Angela M. Tornes, Midwest Region Coordinator
Hydropower Assistance Program

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

May 15, 2019

Mr. Shawn Puzen
Mead & Hunt, Inc.
2440 Deming Way
Middleton, Wisconsin 54115

Re: Preliminary Information Document (PAD) and recommended studies for relicensing the Cornell Hydroelectric (hydro) Project, Chippewa River (FERC No. 2639)

Dear Mr. Puzen:

The River Alliance of Wisconsin (RAW) has reviewed the PAD for the Cornell Hydro Project on the Chippewa River. We intend to participate in relicensing of this project and hope that you seriously consider our concerns and recommendations listed below as you prepare the draft Application for License.

COMMENTS ON THE PAD

Please address our comments on the PAD in the draft Application for License.

Page 8. 3.2.1.2. Powerhouse Section. It is stated that turbine units No. 1, 2, and 3, each have their own intake and that a vertical bar trash rack protects all three intakes from debris. The clear spacing between the vertical bars is 5.375 inches. We are very concerned that with such wide spacing between bars that larger bodied fish are susceptible to being entrained through the plant and thus, be subjected to injury or death from turbine runners and wicket gates. It is well documented in the scientific literature that many species of fish such as walleye, adult lake sturgeon, juvenile lake sturgeon, smallmouth bass, and northern pike move many miles seasonally upstream and downstream to spawning, wintering, and foraging habitat. Although larger fish likely have the swimming ability to avoid the through the rack intake velocity at Cornell, they may want to willingly move downstream to other habitats as part of their life cycle. Many turbine survival studies conducted at hydro projects on Wisconsin Rivers in the last 30 years have shown that turbine injury and mortality does occur. Fish survival rates are highly variable among sites. An entrainment study was conducted at Wissota Hydro in 1998-1999. It has a trash rack spacing of 3.75 inches. Data from this study is being used to predict fish survival at the Cornell Project, even though trash rack spacing is about two more inches wider than at Wissota. Our Consultant tells us that in his experience reviewing numerous entrainment studies, and the associated modeling that accompanies them, that in his professional opinion to extrapolate survival data among hydro sites risks accuracy. We believe reducing the clear spacing at the Cornell trash rack to two inches would exclude many larger round bodied fish and help considerably to minimize injury or death to them.

Natural Resources Fund (NRF). We recommend that the Cornell Project be promoted as eligible for proposals that are submitted annually to XE through the *Lower Chippewa River Settlement Agreement (LCRSA) – Natural Resources Fund (NRF)*.

RIVER ALLIANCE of WISCONSIN
147 S. Butler Street, Suite 2
Madison, WI 53703
info@wisconsinrivers.org
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wisconsinrivers.org

Rational. The RAW has been a member of the LCRSA – IT since its inception in 2003. The focus of most NRF projects have been at Dells, Jim Falls, Wissota, and Holcombe Hydro Projects. The IT has witnessed a very successful program of allocating funds from the NRF to applicants for projects which resulted in important environmental survey data or direct on-the-ground habitat improvement work in the Lower Chippewa River. We would like to see environmental improvement projects occur in the Cornell Project area as well during the period of the new license. This may require some minor restructuring of the LCRSA through the FERC.

RECOMMENDED STUDIES

1.Mussel survey. In consultation with the Wisconsin DNR and U.S. Fish and Wildlife Service (FWS) conduct a mussel study in the Cornell Flowage and in the tailwater of the dam.

Rational

1*. Identify the basis for determination of the recommended study*

Mussels are an important component of a river system and are sensitive to changes in flow discharge in the tailwater of a dam and to water level fluctuations in a reservoir. The Cornell Hydro Project is operated as a modified peaking operation. Mussels are not very mobile and can be easily adversely affected by hydro operations in terms of species diversity and relative abundance within the zone of fluctuating flow and fluctuating water levels. There is also good reason for a mussel study to document the presence of any State or Federal threatened or endangered species that may occur in the project area. For example, on page 31 of the PAD it is stated that the *purple warty back* mussel, listed as endangered in Wisconsin, is likely to occur in the Chippewa River in the project vicinity.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

It is stated on page 31 of the PAD that the Licensee has been unable to obtain any existing information on freshwater mussels. Therefore, there is good reason to conduct a mussel survey to determine what species could be affected by project operations.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or U.S. Fish and Wildlife Service (FWS) mussel experts. At a minimum, data on mussel species diversity and frequency of abundance should be obtained from sampling.

4*. Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or FWS. Please consult resource agency staff.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project*

Mussel data will be useful in the short term and long term if it is place on a state-wide data base administrated by the Wisconsin DNR. It will be useful for documenting what mussel species are present currently in the project area and useful in evaluating long term trends in the mussel community there. Further, if a water resource project is planned in the area, a current list of mussels will be needed by the developer to evaluate potential affects to the mussel community that could result from the project.

2.Aquatic and terrestrial Invasive species study (ATIS). Conduct an ATIS survey within the Cornell Flowage and in in the tailwater. The species to be sampled should include *Restricted Species* per Wisconsin Administrative Code (NR 40): invasive species already established in Wisconsin. We note from page 37 of the PAD that Cornell is currently being monitored for purple loosestrife as part of a larger effort on the Chippewa River pursuant to an *Exotic Control Plan*. However, there are many other invasive species to consider.

Rational

1. *Identify the basis for determination of the recommended study*

Species such as purple loosestrife, Eurasian watermilfoil, and curly-leaf pondweed are invasive wetland plants which out-compete many other valuable wetland plants and can dominate the species composition of a wetland or aquatic macrophyte bed in a few years. Terrestrial invasive plants have the same pattern and can out-compete native vegetation as well. There is little food value for wildlife from purple loosestrife; accordingly, infestation of valuable wetlands by this plant is extremely undesirable and harmful. Eurasian watermilfoil and curly-leaf pondweed can rapidly cause aquatic weed problems and alter fish communities by providing too much refugia leading to overpopulation and/or growth stunting problems in the reservoirs and flowages. Likewise, rusty crayfish and zebra mussels can cause pronounced ecological changes in rivers and impoundments. The Zebra mussels rapid reproduction, coupled with its consumption of microscopic plants and animals, adversely affects the aquatic food web and can place valuable sport fisheries at risk. In addition, zebra mussel infestation can severely reduce native mussel populations by displacing their habitat and by actually attaching to an individual mussel's shell. Measures to control invasive species are limited, but control measures such as use of beetles, weevils, spot herbicide spraying, and hand harvesting have shown to be effective.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

Reference information under No. 1, above.

3. *Explain why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR. Please consult resource agency staff.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The ATIS data will be very useful to the resource agencies, academia and the public if it is housed in a statewide data base administrated by the Wisconsin DNR. The study will show species and species frequency of abundance currently at Cornell. The data can be used over the long term to demonstrate success of any control practice implemented.

1.Recreation. Evaluate the existing condition of recreational facilities and needed upgrades. Evaluate the need for additional facilities to adequately serve the public. Update the recreational brochure for the project to reflect new improvements. Prepare a draft *Recreation Plan* for the project to be reviewed by the resource agencies and other stakeholders.

Rational

1. Identify the basis for determination of the recommended study

The reservoirs and riverine sections of rivers impounded by hydroelectric dams have long ago become major sources of recreation for the public. The FERC and the publics' permission for a Utility to use of a river to generate hydropower requires that recreational facilities be installed within the project boundary and kept in good condition for public use. When a project undergoes relicensing, that is the logical and most practical time for a Utility to do a recreational use study and develop a *Recreational Plan*.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

People are entitled through the *Public Trust Doctrine* to use the reservoirs and riverine sections impounded by dams for recreational use. This includes fishing, boating, hiking picnicking, camping, and other non-consumptive wildlife-oriented uses.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or National Park Service (NPS). Please consult resource agency staff.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or NPS.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The information generated by a recreational use study will be useful to the understanding of the resource agencies, Indian Tribes, and general public in terms of what recreational facilities are present, where they are within the project boundary, what condition they are in and what types of recreation they accommodate. The *Recreation Plan* will be an informative document to all parties that participate in relicensing. Further it will provide a plan for the Licensee to implement during the period of the new license.

We look forward to further participation in relicensing this project to help accomplish environmental protection and improvement at this project. If you have questions on our comments, please contact me at (608) 257-2424 (ext. 115). Also, please feel free to call our Hydro Consultant, Mr. James Fossum at (507) 429-9129.

Sincerely,

Raj Shukla
Executive Director

Cc: Ms. Kimberly D. Bose, Secretary, Washington DC
Matt Miller, Xcel Energy, Eau Claire, WI
Nick Utrup, USFWS, Bloomington, MN
Angela Tornes, NPS, Milwaukee, WI
Cheryl Laatch, Wisconsin DNR, Horicon, WI
Jim Fossum, *JDFossum Environmental Consulting*, Winona, MN

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

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May 17, 2019

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

Matt Miller, Xcel Energy
1414 West Hamilton Avenue
PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Proposed Studies for the Cornell Hydroelectric Dam, p-2639

Dear Ms. Bose and Mr. Miller:

The department appreciates the opportunity to participate in the process to relicense the Cornell hydroelectric dam, as proposed in the Preliminary Application Document (PAD), filed with the Federal Energy Regulatory Commission (FERC) on November 29, 2018.

Many of our requests for studies or information are directly correlated to the 2000 Lake Sturgeon Management Plan, which states that it is a high priority to ensure the impacts of dams and habitat needs of species are considered during the FERC relicensing process. The departments Ten-Year Strategic Plan for Fisheries Management in Wisconsin 2015-2025 has a defined goal of using an integrated ecosystem approach to protect, restore, and enhance sustainable aquatic habitat and fish populations. Additionally, studies and information for water quality and invasive species management are directly connected to our requirements under the Clean Water Act to maintain water quality standards, and to our NR40 requirements to manage invasive species.

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Sincerely,

Cheryl Laatsch
Wisconsin Department of Natural Resources State FERC Coordinator

Study Requests and Request for Information
Relicense of Cornell Hydroelectric Dam

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Please work with department to determine which department protocols are appropriate for both the impoundment and the riverine portions of the project area. The departments protocols for Point Intercept Survey and Lakes Early Detection Protocols to ensure scientific integrity. The information collected from this study includes an assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization.

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If the operating range is determined to lead to extensive dewatering of backwater areas, then the operating range will need to be modified when the settlement agreement expires in 2033.

MINIMIUM FLOWS AND OPERATIONAL IMPACTS TO FISH HABITAT: Rapid or frequent changes in water levels can have negative impacts on water resources. Additionally, low water conditions and dewatering of critical habitat can lead to declines in fish populations.

An Instream Flow Incremental Methodology (IFIM) study was conducted in 1997 during the relicensing of other hydro facilities on the Chippewa River. The results should be evaluated to determine if the current minimum flow is allowing for optimal habitat utilization.

Please review the IFIM summary from 1997 to evaluate habitat suitability at a range of minimum flows for smallmouth bass, walleye, lake sturgeon, and redhorse suckers. Using the IFIM, determine habitat utilization of smallmouth bass, walleye, lake sturgeon, and redhorse suckers at different minimum flows (400cfs and above). The minimum flow permitted is 400cfs which may not allow optimal habitat utilization for many aquatic species.

If higher minimum flows allow for substantially greater habitat utilization, then a higher minimum flow may be required.

ESTIMATE FISH ENTRAINMENT MORTALITY AND DETERMINE METHODS TO MINIMIZE IMPACTS TO LARGE RIVERINE FISH SPECIES: Entrainment through hydro facilities can lead to high mortality especially in adult fish. The Cornell hydro dam has the largest trash rack spacing of any of the dams on the lower Chippewa River at 5 3/8" allowing all life stages of fish, including lake sturgeon up to 40", to become entrained which may be preventing the fishery from reaching its full potential. Specifically, the department is concerned with species impacts to lake sturgeon, muskellunge, walleye and redhorse suckers.

Through desktop models, determine the probability of entrainment mortality for lake sturgeon, muskellunge, walleye, and redhorse suckers for all lengths that can pass through the existing trash racks. The study should evaluate and determine the size of fish that would be excluded and the approach velocities for 2.5" trash rack spacing. If desktop modeling suggests substantial entrainment mortality of the previously mentioned fish species at the current trash rack spacing, then follow up studies will be needed to confirm entrainment or measures will need to be taken to minimize entrainment mortality.

PUBLIC ACCESS TO THE CHIPPEWA RIVER: As part of the license application, please identify locations and options to increase and/or improve shore access to the tailrace fishery and to the impoundment. Improvement identification should include, available and needed parking, access from walkways or trails, public space areas, fishing platforms, handicap accessible options and locations, maps and public awareness of public access features. Costs, land ownership, improvement capabilities, and maintenance should be discussed as part of options to increase or improve public access.

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

CITY OF CORNELL
P.O. BOX 796 • 222 MAIN STREET • CORNELL, WI 54732-0796
PHONE: 715-239-3710 • FAX: 715-239-3721
Email: cornellcityoffice@centurytel.net • www.cityofcornell.com

May 17, 2019

RE: Cornell Hydroelectric Project
FERC No. 2639
Licensee: Northern States Power (Xcel Energy)

To Whom it May Concern:

Recreation is an important resource in the City of Cornell. The Cornell Flowage of the Chippewa River is a focal point in our community; one that draws visitors and residents year-round. The Cornell Hydroelectric Dam has shaped the community to what it is today and it is important that our park is a place where everyone can enjoy the beauty of the area and the great outdoors.

The City is currently updating its Comprehensive Outdoor Recreation Plan. The Plan includes specific improvements in Mill Yard Park, which is adjacent to land owned by Northern State Power and the Chippewa River. We are requesting that recreational improvements be included in the draft license application being submitted by Xcel Energy for the Cornell Hydroelectric Project. We are currently finalizing the Comprehensive Outdoor Recreation Plan and will have it completed by September 30, 2019. It will then be available for review and use by FERC and Xcel Energy.

A few items of interest that are included in our initial draft are:

1. obtaining shoreline rights along the river:
    a. to construct and maintain a trail and trailhead facilities
    b. to control invasive plant species
    c. to control underbrush to allow for viewing of this beautiful segment of the river (it's been mentioned that this site with the islands in the backdrop provides one of the most beautiful sunsets you'll ever witness);
2. improvements of the tail race area for fishing to include possible boat access;
3. a kayak/canoe launch area;
4. a barrier free fishing pier.

The City would appreciate working closely with Xcel on these and other potential recreational system improvements.

Please let me know if you have any questions.

Sincerely,

Judy Talbot

Judy Talbot, Mayor

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Cornell Hydroelectric Project
FERC No. 2639

Final Study Plan

Aquatic and Terrestrial Invasive Species Study

Prepared for

Prepared by

Mead & Hunt

meadhunt.com

February 2020

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TABLE OF CONTENTS

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LIST OF ACRONYMS

Applicant	Xcel Energy Services, Inc.
ATIS	Aquatic and Invasive Species Study
Commission	Federal Energy Regulatory Commission
FERC	Federal Energy Regulatory Commission
Licensee	Northern States Power Company
NR 40	Chapter NR 40 of the Wisconsin Administrative Code
PAD	Pre-Application Document
Project	Cornell Hydroelectric Project
SWIMS	Surface Water Information Management System
RAW	River Alliance of Wisconsin
WDNR	Wisconsin Department of Natural Resources
Xcel Energy	Xcel Energy Services, Inc.

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1. INTRODUCTION

Xcel Energy Services Inc. (Xcel Energy), on behalf of Northern States Power Company, a Wisconsin corporation (Licensee, Applicant) currently holds a license issued by the Federal Energy Regulatory Commission (FERC) to operate and maintain the Cornell Hydroelectric Project (Project). The Project is operated and maintained by the Licensee. The current license, which designates the Project as FERC No. 2639, expires on November 30, 2023. In order to a new license, the Licensee must submit a final license application to FERC no later than November 30, 2021.

On March 19, 2019, the Licensee held a Joint Agency Meeting to present information about the Project. At the meeting and during the 60-day period after the meeting, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) and River Alliance of Wisconsin (RAW) requested the Licensee to complete an invasive species study as part of relicensing. The WDNR requested that the survey include the presence/absence of aquatic invasive species listed under NR 40. The RAW requested that the survey include restricted species under NR 40 and they did not restrict their request to aquatic species. Copies of the study requests are available in Appendix 1.

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2. STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the Aquatic and Terrestrial Invasive Species (ATIS) Study is to provide baseline data on native species and aquatic invasive species listed under NR 40. The study will also identify newly invading species early enough to increase chances of control and help prevent the spread of other nearby invasive species.

2.2 Background and Existing Information

Xcel Energy has been surveying the Cornell Reservoir for Purple loosestrife (Lythrum salicaria) since 2004. It was first identified by Xcel Energy as present on the Cornell Reservoir in 2004. According to the WDNR, the presence of curly-leaf pondweed (Potamogeton crispus) in the Cornell Reservoir was verified and vouchered in 2007. Eurasian water-milfoil (Myriophyllum spicatum) was verified and vouchered in the Cornell Reservoir in 2009. Purple loosestrife and rusty crayfish (*Orconectes rusticus*) were verified in the Cornell Reservoir in 2007 (WDNR 2018b). All four of these invasive species are listed as restricted under NR 40.

On September 8, 2015, according to the Surface Water Information Management System (SWIMS) provided by the WDNR, six hours were expended towing for water fleas on the reservoir. The consolidated sample analysis provided negative results for both the spiny water flea and fishhook water flea. Field technicians also indicated they did not identify the presence of any of the following invasive species listed by common name:

Asiatic clam
Banded mystery snail
Brazilian waterweed
Chinese mystery snails
Didymo
European frogbit
Fanwort
Faucet snails
Flowering rush
Hydrilla
Japanese knotweed
New Zealand mudsnails
Parrot feather
Phragmites
Quagga mussels
Red swamp crayfish
Water chestnut
Water hyacinth
Water lettuce
Yellow flag iris

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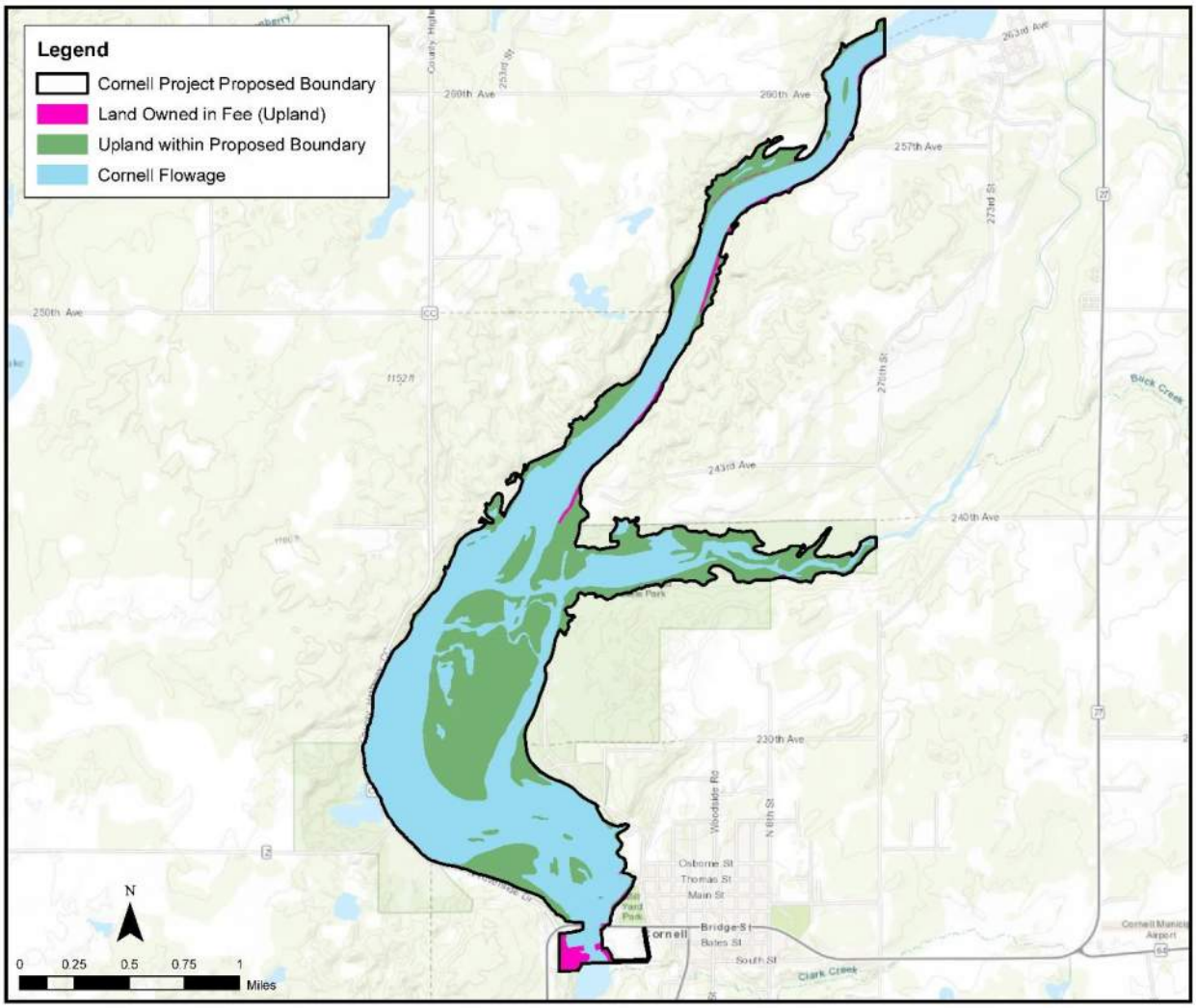
Yellow floating heart

2.3 Nexus between Project Operations and Effects on Resources

Invasive species can be introduced to Project waters and lands through recreational activities such as boating and four-wheeling. These species, once established within the Project boundary, can be transferred downstream through water releases or to areas outside of the project boundary by recreationists.

2.4 Study Area

The ATIS Study will encompass the upstream and downstream inundated portions of the Chippewa River contained within the proposed project boundary outlined in the Pre-Application Document (PAD). It will also encompass upland areas owned in fee by the Licensee within the proposed project boundary. Both areas are depicted below.



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2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas

Samples will be collected in locations outlined in a point-intercept grid provided by the WDNR. Sampling will be completed in June and late July or early August of 2020. The sampling will be completed by boat using either a pole-mounted rake or rope-mounted rake approximating the WDNR Point-Intercept protocols absent the voucher specimen collection (See Appendix 2). The methodology will also incorporate as many parameters as applicable of those listed in Table 1, page 31 of the protocol (See Appendix 2, page 31 of the protocol).

One rake sample per collection site will be taken by lowering the rake to the bottom and slowly drawing it up to the surface. The sample will be inspected for the presence of invasive species as included in NR 40[1]. Their presence and percentage of abundance within the sample will be recorded on a field data sheet accordingly along with the presence and percentage of abundance of native species.

Any areas that are not safely accessible will be noted in the report with one of the following reasons:

- Non-navigable (due to thick emergent plant growth or shallow water);
- Terrestrial (point-intercept located in an upland area not owned by licensee);
- Obstacle (rocks, dock, swim area);
- Temporary obstacle (temporary obstacle should be noted);
- No information (accidentally missed or inaccessible, state reason); and
- Other (provide brief description).

No permanent voucher specimens will be collected. Live voucher specimens may be collected if the identification of the species is questionable. Live voucher specimens with a questionable identity will be provided to the WDNR invasive species coordinator for identification.

In addition to the rake sampling, one water sample will be collected in both the reservoir and tailwater during the July/August survey period. The water samples will be provided to the WDNR invasive species coordinator where they can be analyzed for the presence of spiny water flea, fishhook water flea, and zebra mussel veligers.

2.5.2 Upland Shorelines not owned by Licensee

Upland shoreline areas not owned by Licensee will be surveyed from the boat while moving slowly along the shoreline. During the survey, an overall characterization of the terrestrial plant composition will be made. Terrestrial plants included in NR 40 will be noted and their locations on the shoreline identified by latitude and longitude. An estimate of relative abundance and the length of shoreline where each species is present will be recorded for future mapping.

[1] https://dnr.wi.gov/topic/Invasives/documents/NR40plantlist.pdf

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2.5.3 Upland Areas owned by the Licensee

A meander survey will be utilized for upland areas owned by the License. During the meander survey, an overall characterization of the terrestrial plant community will be made. If any terrestrial plants listed in NR 40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of relative abundance and the length of shoreline where the species is present will be recorded for future mapping. The route traveled during the meander survey will also be recorded for future mapping.

2.5.4 Personnel Qualifications

All surveys will be conducted by an individual with prior aquatic plant identification training and experience with previous point intercept surveys or an individual pre-approved by the WDNR.

2.5.5 Notifications

In the event a new occurrence of an invasive species listed on the rapid response sheet contained in Appendix 3 is identified during monitoring, WDNR will be notified at invasive.species@wisconsin.gov as soon as possible, but no later than five working days after its discovery. The notification will also include pictures and submittal of the online WDNR Early Detection Form to the WDNR.

2.5.6 Survey Report

A written report will be developed summarizing the monitoring results including the location of each species observed and their relative abundance. The information will be provided in an Excel spreadsheet that follows the Point-Intercept Guidelines. Corresponding maps will show the locations of the point intercept survey locations and the meander survey routes. The point intercept locations where the presence of NR 40 species are observed will be differentiated from the locations with negative sample results. An overall map showing the predominant species in an area will also be created along with a map showing the locations and the invasive species identified during the surveys.

Lastly, the report will also include all field sheets and completed WDNR forms for any observed new occurrences of aquatic invasive species identified in the Rapid Response List as well as verification photographs.

2.6 Consistency with Generally Accepted Scientific Practice

The ATIS Survey follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been approved by the Commission in post-licensing compliance plans.

2.7 Project Schedule

The fieldwork and reporting aspects of this project will be completed by November 1, 2020.

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3. CONSULTATION

The ATIS was requested by both the WDNR and the RAW. As a result, the Licensee consulted with both parties as follows.

3.1 Wisconsin Department of Natural Resources

On January 2, 2020, the Licensee, through its consultant Mead & Hunt provided a draft copy of the ATIS plan to the WDNR for comment. The WDNR did not respond with comments and a subsequent telephone conversation with Cheryl Laatsch of the WDNR indicated no comments would be provided. Documentation of Consultation is included in Appendix 4.

3.2 River Alliance of Wisconsin

On January 2, 2020, the Licensee, through its consultant Mead & hunt provided a draft copy of the ATIS plan to RAW for comment. RAW provided comments on January 16, 2020. The minor comments have been incorporated into the final plan. Documentation of Consultation is included in Appendix 4.

4. REFERENCES

River Alliance of Wisconsin, (RAW), January 16, 2020 email from J. Fossum to S. Puzen.

Wisconsin Department of Natural Resources (WDNR) Website. 2018a. https://dnr.wi.gov/topic/Invasives/classification.html. Accessed October 22, 2018.

Wisconsin Department of Natural Resources (WDNR). Find A Lake Website. 2018b. https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2181400&page=invasive. Accessed October 22, 2018.

Xcel Energy. 2018. Pre-Application Document-Cornell Hydroelectric Project. Prepared by Mead & Hunt, Inc. November 30, 2018.

Xcel Energy. 2018. Purple Loosestrife Assessment 2018. Prepared by Great Lakes Environmental Center. October 26, 2018.

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APPENDIX 1 – Study Requests

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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
TTY Access via relay - 711

May 17, 2019

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

Matt Miller, Xcel Energy
1414 West Hamilton Avenue
PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Proposed Studies for the Cornell Hydroelectric Dam, p-2639

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Cornell hydro has the largest operating range of the six lower Chippewa River dams owned by Xcel which can lead to extensive dewatering of backwater areas that can have negative effects on aquatic and semiaquatic organisms. The Department would like to see a wetted perimeter assessment completed to determine the extent of dewatering in the impoundment at various operating conditions up to 2ft fluctuation. Bathometry and Lidar data would be preferred to be able to understand the dynamics of water level changes affecting the rivers edges.

If the operating range is determined to lead to extensive dewatering of backwater areas, then the operating range will need to be modified when the settlement agreement expires in 2033.

MINIMIUM FLOWS AND OPERATIONAL IMPACTS TO FISH HABITAT: Rapid or frequent changes in water levels can have negative impacts on water resources. Additionally, low water conditions and dewatering of critical habitat can lead to declines in fish populations.

An Instream Flow Incremental Methodology (IFIM) study was conducted in 1997 during the relicensing of other hydro facilities on the Chippewa River. The results should be evaluated to determine if the current minimum flow is allowing for optimal habitat utilization.

Please review the IFIM summary from 1997 to evaluate habitat suitability at a range of minimum flows for smallmouth bass, walleye, lake sturgeon, and redhorse suckers. Using the IFIM, determine habitat utilization of smallmouth bass, walleye, lake sturgeon, and redhorse suckers at different minimum flows (400cfs and above). The minimum flow permitted is 400cfs which may not allow optimal habitat utilization for many aquatic species.

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If higher minimum flows allow for substantially greater habitat utilization, then a higher minimum flow may be required.

ESTIMATE FISH ENTRAINMENT MORTALITY AND DETERMINE METHODS TO MINIMIZE IMPACTS TO LARGE RIVERINE FISH SPECIES: Entrainment through hydro facilities can lead to high mortality especially in adult fish. The Cornell hydro dam has the largest trash rack spacing of any of the dams on the lower Chippewa River at 5 3/8" allowing all life stages of fish, including lake sturgeon up to 40", to become entrained which may be preventing the fishery from reaching its full potential. Specifically, the department is concerned with species impacts to lake sturgeon, muskellunge, walleye and redhorse suckers.

Through desktop models, determine the probability of entrainment mortality for lake sturgeon, muskellunge, walleye, and redhorse suckers for all lengths that can pass through the existing trash racks. The study should evaluate and determine the size of fish that would be excluded and the approach velocities for 2.5" trash rack spacing. If desktop modeling suggests substantial entrainment mortality of the previously mentioned fish species at the current trash rack spacing, then follow up studies will be needed to confirm entrainment or measures will need to be taken to minimize entrainment mortality.

PUBLIC ACCESS TO THE CHIPPEWA RIVER: As part of the license application, please identify locations and options to increase and/or improve shore access to the tailrace fishery and to the impoundment. Improvement identification should include, available and needed parking, access from walkways or trails, public space areas, fishing platforms, handicap accessible options and locations, maps and public awareness of public access features. Costs, land ownership, improvement capabilities, and maintenance should be discussed as part of options to increase or improve public access.

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Rational. The RAW has been a member of the LCRSA – IT since its inception in 2003. The focus of most NRF projects have been at Dells, Jim Falls, Wissota, and Holcombe Hydro Projects. The IT has witnessed a very successful program of allocating funds from the NRF to applicants for projects which resulted in important environmental survey data or direct on-the-ground habitat improvement work in the Lower Chippewa River. We would like to see environmental improvement projects occur in the Cornell Project area as well during the period of the new license. This may require some minor restructuring of the LCRSA through the FERC.

RECOMMENDED STUDIES

1.Mussel survey. In consultation with the Wisconsin DNR and U.S. Fish and Wildlife Service (FWS) conduct a mussel study in the Cornell Flowage and in the tailwater of the dam.

Rational

1. *Identify the basis for determination of the recommended study*

Mussels are an important component of a river system and are sensitive to changes in flow discharge in the tailwater of a dam and to water level fluctuations in a reservoir. The Cornell Hydro Project is operated as a modified peaking operation. Mussels are not very mobile and can be easily adversely affected by hydro operations in terms of species diversity and relative abundance within the zone of fluctuating flow and fluctuating water levels. There is also good reason for a mussel study to document the presence of any State or Federal threatened or endangered species that may occur in the project area. For example, on page 31 of the PAD it is stated that the *purple warty back* mussel, listed as endangered in Wisconsin, is likely to occur in the Chippewa River in the project vicinity.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

It is stated on page 31 of the PAD that the Licensee has been unable to obtain any existing information on freshwater mussels. Therefore, there is good reason to conduct a mussel survey to determine what species could be affected by project operations.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or U.S. Fish and Wildlife Service (FWS) mussel experts. At a minimum, data on mussel species diversity and frequency of abundance should be obtained from sampling.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or FWS. Please consult resource agency staff.

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5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project*

Mussel data will be useful in the short term and long term if it is place on a state-wide data base administrated by the Wisconsin DNR. It will be useful for documenting what mussel species are present currently in the project area and useful in evaluating long term trends in the mussel community there. Further, if a water resource project is planned in the area, a current list of mussels will be needed by the developer to evaluate potential affects to the mussel community that could result from the project.

2.Aquatic and terrestrial Invasive species study (ATIS). Conduct an ATIS survey within the Cornell Flowage and in in the tailwater. The species to be sampled should include *Restricted Species* per Wisconsin Administrative Code (NR 40): invasive species already established in Wisconsin. We note from page 37 of the PAD that Cornell is currently being monitored for purple loosestrife as part of a larger effort on the Chippewa River pursuant to an *Exotic Control Plan*. However, there are many other invasive species to consider.

Rational

1. *Identify the basis for determination of the recommended study*

Species such as purple loosestrife, Eurasian watermilfoil, and curly-leaf pondweed are invasive wetland plants which out-compete many other valuable wetland plants and can dominate the species composition of a wetland or aquatic macrophyte bed in a few years. Terrestrial invasive plants have the same pattern and can out-compete native vegetation as well. There is little food value for wildlife from purple loosestrife; accordingly, infestation of valuable wetlands by this plant is extremely undesirable and harmful. Eurasian watermilfoil and curly-leaf pondweed can rapidly cause aquatic weed problems and alter fish communities by providing too much refugia leading to overpopulation and/or growth stunting problems in the reservoirs and flowages. Likewise, rusty crayfish and zebra mussels can cause pronounced ecological changes in rivers and impoundments. The Zebra mussels rapid reproduction, coupled with its consumption of microscopic plants and animals, adversely affects the aquatic food web and can place valuable sport fisheries at risk. In addition, zebra mussel infestation can severely reduce native mussel populations by displacing their habitat and by actually attaching to an individual mussel's shell. Measures to control invasive species are limited, but control measures such as use of beetles, weevils, spot herbicide spraying, and hand harvesting have shown to be effective.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

Reference information under No. 1, above.

3. *Explain why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR.

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4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR. Please consult resource agency staff.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The ATIS data will be very useful to the resource agencies, academia and the public if it is housed in a statewide data base administrated by the Wisconsin DNR. The study will show species and species frequency of abundance currently at Cornell. The data can be used over the long term to demonstrate success of any control practice implemented.

1.Recreation. Evaluate the existing condition of recreational facilities and needed upgrades. Evaluate the need for additional facilities to adequately serve the public. Update the recreational brochure for the project to reflect new improvements. Prepare a draft *Recreation Plan* for the project to be reviewed by the resource agencies and other stakeholders.

Rational

1. Identify the basis for determination of the recommended study

The reservoirs and riverine sections of rivers impounded by hydroelectric dams have long ago become major sources of recreation for the public. The FERC and the publics' permission for a Utility to use of a river to generate hydropower requires that recreational facilities be installed within the project boundary and kept in good condition for public use. When a project undergoes relicensing, that is the logical and most practical time for a Utility to do a recreational use study and develop a *Recreational Plan*.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

People are entitled through the *Public Trust Doctrine* to use the reservoirs and riverine sections impounded by dams for recreational use. This includes fishing, boating, hiking picnicking, camping, and other non-consumptive wildlife-oriented uses.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or National Park Service (NPS). Please consult resource agency staff.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

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The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or NPS.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The information generated by a recreational use study will be useful to the understanding of the resource agencies, Indian Tribes, and general public in terms of what recreational facilities are present, where they are within the project boundary, what condition they are in and what types of recreation they accommodate. The *Recreation Plan* will be an informative document to all parties that participate in relicensing. Further it will provide a plan for the Licensee to implement during the period of the new license.

We look forward to further participation in relicensing this project to help accomplish environmental protection and improvement at this project. If you have questions on our comments, please contact me at (608) 257-2424 (ext. 115). Also, please feel free to call our Hydro Consultant, Mr. James Fossum at (507) 429-9129.

Sincerely,

Raj Shukla
Executive Director

Cc: Ms. Kimberly D. Bose, Secretary, Washington DC
Matt Miller, Xcel Energy, Eau Claire, WI
Nick Utrup, USFWS, Bloomington, MN
Angela Tornes, NPS, Milwaukee, WI
Cheryl Laatch, Wisconsin DNR, Horicon, WI
Jim Fossum, *JDFossum Environmental Consulting*, Winona, MN

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Appendix 2 – WDNR Point-Intercept Protocol

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Recommended Baseline Monitoring of Aquatic Plants in Wisconsin:

Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell, Susan Knight, Kelly Wagner, Alison Mikulyuk, Michelle Nault, Meghan Porzky and Shaunna Chase

March 2010

Document citation:
Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

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Last Updated:
March 2010

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EXECUTIVE SUMMARY

We outline a baseline monitoring protocol designed to quantitatively assess the distribution and abundance of aquatic plants in lake ecosystems. This protocol employs a point-intercept sampling design, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness. In addition, a qualitative survey is recommended to map obvious species and augment the species list generated through quantitative sampling. Application of this methodology allows: 1) assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization; and 2) comparisons of aquatic plant variables over time and among lakes. This document contains complete instructions for conducting a baseline aquatic plant survey, including details on obtaining an electronic file of site coordinates, uploading site coordinates into a Global Positioning System (GPS) receiver, conducting field work, entering data, working with data summaries, processing voucher specimens, and provides example applications of the collected data. Final products from each baseline survey will include: 1) raw data from the quantitative survey which provides individual site-by-site species distribution and rake fullness data, 2) summary statistics useful in characterizing and comparing populations, 3) additional species observations from the general qualitative survey, and 4) voucher specimens cataloguing species presence. All electronic data should be sent for long-term record-keeping to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

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INTRODUCTION

In lake ecosystems, the aquatic plant community serves as critical habitat and nursery for fish and other animals, a source of oxygen for all organisms, a refuge for prey as well as a foraging area for predators, a buffer against erosion and sediment resuspension from both waves and shoreline inputs, and can significantly contribute to overall lake primary productivity. Over the past several decades, losses of or changes in assemblages of native submersed aquatic vegetation has been a reoccurring phenomenon due to a relatively limited number of factors. Repeatedly, changes in landscapes and atmospheric conditions as a result of human activities have increasingly affected the ecology of adjacent aquatic systems, including aquatic plant communities. In addition, in-lake aquatic plant management activities have increased due to the increasing spread of invasive exotic plants[1].

The Wisconsin Department of Natural Resources (WDNR) is charged with protecting and enhancing the state's natural resources, including lake ecosystems. Given the many ecosystem services associated with aquatic plant communities as well as the recent threats to native species, it has become increasingly important to develop monitoring techniques to support science-based decision-making for effectively managing lake ecosystems. In this document, we present a quantitative, replicable monitoring protocol. Standardized, quantitative and replicable data are an essential part of strategic lake management for three reasons. First, good data allows us to better understand each individual lake; we can use survey data to produce detailed lake maps that show the locations of native, rare, or exotic plant species. Data can then be used as a baseline against which any changes in a lake associated with water clarity, exotic species introduction, water level, or lake management activity can be compared. Second, good data helps direct management by taking the conflict and guesswork out of planning. Aquatic plant management requires weighing a number of potential management options, some of which can be very costly or extensive. Baseline data allows lake groups to identify the most appropriate management options and design the best possible management plan. Additionally, by conducting quantitative comparisons between the aquatic plant communities before and after management actions, lake groups and managers may evaluate whether or not management goals were achieved. Third, by compiling and comparing survey information on lakes statewide, we are able to identify regional trends and refine our understanding of aquatic plant populations on a broader scale in both space and time.

SURVEY OBJECTIVE

In this document, we outline a baseline monitoring protocol designed to assess aquatic plant communities on a whole-lake scale. We recommend a formal quantitative survey conducted at pre-determined sampling locations distributed evenly throughout the lake, accompanied by a general qualitative survey to map obvious species and augment the species list generated through the quantitative survey. Our primary goals in adopting this methodology are to:

[1] Knight, S., and J. Hauxwell. 2009. Distribution and abundance of aquatic plants- human impacts. *In*: G. Likens (editor-in-chief), *Encyclopedia of Inland Waters*. Elsevier, Oxford, United Kingdom.

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1) Collect quantitative data describing the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization for use in developing various management plans; and

2) Use the data to statistically compare aquatic plant variables over time and among lakes.

The importance of a statewide standardized protocol is that observed differences in a lake's plant community can be attributed to actual changes in the community over time, without the confounding variation that results from different field workers employing different sampling techniques.

The quantitative survey employs a point-intercept sampling design, adapted from terrestrial methods, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness ratings. Although the presence/absence data cannot be used to estimate biomass or percent cover, it is less sensitive to interannual or seasonal variations in plant abundance[2]. The method is also relatively rapid and cost-effective and can be used on the large scale to collect baseline data and statistically compare communities over time[2,3]. In summary, it has the following attributes for estimation of aquatic plant distribution and abundance:

- Systematic, quantitative, and replicable
- Appropriate for lakes that vary in depth, size, region, shoreline complexity, and vegetation distribution
- Evenly spaced distribution of sites results in a good coverage of the entire lake, precluding the random exclusion of niche habitats
- Procedural simplicity
- Inexpensive implementation
- Results are easily analyzed with scientifically rigorous statistical methods
- Spatial data preserved and can be mapped for both the managers' use and for clearly communicating distributional data with the public

These guidelines are intended to work on most lakes. However, modifications may be required if a lake is uniquely shaped so that a uniform distribution of points isn't representative (long, skinny lake shape), or if obtaining rake samples is difficult due to substrate (rocky/cobble bottom).

Please note that these are "baseline" recommendations. Additional monitoring activities may be warranted if the goal is to assess a specific management activity. For example, to gauge the ability of chemical spot-treatments to control relatively small stands of an exotic species in a

[2] Madsen, J.D. 1999. Point intercept and line intercept methods for aquatic plant management. Aquatic plant control technical note MI-02. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[3] Dodd-Williams, L., G.O. Dick, R.M. Smart and C.S. Owens. 2008. Point Intercept and Surface Observation GPS (SOG): A Comparison of Survey Methods – Lake Gaston, NC/VA. ERDC/TN APCRP-EA-19. Vicksburg, MS: U.S. Army Engineer Research and Development Center

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relatively large lake, we recommend additional mapping of the beds following the pre- and post-treatment protocol available in Appendix D of the Aquatic Plant Management guide[4].

Unlike the procedures used by the Citizen-Based Lake Monitoring Network, this protocol is not designed for most volunteers. The protocol requires at least one of the field workers be an experienced plant taxonomist and able to identify most plant species in the field. Less experienced volunteers may be able to help with data recording and navigation, but without the help of a professional aquatic ecologist, volunteers may not be able to conduct an entire plant survey without a significant degree of training or study.

SURVEY OVERVIEW

Sampling Sites

This method employs a point-intercept design in which a grid of sampling sites is distributed evenly over the entire lake surface (Figure 1). Lake organizations or individuals can request an electronic file of survey sites by contacting the WDNR Lake Coordinator from their region (see Appendix 1) with the lake name and county, as well as the town, range and section (TRS) or water body identification code (WBIC). Please make requests well in advance of planned field work to allow WDNR staff sufficient time for map creation (recommend at least 1 month). WDNR staff will determine the number of sites and grid resolution based on the estimated size of the littoral zone (the area in which plants grow) and shape of the lake. Grids will be scaled to produce a greater number of sites on lakes that are larger and have more complex shorelines. Lakes with a narrow littoral zone may be assigned a comparatively high number of sampling sites to achieve sufficient survey coverage. Once created, the sampling map (Figure 1) and an associated GPS text file containing the latitude and longitude information associated with each sample site will be provided electronically by the WDNR.

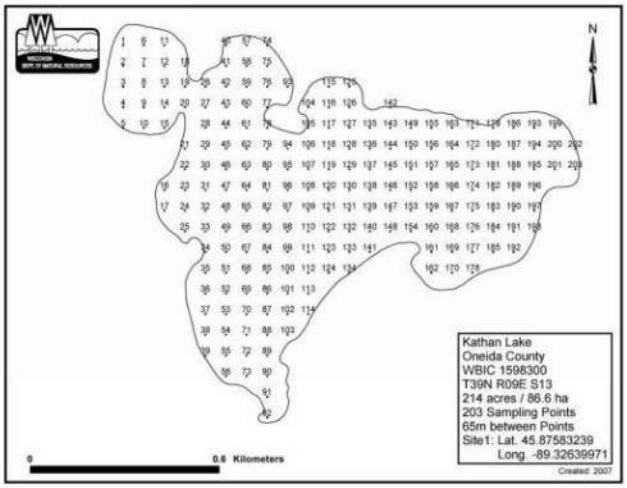

Figure 1: The point-intercept grid for Kathan Lake, Oneida County, WI, with 203 sampling sites.

Timing of Sampling

Surveys should be conducted between early July and mid August. Although certain plant community parameters (such as rake fullness and biomass) can change over the course of the

[4] Aquatic Plant Treatment Evaluation. http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-D.pdf

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growing season, presence/absence data is less sensitive to seasonal variation[2]; presence can often be detected throughout the season. For many species, including Eurasian water milfoil (EWM), plant biomass and density may increase as the season progresses, whereas some species like curly-leaf pondweed (CLP), senesce much earlier in the sampling season. Rake fullness data for these species must be interpreted carefully with the sampling date in mind. If early-senescing species such as CLP are targets of management actions, please contact the WDNR Lake Coordinator in your region to coordinate the best possible sampling time.

Time Spent Sampling

Depending on the size of the lake, a survey may be completed in a few hours, or it may take several days. Ideally, a crew spends one-half to three minutes per sample site; however, this may vary depending on the following factors:

- Distance between sample sites
- Weather (i.e. wind, rain, etc.)
- Rake fullness
- Ease of navigation
- Experience; less experienced field workers may take longer to identify unfamiliar plants. However, most field workers have found that the time spent per site drops dramatically with experience. Others have reported their speed increasing greatly with a few hours of training.

PREPARING FOR FIELD WORK

Field Gear

Necessary equipment:

- Appropriate watercraft and all equipment required by state law
- Double-sided sampling rake attached to a 15-ft (4.6m) pole
- Weighted sampling rake attached to a 40-ft (12m) rope
- Handheld GPS receiver with WDNR sample sites loaded
- Print-out of lake map with WDNR sample sites
- Print-out of WDNR field datasheets on waterproof paper
- Pencils
- Sealable storage bags for voucher specimens
- Waterproof voucher sample labels
- Cooler(s) with ice for storing voucher specimens
- Depth finder

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Helpful, but not required:

- Trolling motor for reaching shallow sites
- Bathymetric map
- Plant ID references or guides to aid in plant identification
- Hand lens to aid in plant identification
- Digital camera for plant specimens or field pictures
- Underwater video camera for viewing the maximum depth of plant colonization

Loading Sample Site Locations onto the GPS Receiver

Detailed instructions on loading sample site locations onto the GPS receiver depend greatly on the type of GPS receiver as well as the software used to translate site location from the text file to "waypoints" in the receiver. The WDNR commonly utilizes Garmin 76 model GPS receivers and the WDNR Garmin GPS Standalone Tool software. The WDNR Standalone Tool is only available to WDNR employees, and only works with Garmin GPS receivers. The Minnesota Garmin GPS Tool and appropriate guidance documents are available to the public and can be found online at the Minnesota DNR internet site[5]. The two programs are similar; their chief difference is that the Minnesota tool requires the GPS text file to be comma-delimited instead of tab-delimited. Procedures for other GPS models with a Wide Area Augmentation System (WAAS-capability) may be used; please refer to the manufacturer's instructions for details on uploading site locations.

Please note that storage capability varies by GPS model. Some GPS receivers are unable to store the large numbers of data sites required in some surveys. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files of sites as needed or work from multiple receivers in the field.

The instructions below describe how WDNR employees can use the WDNR Garmin Standalone Tool software to load sample site locations, or "waypoints," onto a Garmin 76 model GPS receiver.

To upload waypoints from a GPS text file to the GPS receiver, you will need:

- **PC/laptop with WDNR Garmin GPS Tool.** Your IT administrator can help you obtain and install the software.
- **GPS text file (.txt extension).** A tab-delimited text file containing the sample sites and their geographical information.
- **A Garmin 76 model GPS receiver with external data port.**

[5] Available online at: http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html (accessed September, 2009)

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- **PC interface cable (with USB or 9-pin serial connector).** Can be purchased online at http://www.garmin.com

Step 1: Set GPS to the "Simulating GPS" Mode

Operating the receiver in "Simulating GPS" mode prevents the GPS receiver from trying to acquire a satellite signal indoors.

1. Press and hold the red [ON/OFF] button for two seconds to turn the GPS receiver on.
2. Press [PAGE] to navigate through the welcome screens until the "Acquiring Satellites" page is visible.

3. Press the [MENU] button, select "Start Simulator", and press [ENTER]; the screen heading should now read "Simulating GPS."

Step 2: Set Serial Data Format (this setting will **not** have to be re-set upon each use)

Set the serial data format on the Garmin 76 receiver to GARMIN prior to transferring data. Failure to set the serial data format to GARMIN will cause a communication error.

1. Press the [MENU] button twice to reach the main menu, use the rocker key to select "Setup", and then press [ENTER].
2. Use the rocker key to scroll left or right until the "Interface" tab is highlighted. Use the rocker key to scroll down to highlight the drop-down box and press [ENTER].
3. A menu will appear; select "GARMIN" and press [ENTER]. Press [QUIT] twice to exit the menu.

Step 3: Plug in the PC Interface Cable

1. The GPS receiver should be on and in simulation mode.

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2. Plug the 9-pin serial connector cable into COM port #1 on your PC. If port #1 is in use, plug into the next available port and note the port number. The newest version of the WDNR Garmin GPS Tool (ver. 8.2.8) supports USB connectivity as an alternate to COM port connection.

3. Plug the round end of the PC interface cable into the external data/auxiliary power port under the rubber panel on the back of the GPS receiver.

Step 4: Load the GPS text file into the WDNR Garmin Standalone Tool

1. Open the WDNR Garmin GPS Tool file on your computer. Select:

   File > Load > Waypoints From > Lat-Long GPS Text File.

2. Navigate to and select the appropriate GPS text file and select OK. The waypoints will be visible in the Tool's status bar.

3. If necessary, you can view and edit waypoints by clicking the [Advanced] button on the WDNR Garmin GPS Tool.

4. Troubleshooting COM-enabled setups
   a. Check that the correct COM port is selected in the WDNR Garmin GPS tool.
      i. GPS > Assign Port > select correct port #
   b. Check that the baud rate matches that of the GPS receiver.
      i. GPS > Assign Port >Baud Rate > 9600
      ii. A Garmin 76 receiver will transfer at 9600 bits per second

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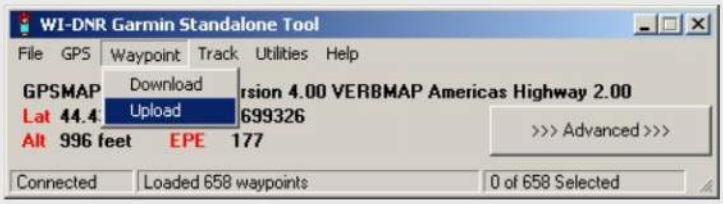
c. Check that the serial data format is set to "GARMIN" (see Step 2).

d. If your problem persists, please consult your GPS unit's user's manual.

Step 5: Upload Waypoint Data from the WDNR Garmin GPS Tool to the GPS receiver

1. In the menu bar, select: Waypoint > Upload



2. A pop-up window will indicate the completion of a successful upload. Click OK.

3. Check that the uploaded waypoints are visible on the GPS receiver: press [MENU] twice to get to the main menu, select "Points", press [ENTER], select "Waypoints", and press [ENTER].

4. Troubleshooting
   a. Storage capability varies by GPS model. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files as needed or work from multiple receivers in the field.
   b. For more help, please refer to the appropriate online documentation or user's manuals.

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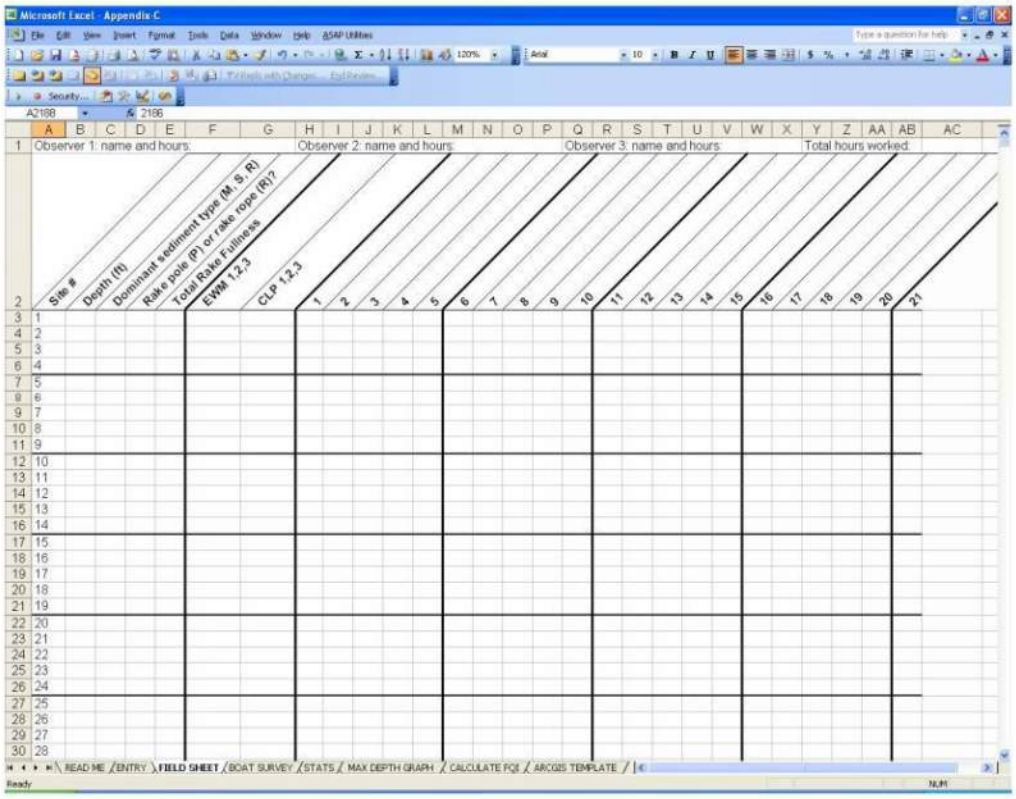
Printing Datasheets

The form used for recording data can be found on the tab labeled "FIELD SHEET" in the Aquatic Plant Survey Data Workbook, downloadable from the University of Wisconsin Extension website (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls). Print the field sheet (waterproof paper recommended), using the "Print Area > Set Print Area" function under the "File" menu to set the appropriate number of rows to print. Under Header (View > Header and Footer > Custom Header) record lake name, Waterbody Identification Code (WBIC), county and survey date.



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Constructing the Rake Samplers

The rake samplers are each constructed of two rake heads welded together, bar-to-bar, to form a double-sided rake head. The rake head is 13.8 inches (35 centimeters) long, with approximately 14 tines on each side. For use in shallow waters, mount a double-sided rake head to a pole that has the capability to extend to 15 feet (4.6 meters). For use in deeper waters, attach a second double-sided rake head to a rope; this rake head should also be weighted (Figure 2).

Pole Sampler

To make the pole samplers shown in the photographs, we removed the handles from 2 standard bow rakes (available at most hardware stores), and welded the rake heads together bar-to-bar. We mounted the rake head to an 8-foot (telescoping to 15.5 feet) pool skimmer handle purchased from a supply store (left, $50). For an even sturdier sampler we purchased an aluminum Co-Handle from Duraframe Dipnet and designed a rake pole which attaches and detaches into 3 sections (right, $200). For depth recording, mark the rake handle in one-foot increments. Electrical tape marked with permanent marker, then covered with a length of clear packing tape works well and holds up over time.

Rope Sampler

A similar rake head should be constructed and attached to a 40-foot-long rope or anchor line. In order to ensure a quick vertical descent to the lake bottom, attach a light weight (~5 lb) to the rake head, away from the tines. The rope sampler pictured here has a short piece of steel tubing welded to the rake head to serve as a handle through which 45 feet of rope is attached.

Figure 2: Examples of sampling rakes used during surveys.

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COLLECTING AND RECORDING FIELD DATA

Using the Rake Samplers

Collect one rake sample per sample site.

In water shallower than 15 feet deep, use the pole sampler. At each sample site, lower the rake straight through the water column to rest lightly on the bottom, twist the rake around twice, and then pull the rake straight out of the water.

In water deeper than 15 feet, drop the rope sampler straight into the water alongside the boat, drag the rake along the sediment surface for approximately one foot (0.3 m), and then pull the rake to the surface.

A large tray or bin may be used to aid in processing the entire sample.

Navigating to Sites

Accuracy

The location reported by the GPS receiver has an element of error that varies under different conditions. The total error from the GPS and your navigational error *combined* should not exceed half of the sampling resolution. Therefore, when sampling with a Garmin 76 receiver, navigate at no greater than an 80-foot zoom level and aim to completely cover the sampling site with the arrow. At 80-foot zoom, the locator arrow shown on the screen represents approximately 25 feet in length. In order to sample with acceptable accuracy, the arrow must completely cover the sample site on screen. At coarser zoom levels, because the size of the arrow remains constant, the boat may be more distant from the site even though the arrow completely covers the site. You can use a lower zoom level (120-feet is appropriate) in order to travel from site to site, but as you approach the target site, you must confirm your location at using at least the 80-ft zoom resolution to ensure you are sampling with acceptable accuracy.

Determining Maximum Depth of Plant Colonization

When sampling, you will have to determine the maximum depth at which the plants are rooted. The maximum depth of colonization (MDC) can vary greatly among lakes, from just a few feet to as deep as the physiological requirements of a species will allow. When sampling a line of sites heading from shore out to deep water, take samples until plants are no longer found on the

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rake. Continue sampling at least two sites deeper to ensure you sampled well over the maximum depth of colonization. If no plants are found at these sites, simply record the depth, sampling tool used, and dominant sediment type. Leave the rake fullness and species information blank. Depending on the lake bathymetry, you may choose to continue down the same row to the other side of the lake. Use a depth finder and begin sampling again when the depth reaches that of the last (no plant) site sampled. Alternatively, if the rows are very long, you may choose to move over to the next row and sample sites back into shore, working back and forth along the shoreline and around the lake. However, if the second row is shallower than the first, be sure to start sampling sufficiently far from shore so that the depth is similar to that at which you stopped sampling in the first row. By sampling in this way, over time you will begin to hone in on the maximum depth of plant colonization.

After working several rows crossing the edge of the littoral zone, estimate the maximum depth of colonization (e.g. 20 feet) and only continue to sample deeper sites within 6 feet of this estimation (all sites ≤ 26 feet). As you complete more rows and gain confidence in your estimation, you can then begin to gradually omit sampling depths that are too deep for plants to grow. Once you have sampled the deep end of your estimated maximum depth of colonization (i.e. 26 feet) at least three times and have not found any plants, then you can discontinue sampling at anything deeper, but continue to sample any sites shallower (≤ 25 feet). If you then sample a shallower depth three times (i.e. 25 feet) and find no plants at any of those sites, you may now discontinue sampling at these deeper sites and only sample sites shallower than this new sampling depth (≤ 24 feet). Continue to successively eliminate shallower depths in sequence until you establish the maximum depth of colonization. To account for patchiness and other sources of variation, never narrow the sampling window to less than 1.5 feet of the estimated maximum depth of colonization. Use your best judgment when eliminating depths, and remember that plant distribution may be uneven and that different areas of a single lake may have plants growing relatively deeper or shallower. It is good practice to err on the side of oversampling.

Recording Data

Completing the Field Sheet

1. General site information
   Complete the top portion of the "Field Sheet" with the lake name, county, WBIC, date, names of observers, and how many hours each person worked during the survey.

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2. Site number
   Each site location is numbered sequentially. Each site number will have one row of data on the "Field Sheet."

3. Depth
   Measure and record the depth to the nearest half-foot increment at each site sampled, regardless of whether vegetation is present. The pole mounted rake and rope sampler should be marked to measure the depth of water at a sample site. However, a variety of options exist for taking depth measurements, including sonar handheld depth finders (trigger models) and boat-mounted depth finders. If you are using a depth finder, it is useful to know that the accuracy may decrease greatly in densely vegetated areas. Depth finders sometimes report the depth to the top of the vegetation instead of to the sediment surface. In most cases, it is best to use depth markings on a pole-mounted rake for shallow sites.

4. Dominant sediment type
   At each sample site, record the dominant sediment type based on how the rake feels when in contact with the sediment surface as: mucky (M), sandy (S), or rocky (R).

5. Pole vs. Rope
   Record whether the pole (P) mounted rake or the rake-on-a-rope (R) was used to take the sample.

6. Rake fullness
   At each site, after pulling the rake from the water record the overall rake fullness rating that best estimates the total coverage of plants on the rake (1 - few, 2 - moderate, 3 - abundant; see Figure 3). Also identify the different species present on the rake and record a separate rake fullness rating for each. Account for plant parts that dangle or trail from the rake tines as if they were fully wrapped around the rake head. The rake may dislodge plants that will float to the surface, especially short rosette species not easily caught in the tines. Include the rake fullness rating for plants dislodged and floating but not collected on the rake. Record rake fullness ratings for filamentous algae, aquatic moss, freshwater sponges, and liverworts, but do not include these ratings when determining the overall rake fullness rating. While at a site, perform a brief visual scan. If you observe any species within 6 feet (2m) of the sample site, but not collected with the rake, record these species as observed visually ("V") on the field sheet. These species will be included in total number of species observed.

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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 3: Illustration of rake fullness ratings used during the survey.

7. Species names

   Note that the field datasheet does not include any species names, except for EWM (Eurasian water milfoil) and CLP (Curly-leaf pondweed). The sampling crew must write the species name in subsequent columns the first time that species is encountered. Names must be re-written on successive field sheets as they are encountered. You may use common or Latin names, but be sure there is no ambiguity in the name that will present problems during data entry. The use of standard abbreviations can greatly shorten this process. It is generally safe to shorten the names to include the first three letters of the genus name followed by the first three letters of the species name (i.e. *Ceratophyllum demersum* = CerDem).

8. Inaccessible sites

   It may be impossible or unsafe to reach some sample sites. Where the water is very shallow, rocks are present, or dense plant growth prevents navigation, field workers should attempt to access the site as long as doing so is safe and relatively practical. It is often possible to reach difficult sites by using oars or poling; however, keep safety in mind and practice good judgment. Do not get out and drag the boat through mucky sediment to reach a site. If the sampling site is shallow but the substrate is firm, you may be able to walk to the site from shore or from the boat. If you cannot access a site, leave the depth blank and record the appropriate comment on the field datasheet from the list below. Remember to also transfer these to the "Comments" column of the ENTRY sheet (see data entry section):

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a. NONNAVIGABLE (PLANTS)
1. Sample site cannot be accessed due to thick plant growth.
2. Aquatic plants that are visible within 6 feet of a non-navigable sample site (e.g. water lilies, cattails, bulrushes, etc.) should be recorded as visuals (V) on the datasheet.

b. TERRESTRIAL
1. Sample site occurs on land (including islands).
2. Aquatic plants visible within 6 feet of a terrestrial sample site (e.g. water lilies, cattails, bulrushes, etc.) may be included in the general boat survey list, but should not be marked as visuals (V) on the datasheet.
3. Only species rooted in water should be recorded as present or as part of the boat survey.

c. SHALLOW
1. Sample site is in water that is too shallow to allow access.
2. Aquatic plants that are visible within 6 feet of a shallow sample site should be recorded as visuals (V) on the datasheet.

d. ROCKS
1. Sample site is inaccessible due to the presence of rocks.

e. DOCK
1. Sample site is inaccessible due to the presence of a dock or pier.

f. SWIM AREA
1. Sample site is inaccessible due to the presence of a designated swimming area.

g. TEMPORARY OBSTACLE
1. Sample site is inaccessible due to the presence of a temporary obstacle such as a boater, swimmer, raft, loon, etc.
2. If possible, try to revisit this site later on during the survey once the temporary obstacle has moved.

h. NO INFORMATION
1. No information is available about the sample site because it was not traveled to (inaccessible channel, accidently omitted during survey, skipped due to time constraints, etc.).

i. OTHER
1. Site was not sampled for another reason; please provide a brief description.

9. Filling Out the Boat Survey Datasheet
   Often there will be localized occurrences of certain species (e.g., floating-leaf or emergent species) that are missed by the point-intercept grid. For areas that are outside the grid or in between sampling sites, record the name of the plant and the closest site to the plant. This information will be entered into the "BOAT SURVEY" section of the data entry file. Emergent near-shore vegetation should only be recorded if it's rooted in water.

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Collecting and Identifying Voucher Samples

Voucher each plant species for verification and identification. You can often use plants collected on the rake as vouchers. However, if the sample is of poor quality or lacks reproductive structures, attempt to collect a better specimen. If a better specimen is unavailable, voucher and press what you are able to collect. Remember that the more material collected, the easier identification will be. Whenever possible, collect at least two specimens, and include reproductive material such as seeds, flowers, fruit, roots, etc. Place the voucher plant into a re-sealable plastic bag with a waterproof voucher label. The voucher label should include the species name, or in the case of unknown species, a unique identifier, the lake name, county, sample site, sediment type, collector's name, and the date. Additional information about habitat or co-occurring species may also be included on the tag. Place all specimens in a cooler for transport to the lab. See below, "Pressing Plants" for instructions once back at the laboratory.

Plant Identification and Troublesome Taxa

1. Plants should be identified to species whenever possible. Certain genera, including *Carex*, *Sparganium*, and *Sagittaria* must be flowering and/or fruiting to confirm identification and may not be identifiable to species without these parts.

2. Non-angiosperms such as *Chara* or *Nitella* are identified to genus only. Often, *Isoetes* can be identified to species by looking at spores, if present. Filamentous algae, aquatic moss, and freshwater sponge can be referred to simply as algae, moss, and sponge.

3. If a plant cannot be identified in the field, place the two voucher specimens in a re-sealable bag with a separate voucher label. Take these specimens back to the lab to verify the identity. The label should include a unique identifier, lake, county, the sample site number, and sediment type. The presence and fullness of the species should be recorded on the field datasheet under the same unique identifier name listed on the voucher label.

4. In the lab, try to identify the plant using plant identification keys and a stereo microscope. If you are still uncertain of the identity of the plant, contact a DNR biologist in your region to help with identification. Do not send specimens to an expert until you notify them of your intended shipment and they have instructed you to do so. Once the plant is identified, record this information so that the correct identification is used during data entry.

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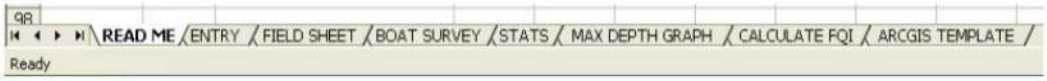
ENTERING DATA ELECTRONICALLY

Worksheet Descriptions and Instructions

The Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls) contains eight worksheets:



1. READ ME

   Provide a brief description of the six other worksheets included in the workbook.

2. FIELD SHEET

   The FIELD SHEET should be printed on waterproof paper for recording the field data.

3. ENTRY

   a. There are many formulas embedded in the ENTRY sheet that allow for the statistical calculations on the STATS sheet. Thus, **DO NOT add or delete columns or rows on the ENTRY or STATS sheets.**

   b. Data collected in the field is recorded on the FIELD SHEET and afterwards transferred to the electronic ENTRY sheet.

   c. Copy latitude and longitude information for the sample sites from the GPS text file and paste into the appropriate columns of the ENTRY sheet.

   d. Record the lake and county name, WBIC, survey date, and the names of the field workers.

   e. There is a column for comments on the ENTRY sheet. Please use the standardized comments discussed on page 18 of this protocol.

   f. Species' Latin names appear alphabetically in the first row of the spreadsheet. Species such as aquatic moss, freshwater sponge, filamentous algae, and liverworts are listed separately at the end of the alphabetical list.

   g. Additional species not already listed should be added in the columns at the end of the alphabetical list (sp1, sp2, etc.). Any vouchered specimens that are awaiting ID confirmation should be entered here as well. You should use the same unique voucher identifier established in the field to for ease of updating the information.

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h. We strongly recommend double-checking the electronically entered data against the original field datasheets to ensure that no errors or omissions occurred during the entry process.

4. BOAT SURVEY

a. Enter information on plants observed during the survey that were observed more than 6 feet away from a sample site.

b. Additional comments about field conditions, known management activities, or other observations can also be recorded in this worksheet.

5. STATS

The STATS worksheet automatically calculates summary statistics using the data entered into the ENTRY worksheet (see Appendix 2, Table 1). There are several summary calculations including:

a. Individual Species Statistics:

- **i. Frequency of occurrence within vegetated areas (%)**: Number of sites at which a species was observed divided by the total number of vegetated sites. Frequency of occurrence is sensitive to the number of sample sites included. Including non-vegetated sites will lower the frequency of occurrence.
- **ii. Frequency of occurrence at sites shallower than maximum depth of plants**: Number of sites a species was observed at divided by the total number of sites shallower than maximum depth of plants.
- **iii. Relative frequency (%)**: This is a proportional value that reflects the degree to which an individual species contributes to the sum total of all species observations. The sum of the relative frequencies of all species is 100%. Relative frequency is not sensitive to whether all sampled sites, including non-vegetated sites, are included. Relative frequency does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts.
- **iv. Relative frequency (squared)**: This value is only part of a calculation and is not used directly.
- **v. Number of sites where a species was found**: This is the sum of the number of sites at which a species was recorded on the rake.
- **vi. Average rake fullness**: Mean rake fullness rating, ranges from 1-3.
- **vii. Number of visual sightings**: This is the total number of times a plant was seen within 6 feet of the boat, but not collected on the rake.
- **viii. Present (visual or collected)**: Automatically fills in "present" if the species was observed at a sample site.

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b. **Summary Statistics:**

i. **Total number of sites visited**: Total number of sites where depth was recorded, even if a rake sample was not taken.

ii. **Total number of sites with vegetation**: Total number of sites where at least one plant was found on the rake.

iii. **Total number of sites shallower than maximum depth of plants**: Total number of sites where the depth was less than or equal to the maximum depth at which plants were found. This value is used for frequency of occurrence at sites shallower than maximum depth of plants.

iv. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of times plants were recorded at a site divided by the total number of sites sampled that were shallower than the maximum depth of plants.

v. **Simpson's Diversity Index**: A nonparametric estimator of community heterogeneity. It is based on relative frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.

vi. **The maximum depth of plants**: This is the depth of the deepest site sampled at which vegetation was present. Please note that this value does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts. See "MAX DEPTH GRAPH" below for more information.

vii. **Number of sites sampled using rake on rope (R)**

viii. **Number of sites sampled using rake on pole (P)**

ix. **Average number of all species per site (shallower than max depth)**: Mean number of species found at sample sites which were less than or equal to the maximum depth of plant colonization.

x. **Average number of species per site (vegetated sites only)**: Mean number of species found at sample sites were vegetation was present.

xi. **Average number of native species per site (shallower than maximum depth)**: This does not include Eurasian water milfoil, Curly-leaf pondweed, Purple loosestrife, Spiny naiad, or Reed canary grass.

xii. **Average number of native species per site (vegetated sites only)**

xiii. **Species richness**: Total number of species observed not including visual sightings. Please note that this value does not include aquatic moss, freshwater sponges, filamentous algae, or liverworts.

xiv. **Species richness (including visuals)**: Total number of species observed including visual sightings recorded within 6 feet of the sample site (but does not include additional species found during the boat survey).

6. MAX DEPTH GRAPH

The maximum depth of colonization is an important metric to characterize accurately, as it can indicate changes in water clarity and water quality over time. This worksheet automatically displays a histogram of plant occurrences by water depth. Occasionally, unrooted plants floating in the water column are snagged by the rake, which can sometimes result in an inaccurate estimation of the maximum depth of colonization. It is

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important to examine the reported maximum depth of plant colonization in order to detect potential outliers. As a general rule, a single plant occurrence reported at a site which is 2 or more feet deeper than the next shallowest site with plants is considered an outlier, and should be excluded when determining the maximum depth of plant colonization (see Figure 4).

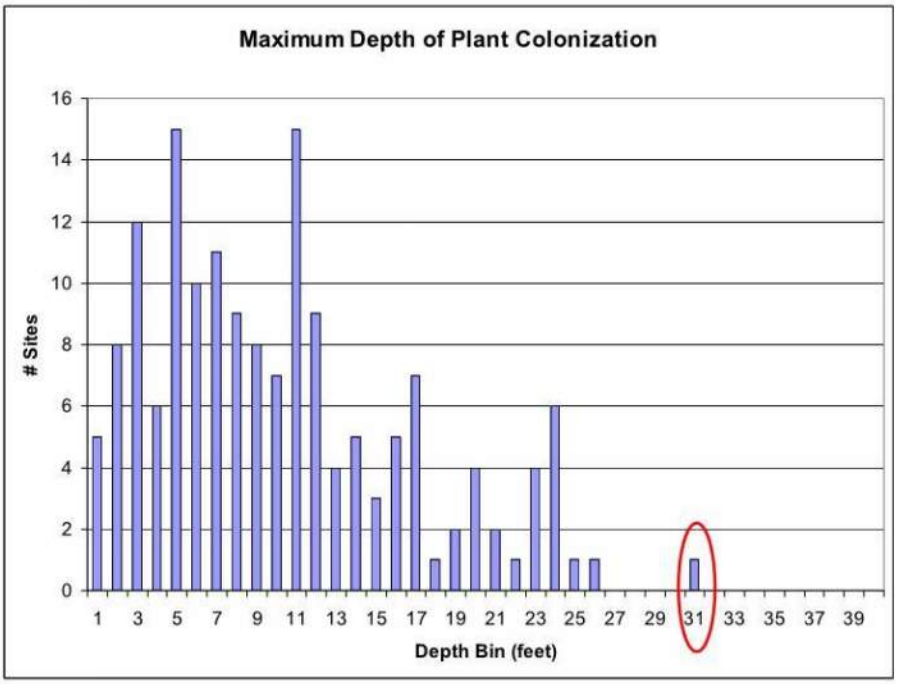

Figure 4: Distribution of plant occurrences versus water column depth. The value circled in red is more than 2 feet deeper than all other plants found during the survey, and is considered an outlier. Outliers should be omitted when determining the maximum depth of plant colonization.

It is necessary to delete the occurrence of this outlier from the ENTRY spreadsheet so that the automatically-calculated statistics will reflect the revised maximum depth of colonization. To do this, locate the sampling point number on the ENTRY worksheet where the outlier was found. Scroll across the row until you find the outlier to omit. Once you've located the cell with the outlier, press delete to clear the cell. Right click on the cell and select "Insert Comment". Briefly describe the occurrence of the outlier and the reason for omitting it. Follow the same steps with the overall rake fullness column, deleting out the contents of the cell and including a brief comment. Please also include information regarding any omissions of outliers and revised MDC directly on the STATS spreadsheet, typing all comments in the space below "See Max Depth Graph Worksheet to Confirm".

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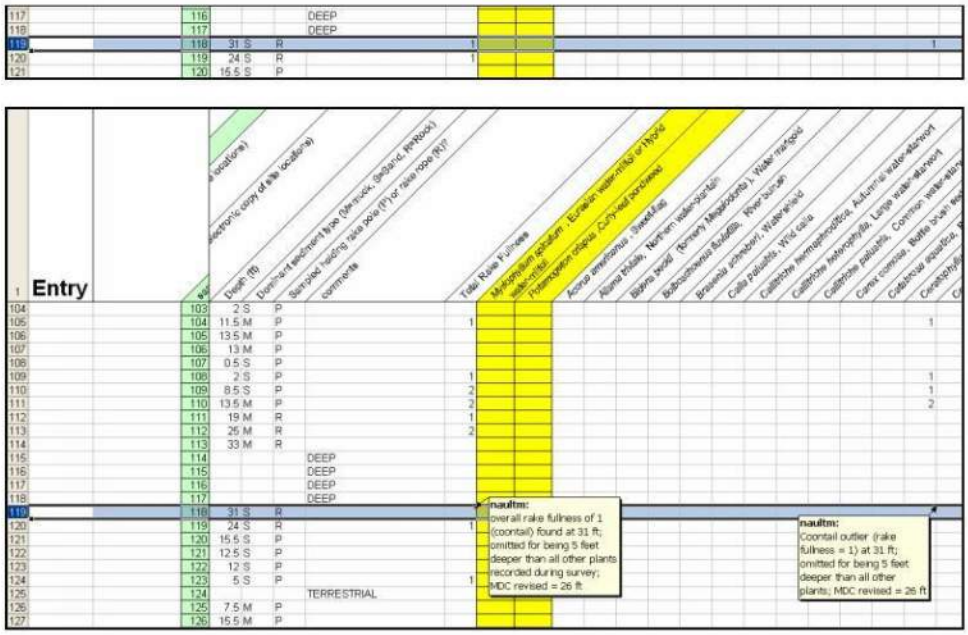

Figure 5: ***Top*** **- Ceratophyllum demersum outlier at 31 feet (sampling point #118).** ***Bottom*** **- C. demersum outlier at 31 feet deleted from both C. demersum and total rake fullness columns. Brief descriptive comments should be inserted in cells where outliers have been deleted.**

7. CALCULATE FQI

This worksheet automatically calculates the Floristic Quality Index (FQI) based upon the data entered into the ENTRY worksheet. The FQI metric is designed to evaluate the closeness of the flora in an area to that of undisturbed conditions[6]. The species list considered in this calculation is that which Nichols[6] originally considered, and the "C values" used in this spreadsheet reflect those currently accepted by the Wisconsin State Herbarium[7]. Species are counted as being present only if they are collected on the rake at some point during the baseline survey.

8. ARCGIS TEMPLATE

This worksheet of truncated species names is used when creating plant distribution maps using ArcGIS 9.3. See Appendix 3 for more information.

[6] Nichols, S.A. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management, 15(2):133-141.
[7] University of Wisconsin-Madison, 2001. Wisconsin Floristic Quality Assessment (WFQA). Retrieved October 27, 2009 from: http://www.botany.wisc.edu/WFQA.asp

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Saving the File

Once the data is electronically entered into the Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls), please save the file with a name indicating the lake, county, WBIC, and year sampled. The format we recommend is: Lake_County_WBIC_(year).xls. For example, Lake Mendota sampled in 2009 would be named: Mendota_Dane_805400_(2009).xls

Double-Checking the Data

We strongly recommend double-checking the electronic data against the field sheet to catch any errors made during the entry process.

Sending the Data

Send the final electronic file to the WDNR via email (DNRBaselineAquaticPlants@wisconsin.gov). There should be one file for each completed lake survey.

Creation of Plant Distribution Maps

Aquatic plant distribution maps can be easily created using the point-intercept data collected during the survey. Instructions on how to create these maps can be found in Appendix 3 and 4.

Statistical Analysis of Data

Statistical comparisons of datasets can easily be analyzed between pre- and post-management activities or between two survey years by using a simple chi-square analysis. The chi-square analysis is commonly used to examine whether or not there was a statistically significant change in the occurrence of a plant species between the survey years or after management activities have occurred. The "Compute Pre-Post Data" worksheet (available at: http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Apendix-D1.xls), allows users to enter in the number of sites at which a species was recorded during each survey, and provides an output indicating whether or not differences reflect a statistically significant change in the plant community.

PRESSING PLANTS – PREPARATION OF VOUCHER SPECIMENS

"Floating" Specimens

Because most aquatic plants, especially finely dissected specimens, tend to stick to paper as they dry, it is usually better to "float" the plant directly onto herbarium paper. However, if the plant is large and robust, or not entirely aquatic (such as bulrushes, emergent sedges or pickerelweed) you can press the plant in newsprint.

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1. Use a pencil to label the mounting paper with the plant name, geographic location, date collected, and serial code (a unique identifier in a series that identifies all specimens you have pressed; we use the initials of the presser followed by the year and a sequential number; i.e. AM2009-01). Mount only one species per sheet, and do not cut herbarium sheets in half.

2. Carefully rinse the plant so it is free of epiphyton, silt, and other debris.

3. Fill a sink or tray with about one inch of water. Slip the labeled mounting paper into the water.

4. Float the plant in the water and arrange it onto the sheet.

5. If the plant has fine leaflets, such as water milfoil or bladderwort, cut off one leaf and display it floated out onto the paper so that leaflet characteristics can be readily observed.

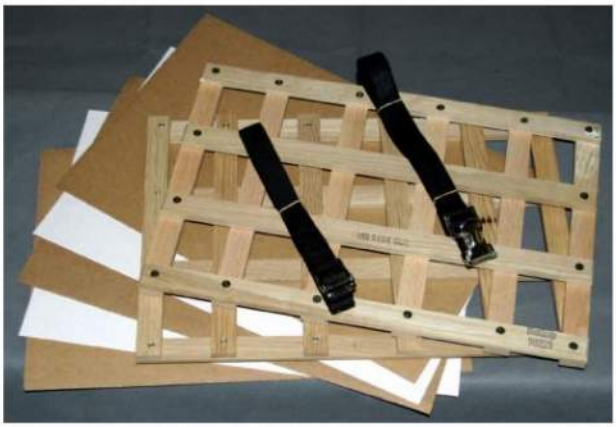
6. The plant may be bent into a "V" or "W" or curled shape to fit on the sheet.

7. Slowly lift the paper out of the water by one end. Keeping the plant in place, let the water slowly drain off.

8. Use a toothpick or probe to spread out plant parts for better display, making sure to expose identifiable characteristics such as stipules, sheaths or seeds.

Pressing Specimens

- Cover the plant with a sheet of waxed paper or plastic wrap if it is especially delicate (we recommend this technique especially for bladderworts and other fine, delicate species).
- Place the specimen sheet inside folds of newspaper.
- Place the newspaper between two sheets of blotting paper, and the blotting paper between two sheets of corrugated cardboard.
- Place multiple specimens in a plant press. Use rope or straps to compress plants to keep specimens flat as they dry.



- Place the press somewhere warm and dry. Placing the press on its long edge on top of a ventilated aluminum or aluminum-lined box containing incandescent light bulbs allows for quick drying. Remove plants after several days when they are thoroughly dry.

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Suggested Herbarium Materials

Herbarium and science supply businesses such as the Herbarium Supply Company (www.herbariumsupply.com; 800-348-2338) sell many herbarium products including mounting paper, plant presses, blotting paper, and cardboard spacers. When ordering herbarium mounting paper, look for acid-free, non-glossy, 100% rag, and heavy or standard weights.

Preparing Dried Specimens for Shipment to an Herbarium

1. **Package specimens**. Place each dried specimen with unique identifier clearly marked on the newsprint or mounting paper in the fold of a single sheet of newspaper and place all of the newspaper/specimens between two pieces of cardboard. Tie or rubber band the cardboard bundle together, and put it into a padded envelope or a box. As long as the package is going to or from an educational institution, a special 4th class mailing rate called "Library Rate" can be used.

2. **Label information**. Both of the herbaria utilized by the WDNR label the dried plant specimens themselves. Prepare an electronic spreadsheet with the relevant information for each specimen. Send the file to Mark Wetter (mawetter@wisc.edu) for the Madison herbarium or to Robert Freckmann (rfreckma@uwsp.edu) for the Stevens Point herbarium. Each row (i.e. each specimen) in the file will need a unique identifier such as the collector's initials followed by a specimen number. Use the same identifier on the specimen so the herbaria can match the label to the specimen. Each row of the spreadsheet should include columns for the following (column heading in **bold**, example in plain text):

    a. **Specimen Identifier** CD2009-01
    b. **Collector Name** Isabel Velez
    c. **Preparer's Name** (If different from collector) Chad Douwe
    d. **Lake Name** Little John Jr.
    e. **County** Vilas
    f. **Date collected** 7 July 2009
    g. **Specimen ID** *Potamogeton spirillus,* Spiral-fruited pondweed
    h. **Habitat** muck over sand
    i. **Associated species (if known)** *Najas gracillima, Potamogeton friesii*
    j. **TRS** T41N R07E S29
    k. **WBIC** 1861700
    l. **More detailed location** (if known) SW edge of lake, 1 m depth
    m. **GPS lat/long coordinates** (if known) N 46°15.037' W090°01.804'
    n. **Herbarium of deposition** UWSP

3. **Send pressed plants** to Mark Wetter or Ted Cochrane (UW- Madison), or to Dr. Robert Freckmann (UW-Stevens Point). **Please notify the herbarium of your intention and wait for confirmation before sending plants**:

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Mark Wetter or Ted Cochrane
University of Wisconsin-Madison Herbarium
Department of Botany, Birge Hall
430 Lincoln Drive
Madison, WI 53706-1381
tel.: (608) 262-2792
FAX: (608) 262-7509
www.botany.wisc.edu/herbarium/

Dr. Robert Freckmann
Robert Freckmann Herbarium
0310 CNR Addition
1900 Franklin Street
Stevens Point, WI 54481
rfreckma@uwsp.edu

4. **Send electronic record to the WDNR.** Please send a copy of the electronic herbarium file along with the plant data to DNRBaselineAquaticPlants@wisconsin.gov.

CONCLUSIONS

There will be four products from each plant survey. First, there will be the raw data from the quantitative survey which provides a lakewide plant species list and distribution and rake fullness data for each species observed. Second, there will be summary statistics useful in characterizing and comparing populations. Third, there will be observations from the general boat survey. Fourth, voucher specimens will provide a catalog of plant species present in the lake and will bolster the state collections. All electronic data should be sent by email to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to the WDNR Lake Coordinators and Aquatic Plant Management staff for recommendations and comments in the design, implementation, and applications of the data and the survey methodology. The many hours the field staff put into testing this methodology was integral to its successful development, and we are very grateful for all of their hard work.

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Appendix 1

Current (02/2010) contact information for regional WDNR aquatic plant management (APM) and lake coordinators

Northern Region (NOR)

(Ashland, Barron, Bayfield, Burnett, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Oneida, Polk, Price, Rusk, Sawyer, Taylor, Vilas, & Washburn Co.)

Frank Koshere
APM Coordinator
715-392-0807
frank.koshere@wisconsin.gov

Kevin Gauthier, Sr.
Florence, Forest, Langlade, Lincoln, Oneida, & Vilas Co.
715-365-8937
kevin.gauthiersr@wisconsin.gov

Pamela Toshner
Barron, Bayfield, Burnett, Douglas, Polk, & Washburn Co.
715-635-4073
pamela.toshner@wisconsin.gov

Jim Kreitlow
Ashland, Iron, Price, Rusk, Sawyer, & Taylor Co.
715-365-8947
james.kreitlow@wisconsin.gov

Southeast Region (SER)

(Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, & Waukesha Co.)

Heidi Bunk
: Ozaukee, Sheboygan, Walworth, Washington, & Waukesha Co.
262-574-2130
heidi.bunk@wisconsin.gov

Craig Helker
Kenosha, Milwaukee, & Racine Co.
262-884-2357
craig.helker@wisconsin.gov

South Central Region (SCR)

(Columbia, Dane, Dodge, Green, Grant, Iowa, Jefferson, Lafayette, Richland, Rock, & Sauk Co.)

Susan Graham
Lake & APM Coordinator
608-275-3329
susan.graham@wisconsin.gov

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Northeast Region (NER)
(Brown, Calumet, Door, Fond du Lac, Green Lake, Kewaunee, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Shawano, Waupaca, Waushara, & Winnebago Co.)

Mary Gansberg
Kewaunee, Door, Manitowoc, & Menominee Co.
920-662-5489
mary.gansberg@wisconsin.gov

Ted Johnson
Green Lake, Marquette, Waupaca, & Waushara
920-787-4686 ext. 3017
tedm.johnson@wisconsin.gov

Mark Sesing
Fond du Lac, Outagamie, & Winnebago Co.
920-485-3023
mark.sesing@wisconsin.gov

Jim Reyburn
Brown, Oconto, & Shawano Co.
920-662-5465
james.reyburn@wisconsin.gov

Greg Sevener
Marinette Co.
715-582-5013
gregory.sevener@wisconsin.gov

West Central Region (WCR)
(Adams, Buffalo, Chippewa, Clark, Crawford, Dunn, Eau Claire, Jackson, Juneau, La Crosse, Marathon, Monroe, Pepin, Pierce, Polk, Portage, St. Croix, Trempealeau, Vernon, & Wood Co.)

Scott Provost
APM Coordinator
715-421-7881 ext. 3017
scott.provost@wisconsin.gov

Buzz Sorge
Lake Coordinator
715-839-3794
patrick.sorge@wisconsin.gov

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Appendix 2

This appendix contains examples of statistical outputs created through the point-intercept sampling method for Kathan Lake, Oneida County. The data was collected during a survey conducted August 21-22, 2007.

Table 1. Summary Statistics

Total number of sites set-up	203
Total number of sites visited	171
Total number of sites with vegetation	149
Total number of sites shallower than maximum depth of plants	165
Frequency of occurrence at sites shallower than maximum depth of plants	90.30
Simpson Diversity Index	0.94
Maximum depth of plants (ft)	9.50
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	171
Average number of all species per site (shallower than max depth)	3.96
Average number of all species per site (veg. sites only)	4.39
Average number of native species per site (shallower than max depth)	3.56
Average number of native species per site (veg. sites only)	3.95
Species Richness	37
Species Richness (including visuals)	38
Species Richness (including visuals & boat survey)	40

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Table 2. Individual species frequency of occurrences

Common Name	Scientific Name	% Frequency (Littoral)	% Frequency (Whole lake)	% Frequency (in vegetated areas)	Relative Frequency (%)
Bushy pondweed	*Najas flexilis*	41.2	39.8	45.6	10.4
Common waterweed	*Elodea canadensis*	40.6	39.2	45.0	10.2
Eurasian water milfoil*	*Myriophyllum spicatum**	40.0	38.6	44.3	10.1
Filamentous algae	*Algae* spp.	26.1	25.1	28.9	6.6
Coontail	*Ceratophyllum demersum*	23.0	22.2	25.5	5.8
Stoneworts	*Nitella* spp.	21.8	21.1	24.2	5.5
Watershield	*Brasenia schreberi*	20.6	19.9	22.8	5.2
Small bladderwort	*Utricularia minor*	17.6	17.0	19.5	4.4
Small pondweed	*Potamogeton pusillus*	17.0	16.4	18.8	4.3
Common bladderwort	*Utricularia vulgaris*	16.4	15.8	18.1	4.1
Wild celery	*Vallisneria americana*	15.2	14.6	16.8	3.8
Flat stem pondweed	*Potamogeton zosteriformis*	13.9	13.5	15.4	3.5
Stiff pondweed	*Potamogeton strictifolius*	11.5	11.1	12.8	2.9
Ribbon leaf pondweed	*Potamogeton epihydrus*	9.1	8.8	10.1	2.3
White water lily	*Nymphaea odorata*	7.9	7.6	8.7	2.0
Muskgrasses	*Chara* spp.	7.3	7.0	8.1	1.8
Freshwater sponge	Sponge spp.	6.1	5.8	6.7	1.5
Moss	Moss spp.	6.1	5.8	6.7	1.5
Large-leaf pondweed	*Potamogeton amplifolius*	5.5	5.3	6.0	1.4
Spiny-spored quillwort	*Isoetes echinospora*	4.9	4.7	5.4	1.2
Waterwort	*Elatine minima*	4.2	4.1	4.7	1.1
Creeping spikerush	*Eleocharis palustris*	4.2	4.1	4.7	1.1
Water horsetail	*Equisetum fluviatile*	4.2	4.1	4.7	1.1
Northern water milfoil	*Myriophyllum sibiricum*	4.2	4.1	4.7	1.1
Thin floating-leaf bur-reed	*Sparganium* sp.	4.2	4.1	4.7	1.1
Spatterdock	*Nuphar variegata*	3.6	3.5	4.0	0.9
Spiral-fruited pondweed	*Potamogeton spirillus*	3.6	3.5	4.0	0.9
American bur-reed	*Sparganium americanum*	3.6	3.5	4.0	0.9
Shoreweed	*Littorella uniflora*	3.0	2.9	3.4	0.8
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	2.4	2.3	2.7	0.6
Variable pondweed	*Potamogeton gramineus*	2.4	2.3	2.7	0.6
Twin-stemmed bladderwort	*Utricularia geminiscapa*	1.8	1.8	2.0	0.5
Pipewort	*Eriocaulon aquaticum*	0.6	0.6	0.7	0.2
Clasping leaf pondweed	*Potamogeton richardsonii*	0.6	0.6	0.7	0.2
Broad-leaved arrowhead	*Sagittaria latifolia*	0.6	0.6	0.7	0.2
Thin-leaved pondweed	*Potamogeton* sp.	0.6	0.6	0.7	0.2
Flat-leaved bladderwort	*Utricularia intermedia*	0.6	0.6	0.7	0.2
Cattail	*Typha* sp.	Visual	Visual	Visual	Visual
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	Boat Survey	Boat Survey
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	Boat Survey	Boat Survey

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Table 3. Number of sites where species was found and average rake fullness rating

Common Name	Scientific Name	# sites where species was found	# sites where species was found (including visuals)	Average rake fullness rating
Bushy pondweed	*Najas flexilis*	68	68	1.28
Common waterweed	*Elodea canadensis*	67	67	1.28
Eurasian water milfoil*	*Myriophyllum spicatum**	66	71	1.47
Filamentous algae	*Algae* spp.	43	43	1.00
Coontail	*Ceratophyllum demersum*	38	38	1.37
Stoneworts	*Nitella* spp.	36	36	1.00
Watershield	*Brasenia schreberi*	34	58	1.68
Small bladderwort	*Utricularia minor*	29	29	1.10
Small pondweed	*Potamogeton pusillus*	28	28	1.14
Common bladderwort	*Utricularia vulgaris*	27	27	1.30
Wild celery	*Vallisneria americana*	25	26	1.36
Flat stem pondweed	*Potamogeton zosteriformis*	23	25	1.22
Stiff pondweed	*Potamogeton strictifolius*	19	19	1.16
Ribbon leaf pondweed	*Potamogeton epihydrus*	15	18	1.27
White water lily	*Nymphaea odorata*	13	42	1.69
Muskgrasses	*Chara* spp.	12	12	1.25
Freshwater sponge	Sponge spp.	10	11	1.00
Moss	Moss spp.	10	10	1.20
Large-leaf pondweed	*Potamogeton amplifolius*	9	10	1.33
Spiny-spored quillwort	*Isoetes echinospora*	8	11	1.00
Waterwort	*Elatine minima*	7	8	1.00
Creeping spikerush	*Eleocharis palustris*	7	9	1.14
Water horsetail	*Equisetum fluviatile*	7	15	1.43
Northern water milfoil	*Myriophyllum sibiricum*	7	7	1.00
Thin floating-leaf bur-reed	*Sparganium* sp.	7	7	1.00
Spatterdock	*Nuphar variegata*	6	22	1.17
Spiral-fruited pondweed	*Potamogeton spirillus*	6	6	1.00
American bur-reed	*Sparganium americanum*	6	11	1.50
Shoreweed	*Littorella uniflora*	5	5	1.00
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	4	5	1.25
Variable pondweed	*Potamogeton gramineus*	4	5	1.00
Twin-stemmed bladderwort	*Utricularia geminiscapa*	3	3	1.00
Pipewort	*Eriocaulon aquaticum*	1	2	1.00
Clasping leaf pondweed	*Potamogeton richardsonii*	1	1	2.00
Broad-leaved arrowhead	*Sagittaria latifolia*	1	1	1.00
Thin-leaved pondweed	*Potamogeton* sp.	1	1	1.00
Flat-leaved bladderwort	*Utricularia intermedia*	1	1	1.00
Cattail	*Typha* sp.	Visual	3	n/a
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	n/a
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	n/a

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Appendix 3

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 9.3

This is a protocol for making a plant distribution map using ArcGIS 9.3 and the Excel (2003 version) file of data from the point intercept (PI) survey. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. After entering the PI survey data into the Aquatic Plant Survey Data Workbook (Appendix-C.xls), save the file using a unique name. We recommend the convention: Lake_County_WBIC_(YYYY).xls

2. Prepare <Lake_County_WBIC_(YYYY).xls> For Join
    a. Open file in Excel
    b. **File → Save As → Lake_County_WBIC_(YYYY)_JOIN.xls (DO NOT MODIFY ORIGINAL FILE)**
    c. Delete all worksheets except for ENTRY and ARCGIS TEMPLATE (make sure to scroll left and delete the README sheet)
        i. Click on worksheet tab; Edit → Delete Sheet → Delete
    d. Delete the following columns
        i. Entry columns (A & I) and calculated columns (B-H)
            1. Columns B-H are normally hidden. To "unhide" them, cursor over the column heading (A) at the top of the sheet and click/drag to highlight it and the adjacent column (I). Right click the highlighted region, then select unhide. Columns B-H are colored blue. Now delete all columns A-I.
        ii. Latitude, Longitude columns (possibly hidden, located between sampling point and depth columns)
        iii. Replace first row of ENTRY with ARCGIS TEMPLATE
            1. Copy the entire first row of truncated species names from the ARCGIS TEMPLATE worksheet
            2. Highlight the first row on the ENTRY worksheet and replace with the template (Edit → Paste)
        iv. Species columns with no data
            1. Add a count row to identify empty columns to delete
                a. Select all cells and remove any validation
                    i. Select All (Ctrl-A)
                    ii. Data → Validation → OK → Allow Any Value → OK
                b. In the row below the last sampled point, and in the first column under a plant species, enter the formula =counta(
                c. Then highlight the column up to the first sampling point. The beginning of this procedure is depicted below.

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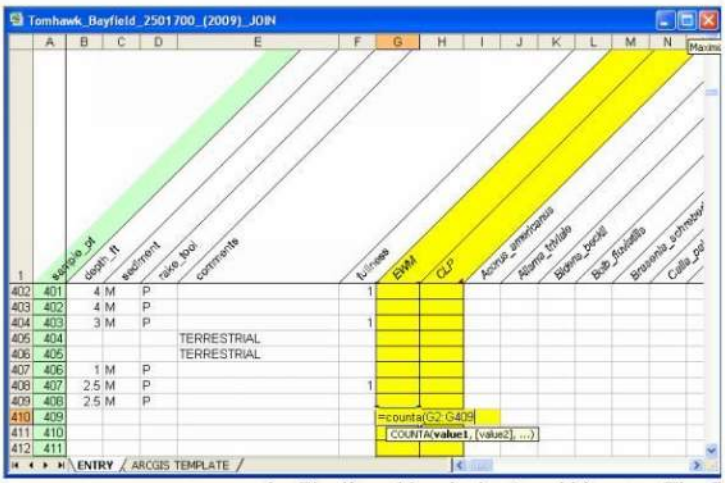
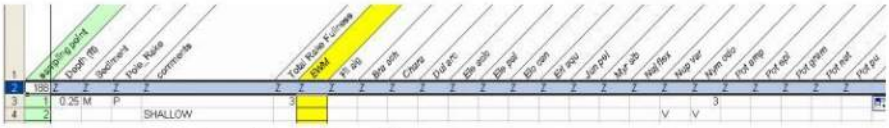


d. Finally, add a closing) and hit enter. The final formula will be similar to this: =counta(G2:G500)
e. Point the cursor over the bottom right corner of the cell until cursor turns into a "+". Click/Drag this formula all the way across to the end of the species list.
f. Delete any columns where the sum row is equal to 0
g. Then delete the sum row

e. Delete any rows after the last applicable sample point
   i. The "sample_pt" column is usually populated up to 4000 points; delete any rows where the sampling point column is numbered, but these sample points are greater than the number of points set-up in the lakewide grid, and therefore the row doesn't contain any information.
f. Add a "dummy" row so all data imports into ArcGIS as "text"
   i. Add a row directly above the first sampled point
   ii. In this newly created row, under the Sampling Point column, enter the number equal to the total number of sample points plus 1 (i.e. total sampling points in example image is 187. The number 188 would be entered into the "dummy" row under the sampling point)
g. Enter "Z" in all other cells in all columns that contain any information



h. Save the file and close Excel

3. Save the lake specific polygon and point shapefiles to a folder on a local drive
   a. We'll refer to this folder as "MapFolder"

4. Open ArcMap
   a. Select to Start using ArcMap with "a new empty map" and click "OK"

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5. Add Data (either method "a" or "b")
    a. Using Add Data Button
        i. Select the "Add Data" button; or File → Add Data 
        ii. Navigate to MapFolder
        iii. Highlight both the lake polygon (lake_country_WBIC_poly.shp) and point (lake_county_WBIC_XXmpts.shp) shapefiles
        iv. Click on 'Add'
    b. Directly from ArcCatalog
        i. Situate ArcMap and ArcCatalog windows so that you can see both
        ii. Navigate to MapFolder in ArcCatalog
        iii. Highlight both the lake polygon (lake_county_WBIC_poly) and point (lake_county_WBIC_XXmpts) shapefiles
        iv. Drag and drop these shapefiles into ArcMap
        v. Note: Shapefiles should only be saved, deleted, moved, etc. in ArcCatalog. Using Windows Explorer with shapefiles can result in accidental deletion of individual shapefile files (i.e. *.shp, *.dbf, *.sbn, *.shx, *.sbx, and *.sbn files must all be stored together. ArcCatalog packages these files together so nothing gets lost)

6. Defining Shapefile Projections
    a. If after adding in your shapefiles a warning message regarding "Unknown Spatial Reference" appears, the shapefiles coordinate system is not defined
        i. To define and verify projection, please contact DNRBaselineAquaticPlants@wisconsin.gov
        ii. Alternatively, the shapefile projection can be defined manually by using the Define Projection Tool located in ArcToolbox
            1. ArcToolbox → Data Management Tools → Projections and Transformations → Define Projection
            2. Input Dataset or Feature Class
                a. Select the shapefile that needs a defined projection
            3. Click on the browse button (right side of dialog box)
            4. In the Spatial Reference Properties dialog box, click on the "Select" button
            5. Browse for the correct coordinate system
                a. Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj; Click Add.
                    i. Do not use the US Feet system
                    ii. The coordinate system name may also be displayed as NAD 1983 HARN Transverse Mercator
                    iii. Coordinate system parameters:
                        1. Projection → Transverse Mercator
                        False Easting → 520000.00000000
                        False Northing → -4480000.000000
                        Central Meridian → -90.00000000
                        Linear Unit → Meter

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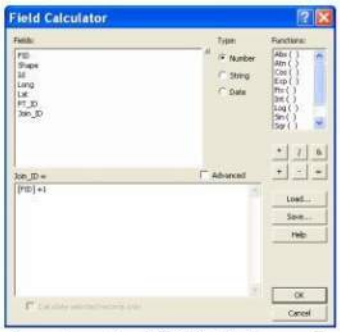
6. Select "OK" on Spatial Reference Properties dialog box, and "OK" on define projection tool

7. Edit Attribute Table for point shapefile
   a. Open Attribute Table
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select "Open Attribute Table"
   b. Add a Field
      i. Select the "Options" button → "Add Field"
      ii. Name: Join_ID
      iii. Type: Double
      iv. Precision: 10
      v. Scale: 3

   c. Populate Join_ID Column
      i. Right click on "Join_ID" column heading
      ii. Select "Field Calculator"
      iii. If Field Calculator warning message pops up, click "Yes"
      iv. Set expression by double-clicking FID in the "Fields:" box and typing +1. The white box under "Join_ID =" should now read **[FID] +1**
      v. Click "OK"
      vi. Your Join_ID column should now be populated in sequential order, starting with point #1 at the top
      vii. Close the attribute table
      viii. Note: This expression is assuming that each unique ID was based off of the calculation [FID] +1 when creating the initial point file. If the unique ID's were not created in sequential order based on the FID field, then calculate Join_ID field accordingly (example: Truncate a unique ID such as 'Como001' so that it just reads '001' in the Join_ID field.)



8. Join shapefile to <Lake_County_WBIC_(YYYY)_JOIN.xls>
   a. Right click on point shapefile in ArcMap table of contents
   b. Select Joins and Relates → Join…
   c. Set the following options:
      i. Join Attributes from a table
      ii. Join will be based on "Join_ID"
      iii. Choose the table to join to this layer
         1. Click on Window Folder (See arrow)

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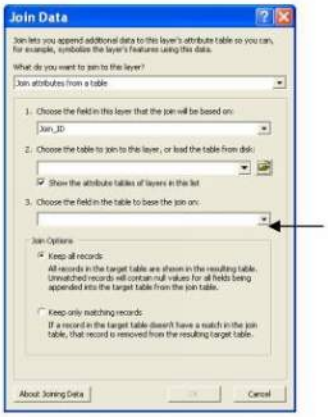
2. Navigate to and double-click on the Excel file saved in step 2
3. Double-click on the 'ENTRY $' sheet
4. Click "Add"

iv. Base the join on "sample_pt"
v. Join Options: Keep All Records (If using ArcGIS 9.2, these options can be viewed by clicking the "Advanced" button)
vi. Click "OK"
vii. If prompted to create index, select "Yes"



9. Export joined shapefile to make it permanent
   a. Right click on joined point shapefile in ArcMap table of contents
   b. Select Data → Export Data
   c. Set the following options:
      i. Export: All Features
      ii. Use the same coordinate system as: this layer's source data
      iii. Output shapefile or feature class: Save in MapFolder as **Lake_County_WBIC_ XXpts_YEAR_JOIN.shp**

   d. Click "OK"
   e. When asked if you want to add the exported data to the map as a layer, select "Yes"
      i. This final joined shapefile will now be referred to as "Joined Point Shapefile"
   f. Remove the Join from the original point shapefile
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select Joins and Relates → Remove Join(s) → Remove All Joins
   g. In the table of contents, uncheck or remove the original point shapefile that was used to create the Joined Point Shapefile.

10. Check Join Results
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select "Open Attribute Table"
    c. Verify that Join was successful
       i. All data present in Excel file should now be located in the Joined Point Shapefile attribute table, and the Join_ID and Sample_Pt columns will be identical

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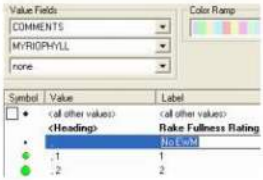
11. Display Plant Distribution Data
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select "Properties"
    c. Select "Symbology" tab
    d. On left side of dialog box under "Show:", select "Categories – Unique Values, Many Fields"
    e. Value Fields should be "Comments". Be sure to select the appropriate Comments field, as there may be two that appear similar.
    f. You will then choose additional Value Fields to display species information (i.e. If you want to display both EWM and CLP species information, then both EWM and CLP need to be chosen as Value Fields)
    g. Select "Add All Values"
        i. All possible values are now displayed, separated by a comma. Each position indicates the unique values for each Value Field you designated in steps e & f, in the order entered. That is, if you selected 'comments', 'EWM', and 'CLP' as your value fields, the first value might read: ' , , ' indicating points that were sampled, but had neither a comment, EWM, nor CLP present. The next value might read ' , ,1', which includes points with no comments, no EWM, and fullness rating of 1 for CLP.
        ii. Points with information for the 'comments' value field were likely not sampled; the comment listed should clarify how to work with these points.
    h. Un-check <all other values> box
    i. Double-click on symbol next to each value to set symbology
        i. You must now choose appropriate symbols and colors for the different variables being expressed.
        ii. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2, 3), a small light green circle for visuals (V), a small black dot for sites sampled that had no relevant plant data, and a small "x" symbol for all sites not sampled
    j. You can change the label name of the symbol being represented by clicking on the respective space under "Label". (e.g. change " , " to "No EWM"; " ,1" to "1"; " ,V" to "Visual"; "Deep, " to "Not Sampled")



    k. You can also group values together (e.g. No Information, Deep, Shallow, etc)
        i. Hold down the Shift key and highlight all rows that should be grouped

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ii. Right click on highlighted rows and select "Group Values"
iii. The final Layer Properties dialog box should look similar to this: Note: If you want to change the order that these will appear in the legend, highlight a row and use the arrows on the right side to move.
iv. Click "Apply" then "OK" to update symbols on map

v. The polygon shapefile fill color and outline may also be modified similarly under the "Symbology" tab

12. Map Page Layout
    a. Verify that the coordinate system is defined correctly for the Data Frame
        i. Select View → Data Frame Properties → Coordinate System Tab
        ii. If the coordinate system is incorrectly defined, browse for the correct coordinate system
            1. Predefined → Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj
    b. View → Layout View
    c. File → Page and Print Setup → Select Landscape or Portrait
    d. Modify size/shape of data frame to fit on entire page and serve as map border
        i. Right click data frame, select Properties, under the 'Frame' tab, change border to a thickness of 2 and select OK.
    e. Insert → North Arrow
        i. Size and position appropriately
    f. Insert → Scale Bar
        i. Select "Alternating Scale Bar 1" and click "OK"
        ii. Double-click on Scale Bar in Layout view to edit properties
        iii. Set the following properties:
            1. Number of divisions: 2
            2. Number of subdivisions: 1
            3. Set units to kilometers

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4. Click "OK"

g. Insert → Text
   i. Double-click on Text Box to edit information
      1. Create text box with the following information:
         a. Lake Name, County, Date Sampled, etc.
      2. Format text as appropriate using "Change Symbol…" button

h. Insert → Picture → Navigate to WDNR Logo (Black & White)
   i. Size and position appropriately

i. Legend
   i. In the table of contents, modify the displayed name of your shapefile as you would like it to appear in your legend by single clicking on the text
   ii. Insert → Legend
   iii. Choose which layers you want to include in your legend
      1. Include the layer that has the plant distribution symbology information
      2. You may have to remove the polygon layer by highlighting it under "Legend Items" and clicking the single left angle bracket (<), then select "Next"
   iv. Remove the word "Legend" from the Legend Title and select "Next"
   v. Continue selecting "Next" and then "Finish"
   vi. Format legend text
      1. Right click on Legend and select "Properties"
   vii. Size and position legend as appropriate

j. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as an ArcMap Template so you can use the same one each time
   i. File → Save As → Save As Type: ArcMap Template

k. Check printed map for color accuracy before you export (Step 13). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

13. Saving Map as JPEG
   a. File → Export Map
      i. Save as type: JPEG
      ii. Set Resolution: 300 dpi
      iii. Navigate to appropriate folder and Save

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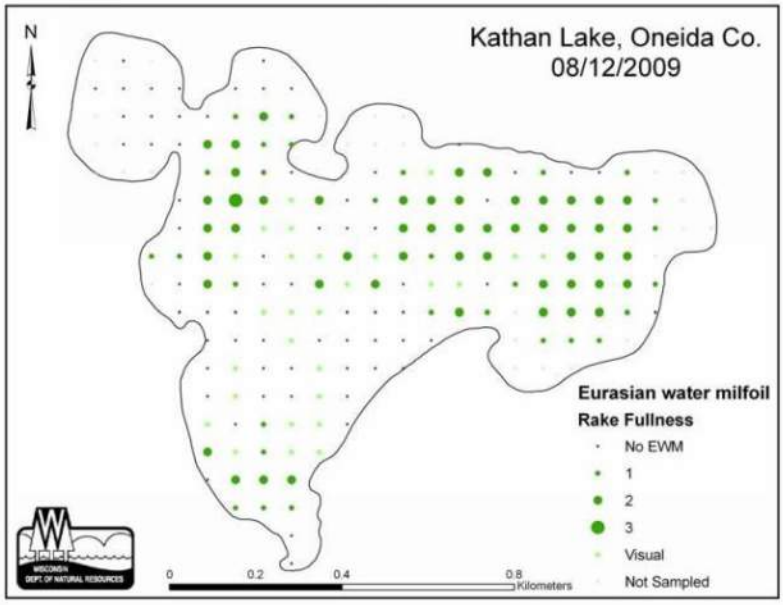

Figure 6: Example plant distribution map created using point-intercept data and ArcGIS 9.3 software for Kathan Lake, Oneida County.

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Appendix 4

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 3.3

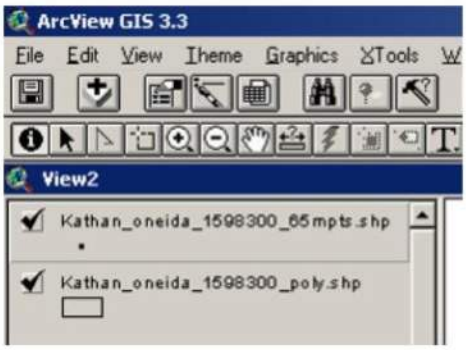
This is a protocol for making plant maps using ArcView GIS 3.3 and the Aquatic Plant Survey Data Workbook Excel file <Appendix-C.xls.>. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. Save the ArcView shapefiles (*.shp, *.dbf, *.sbn, *.shx, *.sbx, *.sbn) to a folder on a local drive.
    a. We'll refer to this folder as "MapFolder"

2. Open ArcView and create a new project with a new view.
    a. Click "yes" to add data

3. Add shapefiles from MapFolder
    a. You can add multiple files at once by holding down "shift" while you click the individual files

4. View window: select the point file
    a. Make sure both themes have the box checked in order to view them
    b. Click once on the point layer to activate that theme (raised box around that item)
    c. If necessary, drag the activated point layer above the polygon layer in order to see the sample points



5. Open theme table
    a. Theme > Table or
    b. The open theme table shortcut button

6. Start editing, add variable column
    a. Table > Start Editing
    b. Edit > Add Field
        i. Enter the name of the field (e.g. EWM_2009)
        ii. Specifications 'type', 'width', and 'decimal places' do not need to be changed
        iii. Click "OK"

7. Stop editing, save edits
    a. Table > Stop Editing, 'Yes' to save edits

8. Export point file

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a. File > Export
b. Select 'dBASE'
c. Select MapFolder to save file
d. Default will be named <table1.dbf>
e. Close table

9. Set-working directory
    i. File > Set Working Directory
    ii. Change working directory to MapFolder

10. Save project, exit ArcView
    a. File > Save Project As > save in MapFolder (for ease of reference, lets call the file EWM_Map.apr)
    b. Exit ArcView

11. Open file saved in step 8 with Excel
    a. Open excel; Open a file, when prompted to find the file, navigate to MapFolder
    b. In "Files of type" option bar select "All files"
    c. Open <table1.dbf>

12. List information under data field created (EWM_2009)
    a. Open PI data entry excel file (WiAPMS.xls)
    b. Copy columns "Sample point, Depth, Comments, & EWM"
    c. Paste special "values" into new excel workbook
        i. Edit > Paste Special > Values
    d. Highlight all data, sort by comments
        i. Data > Sort > Comments
    e. Enter the number 5 into EWM column for all unsampled sites (deep, terrestrial, non-navigable, etc) (this is so the legend can code these sites)
    f. Highlight EWM data column and replace all blanks with 0 (zero), and V (visuals) with 4
        i. Edit > Replace, replace all
    g. Highlight all data, re-sort by sampling site
        i. Data > Sort > Sampling Point
    h. Copy EWM column, excluding header, paste into the .dbf file (already open, originally created in step 8)
    i. "Save as" this file as the **original dbf** file's name (the copy you placed in MapFolder, not the original file, obviously)
        i. i.e. overwrite the ISS original (e.g. Kathan_Oneida_1598300_65mpts.dbf) with the new file you just modified in excel. The name must be EXACTLY the same!!
        ii. Close excel

13. Reopen project in ArcView
    a. Open existing project

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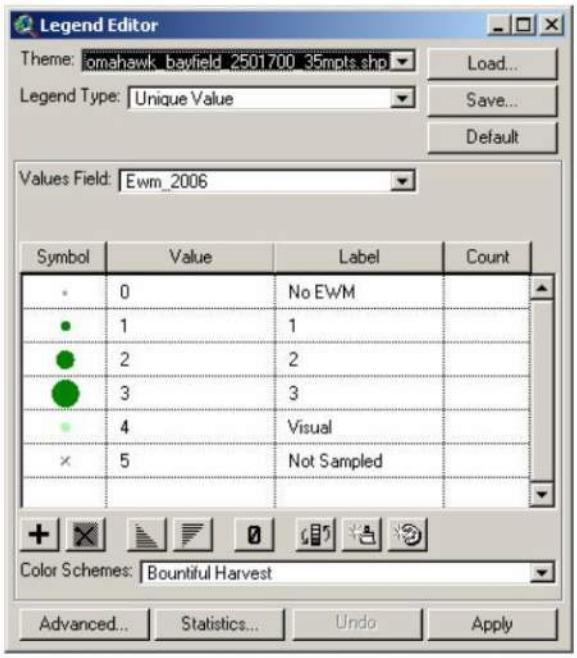
b. Open MapFolder and click on EWM_Map.apr (or whatever you chose to name it in step 9)

14. Create legend
    a. Double-click point symbol in the View frame to open the legend window
    b. In "Legend Type" option bar, choose "Unique Value"
    c. In "Values Field" option bar select "EWM_2009" column (or whatever column you want this map to show)
    d. Apply
    e. You must now choose appropriate symbols and colors for the different variables being expressed by the legend. You can change the symbol by double clicking on it
    f. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2 , 3), a small light green circle for visuals (value: 4), a small black dot for sites sampled, but without EWM, (value: 0), and a small "x" symbol for sites not sampled (value: 5).



    g. You can change the label name of the symbol being represented by clicking on the respective cell under "Label". (e.g. change "5" to "Not Sampled", change "4" to Visual)
    h. The color or shading of the polygon can also be changed by double clicking on the theme

15. Set units
    a. View > Properties
    b. Change map units to "meters" and distance units to "kilometers"

16. Layout
    a. View > Layout
    b. Select Landscape or Portrait
    c. Double-click 'View1' to change map title
    d. Double-click scale bar to adjust range or units
    e. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as a Template (Layout > Store as Template) so you can use the same one each time.

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f. Check printed map for color accuracy before you export (step 17). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

17. Save as JPEG
    a. Have the final layout window active
    b. Select File > Export
    c. In "List Files of Type" option bar, select JPEG
    d. Click 'Options' button
        i. Set resolution to highest number
        ii. Likely 144 DPI and Quality = 100
    e. Type file name, choose location in which to save the JPEG
    f. Click OK

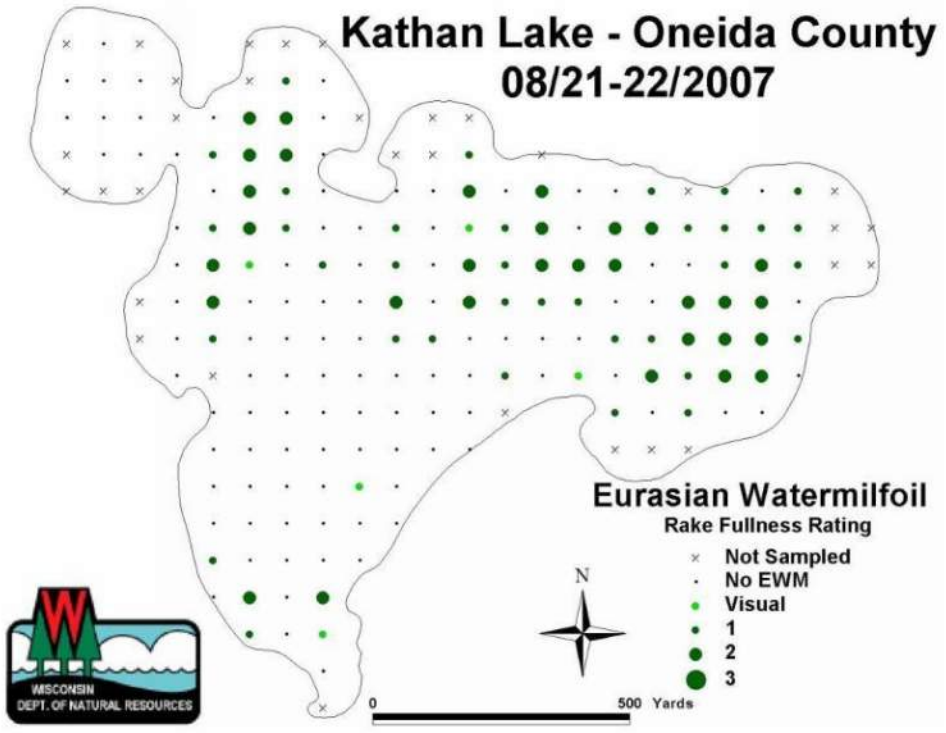

Figure 7: Example plant distribution map created using point-intercept data and ArcGIS 3.3 software for Kathan Lake, Oneida County.

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Document citation:

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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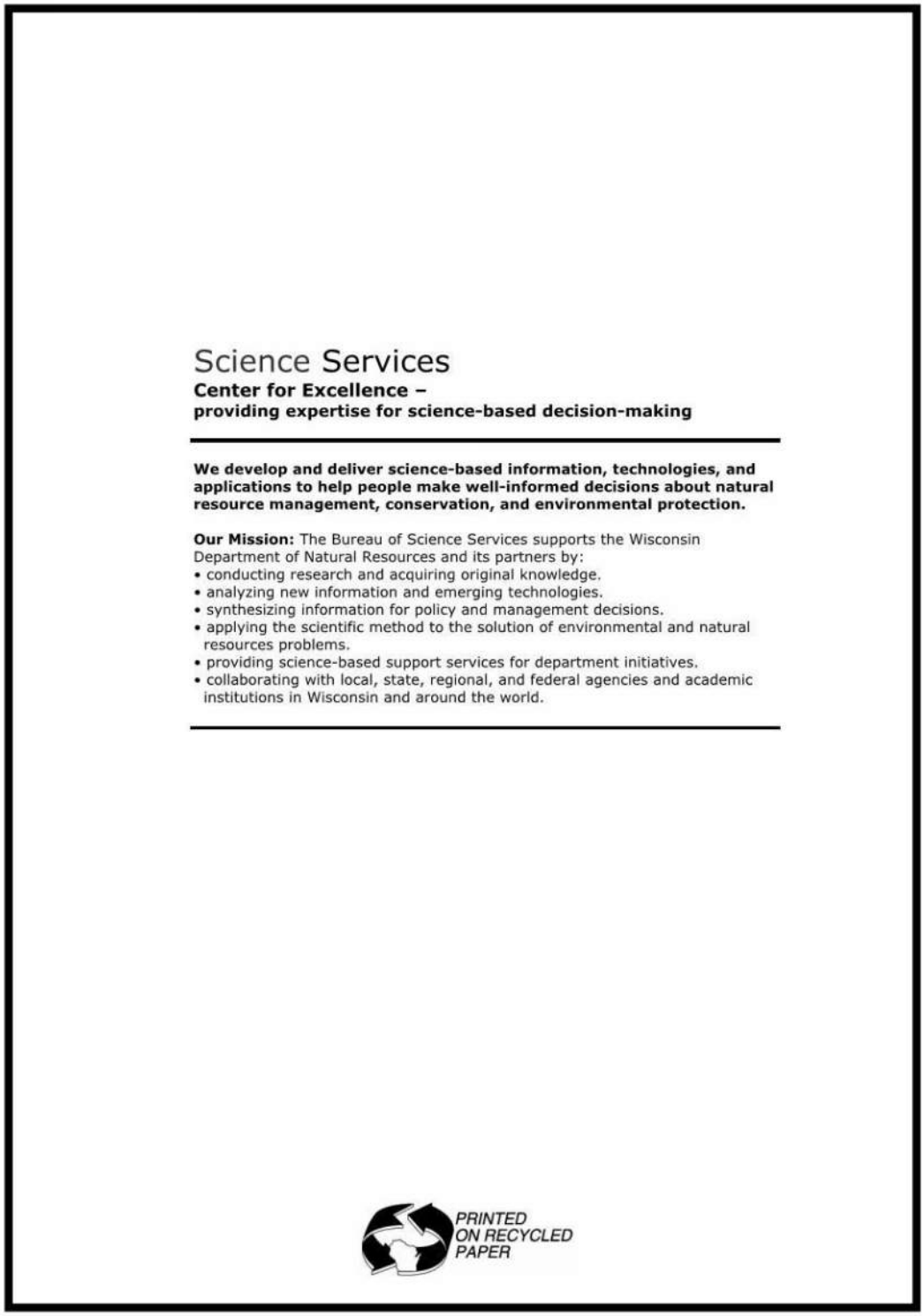

Science Services

Center for Excellence –
providing expertise for science-based decision-making

We develop and deliver science-based information, technologies, and applications to help people make well-informed decisions about natural resource management, conservation, and environmental protection.

Our Mission: The Bureau of Science Services supports the Wisconsin Department of Natural Resources and its partners by:

- conducting research and acquiring original knowledge.
- analyzing new information and emerging technologies.
- synthesizing information for policy and management decisions.
- applying the scientific method to the solution of environmental and natural resources problems.
- providing science-based support services for department initiatives.
- collaborating with local, state, regional, and federal agencies and academic institutions in Wisconsin and around the world.

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Appendix 3 - Rapid Response Aquatic Species Sheet

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Selected Regulated Aquatic Invasive Species in WI

Report any **prohibited** species as soon as possible by emailing: **Invasive.Species@wi.gov.**
This publication does not list all the regulated species. For the full list of Prohibited or Restricted species please visit:
www.dnr.wi.gov keyword: **invasives**

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Appendix 4 – Documentation of Consultation of the Draft ATIS Plan

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Shawn Puzen

From: James Fossum <jfbio@yahoo.com>
Sent: Thursday, January 16, 2020 2:27 PM
To: Shawn Puzen
Cc: Allison Werner; Cheryl - DNR Laatsch; Nick Utrup; Matthew J. Miller; Angela Tornes
Subject: Cornell Hydro

Hi Shawn,

Your recent e-mail requested the River Alliance of Wisconsin's review of Xcel Energy's draft aquatic and terrestrial invasive species relicensing study for Cornell Hydro.

We are pleased that the study design was set up in accordance with the Wisconsin DNR guidance document: *Recommended baseline monitoring of aquatic plants in Wisconsin* (March 210). Accordingly, we do not have substantive comments on the study plan. However, we do recommend that the data collected using the point-intercept method incorporate as many parameters as applicable of those listed in Table 1: "**examples of statistical outputs created through the point-intercept sampling method**" contained in Appendix 2, page 31 of Wisconsin DNR plant study guidelines.

Thank you for the opportunity to comment.

Jim Fossum
Consultant for the RAW

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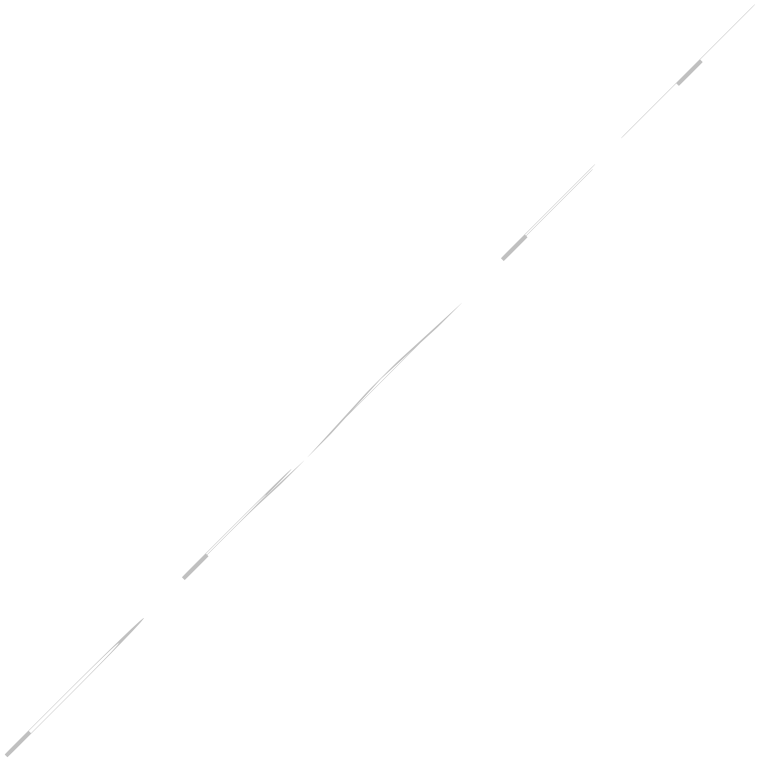
The Wisconsin Department of Natural Resources did not provide comments.



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Shawn Puzen

From: Shawn Puzen
Sent: Thursday, January 2, 2020 11:09 AM
To: 'James Fossum'; cheryl.laatsch@wisconsin.gov
Cc: Miller, Matthew J; Crotty, Scott A; Darrin Johnson; Shawn Puzen
Subject: Cornell Aquatic and Terrestrial Invasive Species Study Plan for Comment
Attachments: 20200102 Aquatic and Terrestrial Invasive Species Study Plan Sent for Comment.pdf

Hi Cheryl and Jim,

Per your study request, Xcel Energy has had the enclosed Study Plan Developed to study the Aquatic and Terrestrial Invasive Species at Cornell as part of the relicensing effort.

Please provide your comments within 30 days.

If you have any questions, please feel free to contact me or Matt Miller. I can forward any questions requiring decisions to Matt for you.

Thanks,

Shawn Puzen | FERC Licensing & Compliance
Mead & Hunt | 1702 Lawrence Drive | De Pere, WI 54115
Direct: 920-593-6865 | Mobile: 920-639-2480
shawn.puzen@meadhunt.com| meadhunt.com
https://www.linkedin.com/in/shawnpuzen

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Cornell Hydroelectric Project
FERC No. 2639

Proposed Study Plan

Aquatic and Terrestrial Invasive Species Study

Prepared for

Xcel Energy®

Prepared by

Mead & Hunt

meadhunt.com

January 2020

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LIST OF ACRONYMS

Applicant	Xcel Energy Services, Inc.
ATIS	Aquatic and Invasive Species Study
Commission	Federal Energy Regulatory Commission
FERC	Federal Energy Regulatory Commission
Licensee	Northern States Power Company
NR 40	Chapter NR 40 of the Wisconsin Administrative Code
PAD	Pre-Application Document
Project	Cornell Hydroelectric Project
SWIMS	Surface Water Information Management System
RAW	River Alliance of Wisconsin
WDNR	Wisconsin Department of Natural Resources
Xcel Energy	Xcel Energy Services, Inc.

DRAFT

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

1. INTRODUCTION

Xcel Energy Services Inc. (Xcel Energy), on behalf of Northern States Power Company, a Wisconsin corporation (Licensee, Applicant) currently holds a license issued by the Federal Energy Regulatory Commission (FERC) to operate and maintain the Cornell Hydroelectric Project (Project). The Project is operated and maintained by the Licensee. The current license, which designates the Project as FERC No. 2639, expires on November 30, 2023. In order to a new license, the Licensee must submit a final license application to FERC no later than November 30, 2021.

On March 19, 2019, the Licensee held a Joint Agency Meeting to present information about the Project. At the meeting and during the 60-day period after the meeting, the Licensee received comments and study requests from several entities. The Wisconsin Department of Natural Resources (WDNR) and River Alliance of Wisconsin (RAW) requested the Licensee to complete an invasive species study as part of relicensing. The WDNR requested that the survey include the presence/absence of aquatic invasive species listed under NR 40. The RAW requested that the survey include restricted species under NR 40 and they did not restrict their request to aquatic species. Copies of the study requests are available in Appendix 1.

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

2. STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the Aquatic and Terrestrial Invasive Species (ATIS) Study is to provide baseline data on native species and aquatic invasive species listed under NR 40. The study will also identify newly invading species early enough to increase chances of control and help prevent the spread of other nearby invasive species.

2.2 Background and Existing Information

Xcel Energy has been surveying the Cornell Reservoir for Purple loosestrife (Lythrum salicaria) since 2004. It was first identified by Xcel Energy as present on the Cornell Reservoir in 2004. According to the WDNR, the presence of curly-leaf pondweed (Potamogeton crispus) in the Cornell Reservoir was verified and vouchered in 2007. Eurasian water-milfoil (Myriophyllum spicatum) was verified and vouchered in the Cornell Reservoir in 2009. Purple loosestrife and rusty crayfish (*Orconectes rusticus*) were verified in the Cornell Reservoir in 2007 (WDNR 2018b). All four of these invasive species are listed as restricted under NR 40.

On September 8, 2015, according to the Surface Water Information Management System (SWIMS) provided by the WDNR, six hours were expended towing for water fleas on the reservoir. The consolidated sample analysis provided negative results for both the spiny water flea and fishhook water flea. Field technicians also indicated they did not identify the presence of any of the following invasive species listed by common name:

Asiatic clam
Banded mystery snail
Brazilian waterweed
Chinese mystery snails
Didymo
European frogbit
Fanwort
Faucet snails
Flowering rush
Hydrilla
Japanese knotweed
New Zealand mudsnails
Parrot feather
Phragmites
Quagga mussels
Red swamp crayfish
Water chestnut
Water hyacinth
Water lettuce
Yellow flag iris

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

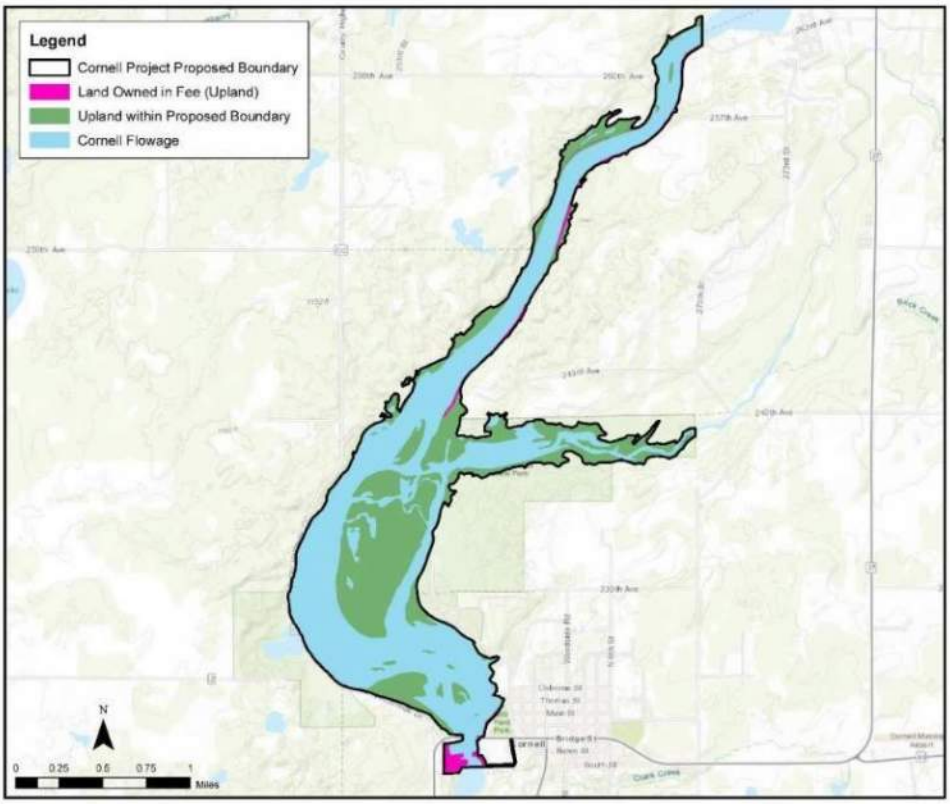
Yellow floating heart

2.3 Nexus between Project Operations and Effects on Resources

Invasive species can be introduced to Project waters and lands through recreational activities such as boating and four-wheeling. These species, once established within the Project boundary, can be transferred downstream through water releases or to areas outside of the project boundary by recreationists.

2.4 Study Area

The ATIS Study will encompass the upstream and downstream inundated portions of the Chippewa River contained within the proposed project boundary outlined in the Pre-Application Document (PAD). It will also encompass upland areas owned in fee by the Licensee within the proposed project boundary. Both areas are depicted below.



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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

2.5 Methodology

2.5.1 Upstream and Downstream Inundated Areas

Samples will be collected in locations outlined in a point-intercept grid provided by the WDNR. Sampling will be completed in June and late July or early August of 2020. The sampling will be completed by boat using either a pole-mounted rake or rope-mounted rake approximating the WDNR Point-Intercept protocols absent the voucher specimen collection (See Appendix 2).

One rake sample per collection site will be taken by lowering the rake to the bottom and slowly drawing it up to the surface. The sample will be inspected for the presence of invasive species as included in NR 40[1]. Their presence and percentage of abundance within the sample will be recorded on a field data sheet accordingly along with the presence and percentage of abundance of native species.

Any areas that are not safely accessible will be noted in the report with one of the following reasons:

- Non-navigable (due to thick emergent plant growth or shallow water);
- Terrestrial (point-intercept located in an upland area not owned by licensee);
- Obstacle (rocks, dock, swim area);
- Temporary obstacle (temporary obstacle should be noted);
- No information (accidentally missed or inaccessible, state reason); and
- Other (provide brief description).

No permanent voucher specimens will be collected. Live voucher specimens may be collected if the identification of the species is questionable. Live voucher specimens with a questionable identity will be provided to the WDNR invasive species coordinator for identification.

In addition to the rake sampling, one water sample will be collected in both the reservoir and tailwater during the July/August survey period. The water samples will be provided to the WDNR invasive species coordinator where they can be analyzed for the presence of spiny water flea, fishhook water flea, and zebra mussel veligers.

2.5.2 Upland Shorelines not owned by Licensee

Upland shoreline areas not owned by Licensee will be surveyed from the boat while moving slowly along the shoreline. During the survey, an overall characterization of the terrestrial plant composition will be made. Terrestrial plants included in NR 40 will be noted and their locations on the shoreline identified by latitude and longitude. An estimate of relative abundance and the length of shoreline where each species is present will be recorded for future mapping.

2.5.3 Upland Areas owned by the Licensee

[1] https://dnr.wi.gov/topic/Invasives/documents/NR40plantlist.pdf

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

A meander survey will be utilized for upland areas owned by the License. During the meander survey, an overall characterization of the terrestrial plant community will be made. If any terrestrial plants listed in NR 40 are observed, their location will be recorded via Global Positioning System (GPS). An estimate of relative abundance and the length of shoreline where the species is present will be recorded for future mapping. The route traveled during the meander survey will also be recorded for future mapping.

2.5.4 Personnel Qualifications

All surveys will be conducted by an individual with prior aquatic plant identification training and experience with previous point intercept surveys or an individual pre-approved by the WDNR.

2.5.5 Notifications

In the event a new occurrence of an invasive species listed on the rapid response sheet contained in Appendix 3 is identified during monitoring, WDNR will be notified at invasive.species@wisconsin.gov as soon as possible, but no later than five working days after its discovery. The notification will also include pictures and submittal of the online WDNR Early Detection Form to the WDNR.

2.5.6 Survey Report

A written report will be developed summarizing the monitoring results including the location of each species observed and their relative abundance. The information will be provided in an Excel spreadsheet that follows the Point-Intercept Guidelines. Corresponding maps will show the locations of the point intercept survey locations and the meander survey routes. The point intercept locations where the presence of NR 40 species are observed will be differentiated from the locations with negative sample results. An overall map showing the predominant species in an area will also be created along with a map showing the locations and the invasive species identified during the surveys.

Lastly, the report will also include all field sheets and completed WDNR forms for any observed new occurrences of aquatic invasive species identified in the Rapid Response List as well as verification photographs.

2.6 Consistency with Generally Accepted Scientific Practice

The ATIS Survey follows generally accepted scientific practice regarding field data collection and reporting. Similar protocols have been approved by the Commission in post-licensing compliance plans.

2.7 Project Schedule

The fieldwork and reporting aspects of this project will be completed by November 1, 2020.

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

3. REFERENCES

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

APPENDIX 1 – Study Requests

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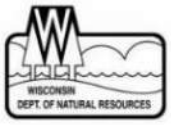
Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

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
TTY Access via relay - 711



May 17, 2019

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

Matt Miller, Xcel Energy
1414 West Hamilton Avenue
PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Proposed Studies for the Cornell Hydroelectric Dam, p-2639

Dear Ms. Bose and Mr. Miller:

The department appreciates the opportunity to participate in the process to relicense the Cornell hydroelectric dam, as proposed in the Preliminary Application Document (PAD), filed with the Federal Energy Regulatory Commission (FERC) on November 29, 2018.

Many of our requests for studies or information are directly correlated to the 2000 Lake Sturgeon Management Plan, which states that it is a high priority to ensure the impacts of dams and habitat needs of species are considered during the FERC relicensing process. The departments Ten-Year Strategic Plan for Fisheries Management in Wisconsin 2015-2025 has a defined goal of using an integrated ecosystem approach to protect, restore, and enhance sustainable aquatic habitat and fish populations. Additionally, studies and information for water quality and invasive species management are directly connected to our requirements under the Clean Water Act to maintain water quality standards, and to our NR40 requirements to manage invasive species.

The department has limited information regarding natural resource information associated with the Cornell hydroelectric project. Studies and additional information have different purposes, from a short term, long term, and cumulative impact perceptive. This information is needed to determine permitting needs, along with protection, mitigation, and enhancement of our natural resources. Our requests for information and studies focus on the continued operation of the Cornell hydroelectric dam.

As Xcel begins to evaluate the array of study requests and informational requests, and determine their study proposal and next steps, the department will continue to provide guidance and recommendations. Please be aware that Scientific Collectors Permits may be required to complete various surveys. Please work with the department to obtain appropriate permits and approvals prior to the collection of data. To save time and costs,

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the department recommends that Xcel meet with the stakeholders who have requested studies to explore options to minimize costs, and still achieve desired data collection. We look forward to working with you.

Sincerely,

Cheryl Laatsch
Wisconsin Department of Natural Resources State FERC Coordinator

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Study Requests and Request for Information
Relicense of Cornell Hydroelectric Dam

WILDLIFE HABITAT: Provide information in the license application to document current wildlife diversity, habitat types, and general abundance within the project area. This information may be used to evaluate the effects of the distribution and composition of vegetation and wildlife habitats, including wetlands, and the effects operations of those actions on wildlife inhabiting those habitats.

AQUATIC INVASIVE SPECIES SURVEY: The invasive species survey is to provide baseline data on the presence/absence of NR 40 listed aquatic invasive species. This data will be used to understand the baseline of native species, diversity and density of invasive species, and prevent the spread of other nearby invasive species. Additionally, this information will be used to better understand the impacts associated with water level manipulations.

Limited information is available. A comprehensive survey will provide needed information to understand the relationship between native and non-native plants, and other aquatic invasive species to determine appropriate short-term and long-term management of the river, along with impacts associated with water level manipulation, and best management practices for the dam operations.

Please work with department to determine which department protocols are appropriate for both the impoundment and the riverine portions of the project area. The departments protocols for Point Intercept Survey and Lakes Early Detection Protocols to ensure scientific integrity. The information collected from this study includes an assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization.

WATER QUALITY STUDY WITHIN THE PROJECT AREA: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions. To adequately assess any impacts of the dam operations on water quality, sampling must occur within the impounded area (in-lake) as well as up and down stream of the impounded area (riverine). Data is necessary to understand if state water quality standards are being met.

The water quality study should determine if the public waters within the project area are meeting state water quality standards; and determine how their water quality profile may impact the downstream riverine areas.

The department protocols should be used as they have been determined to meet the expectations of the Environmental Protection Agency, including guidelines established within the Clean Water Act to ensure that the department is providing appropriate management of public waters and meeting state standards. WisCALM or other department approved protocols shall be used and provides consistent comparison across resource assessments.

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- Impounded Area: Changes in retention times can affect water temperature and nutrient release which can have detrimental effects downstream. Impoundments can influence various water quality parameters that impact downstream DO levels. DO is critical to health and survival of aquatic organisms. Baseline data is needed to determine effects of dam operations on water quality. The assessment should establish baseline data for total phosphorus (TP), chlorophyll a, and secchi depth, DO, temperature, conductivity and pH profiles.

- Riverine Area Above and Below the Impoundment: There is currently no information relating to DO levels, and other water quality parameters, downstream of impoundment. Please assess the TP concentrations, DO, conductivity, and temperature in the riverine portions of the project area.

MUSSEL STUDY: The qualitative and quantitative survey of mussels will provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Cornell hydro dam; and any appropriate management to protect or enhancement the existing freshwater mussel population.

There is limited information on freshwater mussel species within the project area. The following two species have been historically reported, Salamander Mussel and Purple Wartyback mussels. Salamander Mussel requires specific habitat, thus the department would need to review the sampling plan prior to any field data collection.

The change in water levels in the project area associated with operations, and the outflows of the hydro dam could affect mussel species and habitat. The results of the freshwater survey will help FERC and the department determine if any protection, mitigation, or enhancements would be necessary for the freshwater mussel population; and the information will be beneficial for best management practices associated with future drawdowns and repairs.

Methods should follow the WDNR's Guidelines for Sampling Freshwater Mussels in Wadable Stream. A formal study plan should be approved by the department prior to field data collection.

FLASHBOARD FAILURE AND REPLACEMENT, INCLUDING ALTERNATIVES TO MINIMIZE OR REDUCE FLASHBOARD FAILURE: Drawdowns for flashboard replacement can have negative effects on aquatic vegetation, invertebrates and fish species. As part of the license application, please identify alternative flashboard options. Evaluate the drawdown frequency, duration, and other negative environmental impacts associated with each option. Identify flashboard alternatives that would minimize drawdown frequency, duration, and resource impacts.

ASSESSMENT OF IMPACTS ASSOCIATED WITH WATERLEVEL FLUCTUATIONS WITH CURRENT OPERATIONAL RANGE: The existing Lower Chippewa River Settlement Agreement

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(Agreement) was established January 17, 2001. This Agreement sets forth operational requirements for the Cornell hydroelectric dam. When the Agreement expires, operations associated with Cornell may need further review and modification.

> Per the Agreement "The parties recognize, however, that the existing 50-year license for the Cornell Project is not synchronized with the license expiration dates for the other five projects and it is impossible at this time to rectify that difference. Therefore, the parties agree that the term of this settlement should extend to September 30, 2033 which is the license expiration date for the Jim Falls Project and is nearly the same as the January 13, 2034 license expiration date for the Chippewa Falls Project."
>
> Per the Agreement, the Cornell Project is bound to maintain the following operational requirements. NSPW may operate the Cornell Project in a daily peaking mode providing that an instantaneous minimum flow of 400 cubic feet per second (cfs) shall be released from the project at all times. Additionally, NSPW shall maintain the surface water elevation of the Cornell Flowage in accordance with Article 13 of the current FERC license, as issued December 26, 1973, except for the following time period: From April 1 to June 7, the flowage shall be maintained within 0.5 ft of full pool (elevation 1001.5 to 1002.0 ft) to enhance fish spawning.

Cornell hydro has the largest operating range of the six lower Chippewa River dams owned by Xcel which can lead to extensive dewatering of backwater areas that can have negative effects on aquatic and semiaquatic organisms. The Department would like to see a wetted perimeter assessment completed to determine the extent of dewatering in the impoundment at various operating conditions up to 2ft fluctuation. Bathometry and Lidar data would be preferred to be able to understand the dynamics of water level changes affecting the rivers edges.

If the operating range is determined to lead to extensive dewatering of backwater areas, then the operating range will need to be modified when the settlement agreement expires in 2033.

MINIMIUM FLOWS AND OPERATIONAL IMPACTS TO FISH HABITAT: Rapid or frequent changes in water levels can have negative impacts on water resources. Additionally, low water conditions and dewatering of critical habitat can lead to declines in fish populations.

An Instream Flow Incremental Methodology (IFIM) study was conducted in 1997 during the relicensing of other hydro facilities on the Chippewa River. The results should be evaluated to determine if the current minimum flow is allowing for optimal habitat utilization.

Please review the IFIM summary from 1997 to evaluate habitat suitability at a range of minimum flows for smallmouth bass, walleye, lake sturgeon, and redhorse suckers. Using the IFIM, determine habitat utilization of smallmouth bass, walleye, lake sturgeon, and redhorse suckers at different minimum flows (400cfs and above). The minimum flow permitted is 400cfs which may not allow optimal habitat utilization for many aquatic species.

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If higher minimum flows allow for substantially greater habitat utilization, then a higher minimum flow may be required.

ESTIMATE FISH ENTRAINMENT MORTALITY AND DETERMINE METHODS TO MINIMIZE IMPACTS TO LARGE RIVERINE FISH SPECIES: Entrainment through hydro facilities can lead to high mortality especially in adult fish. The Cornell hydro dam has the largest trash rack spacing of any of the dams on the lower Chippewa River at 5 3/8" allowing all life stages of fish, including lake sturgeon up to 40", to become entrained which may be preventing the fishery from reaching its full potential. Specifically, the department is concerned with species impacts to lake sturgeon, muskellunge, walleye and redhorse suckers.

Through desktop models, determine the probability of entrainment mortality for lake sturgeon, muskellunge, walleye, and redhorse suckers for all lengths that can pass through the existing trash racks. The study should evaluate and determine the size of fish that would be excluded and the approach velocities for 2.5" trash rack spacing. If desktop modeling suggests substantial entrainment mortality of the previously mentioned fish species at the current trash rack spacing, then follow up studies will be needed to confirm entrainment or measures will need to be taken to minimize entrainment mortality.

PUBLIC ACCESS TO THE CHIPPEWA RIVER: As part of the license application, please identify locations and options to increase and/or improve shore access to the tailrace fishery and to the impoundment. Improvement identification should include, available and needed parking, access from walkways or trails, public space areas, fishing platforms, handicap accessible options and locations, maps and public awareness of public access features. Costs, land ownership, improvement capabilities, and maintenance should be discussed as part of options to increase or improve public access.

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Rational. The RAW has been a member of the LCRSA – IT since its inception in 2003. The focus of most NRF projects have been at Dells, Jim Falls, Wissota, and Holcombe Hydro Projects. The IT has witnessed a very successful program of allocating funds from the NRF to applicants for projects which resulted in important environmental survey data or direct on-the-ground habitat improvement work in the Lower Chippewa River. We would like to see environmental improvement projects occur in the Cornell Project area as well during the period of the new license. This may require some minor restructuring of the LCRSA through the FERC.

RECOMMENDED STUDIES

1 Mussel survey. In consultation with the Wisconsin DNR and U.S. Fish and Wildlife Service (FWS) conduct a mussel study in the Cornell Flowage and in the tailwater of the dam.

Rational

1. *Identify the basis for determination of the recommended study*

Mussels are an important component of a river system and are sensitive to changes in flow discharge in the tailwater of a dam and to water level fluctuations in a reservoir. The Cornell Hydro Project is operated as a modified peaking operation. Mussels are not very mobile and can be easily adversely affected by hydro operations in terms of species diversity and relative abundance within the zone of fluctuating flow and fluctuating water levels. There is also good reason for a mussel study to document the presence of any State or Federal threatened or endangered species that may occur in the project area. For example, on page 31 of the PAD it is stated that the *purple warty back* mussel, listed as endangered in Wisconsin, is likely to occur in the Chippewa River in the project vicinity.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

It is stated on page 31 of the PAD that the Licensee has been unable to obtain any existing information on freshwater mussels. Therefore, there is good reason to conduct a mussel survey to determine what species could be affected by project operations.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or U.S. Fish and Wildlife Service (FWS) mussel experts. At a minimum, data on mussel species diversity and frequency of abundance should be obtained from sampling.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or FWS. Please consult resource agency staff.

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5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project*

Mussel data will be useful in the short term and long term if it is place on a state-wide data base administrated by the Wisconsin DNR. It will be useful for documenting what mussel species are present currently in the project area and useful in evaluating long term trends in the mussel community there. Further, if a water resource project is planned in the area, a current list of mussels will be needed by the developer to evaluate potential affects to the mussel community that could result from the project.

2. Aquatic and terrestrial Invasive species study (ATIS). Conduct an ATIS survey within the Cornell Flowage and in in the tailwater. The species to be sampled should include *Restricted Species* per Wisconsin Administrative Code (NR 40): invasive species already established in Wisconsin. We note from page 37 of the PAD that Cornell is currently being monitored for purple loosestrife as part of a larger effort on the Chippewa River pursuant to an *Exotic Control Plan*. However, there are many other invasive species to consider.

Rational

1. *Identify the basis for determination of the recommended study*

Species such as purple loosestrife, Eurasian watermilfoil, and curly-leaf pondweed are invasive wetland plants which out-compete many other valuable wetland plants and can dominate the species composition of a wetland or aquatic macrophyte bed in a few years. Terrestrial invasive plants have the same pattern and can out-compete native vegetation as well. There is little food value for wildlife from purple loosestrife; accordingly, infestation of valuable wetlands by this plant is extremely undesirable and harmful. Eurasian watermilfoil and curly-leaf pondweed can rapidly cause aquatic weed problems and alter fish communities by providing too much refugia leading to overpopulation and/or growth stunting problems in the reservoirs and flowages. Likewise, rusty crayfish and zebra mussels can cause pronounced ecological changes in rivers and impoundments. The Zebra mussels rapid reproduction, coupled with its consumption of microscopic plants and animals, adversely affects the aquatic food web and can place valuable sport fisheries at risk. In addition, zebra mussel infestation can severely reduce native mussel populations by displacing their habitat and by actually attaching to an individual mussel's shell. Measures to control invasive species are limited, but control measures such as use of beetles, weevils, spot herbicide spraying, and hand harvesting have shown to be effective.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

Reference information under No. 1, above.

3. *Explain why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR.

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4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR. Please consult resource agency staff.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The ATIS data will be very useful to the resource agencies, academia and the public if it is housed in a statewide data base administrated by the Wisconsin DNR. The study will show species and species frequency of abundance currently at Cornell. The data can be used over the long term to demonstrate success of any control practice implemented.

1.Recreation. Evaluate the existing condition of recreational facilities and needed upgrades. Evaluate the need for additional facilities to adequately serve the public. Update the recreational brochure for the project to reflect new improvements. Prepare a draft *Recreation Plan* for the project to be reviewed by the resource agencies and other stakeholders.

Rational

1. Identify the basis for determination of the recommended study

The reservoirs and riverine sections of rivers impounded by hydroelectric dams have long ago become major sources of recreation for the public. The FERC and the publics' permission for a Utility to use of a river to generate hydropower requires that recreational facilities be installed within the project boundary and kept in good condition for public use. When a project undergoes relicensing, that is the logical and most practical time for a Utility to do a recreational use study and develop a *Recreational Plan*.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

People are entitled through the *Public Trust Doctrine* to use the reservoirs and riverine sections impounded by dams for recreational use. This includes fishing, boating, hiking picnicking, camping, and other non-consumptive wildlife-oriented uses.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or National Park Service (NPS). Please consult resource agency staff.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

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The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or NPS.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The information generated by a recreational use study will be useful to the understanding of the resource agencies, Indian Tribes, and general public in terms of what recreational facilities are present, where they are within the project boundary, what condition they are in and what types of recreation they accommodate. The *Recreation Plan* will be an informative document to all parties that participate in relicensing. Further it will provide a plan for the Licensee to implement during the period of the new license.

We look forward to further participation in relicensing this project to help accomplish environmental protection and improvement at this project. If you have questions on our comments, please contact me at (608) 257-2424 (ext. 115). Also, please feel free to call our Hydro Consultant, Mr. James Fossum at (507) 429-9129.

Sincerely,

Raj Shukla
Executive Director

Cc: Ms. Kimberly D. Bose, Secretary, Washington DC
Matt Miller, Xcel Energy, Eau Claire, WI
Nick Utrup, USFWS, Bloomington, MN
Angela Tornes, NPS, Milwaukee, WI
Cheryl Laatch, Wisconsin DNR, Horicon, WI
Jim Fossum, *JDFossum Environmental Consulting*, Winona, MN

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Appendix 2 – WDNR Point-Intercept Protocol

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

Recommended Baseline Monitoring of Aquatic Plants in Wisconsin:

Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell, Susan Knight, Kelly Wagner, Alison Mikulyuk, Michelle Nault, Meghan Porzky and Shaunna Chase

March 2010

Document citation:
Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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F. Koshere, Wisconsin Department of Natural Resources
A. Mikulyuk, Wisconsin Department of Natural Resources

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Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications

Jennifer Hauxwell[1], Susan Knight[2], Kelly Wagner[1], Alison Mikulyuk[1], Michelle Nault[1], Meghan Porzky[1], and Shaunna Chase[1]

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Last Updated:
March 2010

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EXECUTIVE SUMMARY

We outline a baseline monitoring protocol designed to quantitatively assess the distribution and abundance of aquatic plants in lake ecosystems. This protocol employs a point-intercept sampling design, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness. In addition, a qualitative survey is recommended to map obvious species and augment the species list generated through quantitative sampling. Application of this methodology allows: 1) assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization; and 2) comparisons of aquatic plant variables over time and among lakes. This document contains complete instructions for conducting a baseline aquatic plant survey, including details on obtaining an electronic file of site coordinates, uploading site coordinates into a Global Positioning System (GPS) receiver, conducting field work, entering data, working with data summaries, processing voucher specimens, and provides example applications of the collected data. Final products from each baseline survey will include: 1) raw data from the quantitative survey which provides individual site-by-site species distribution and rake fullness data, 2) summary statistics useful in characterizing and comparing populations, 3) additional species observations from the general qualitative survey, and 4) voucher specimens cataloguing species presence. All electronic data should be sent for long-term record-keeping to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

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INTRODUCTION

In lake ecosystems, the aquatic plant community serves as critical habitat and nursery for fish and other animals, a source of oxygen for all organisms, a refuge for prey as well as a foraging area for predators, a buffer against erosion and sediment resuspension from both waves and shoreline inputs, and can significantly contribute to overall lake primary productivity. Over the past several decades, losses of or changes in assemblages of native submersed aquatic vegetation has been a reoccurring phenomenon due to a relatively limited number of factors. Repeatedly, changes in landscapes and atmospheric conditions as a result of human activities have increasingly affected the ecology of adjacent aquatic systems, including aquatic plant communities. In addition, in-lake aquatic plant management activities have increased due to the increasing spread of invasive exotic plants[1].

The Wisconsin Department of Natural Resources (WDNR) is charged with protecting and enhancing the state's natural resources, including lake ecosystems. Given the many ecosystem services associated with aquatic plant communities as well as the recent threats to native species, it has become increasingly important to develop monitoring techniques to support science-based decision-making for effectively managing lake ecosystems. In this document, we present a quantitative, replicable monitoring protocol. Standardized, quantitative and replicable data are an essential part of strategic lake management for three reasons. First, good data allows us to better understand each individual lake; we can use survey data to produce detailed lake maps that show the locations of native, rare, or exotic plant species. Data can then be used as a baseline against which any changes in a lake associated with water clarity, exotic species introduction, water level, or lake management activity can be compared. Second, good data helps direct management by taking the conflict and guesswork out of planning. Aquatic plant management requires weighing a number of potential management options, some of which can be very costly or extensive. Baseline data allows lake groups to identify the most appropriate management options and design the best possible management plan. Additionally, by conducting quantitative comparisons between the aquatic plant communities before and after management actions, lake groups and managers may evaluate whether or not management goals were achieved. Third, by compiling and comparing survey information on lakes statewide, we are able to identify regional trends and refine our understanding of aquatic plant populations on a broader scale in both space and time.

SURVEY OBJECTIVE

In this document, we outline a baseline monitoring protocol designed to assess aquatic plant communities on a whole-lake scale. We recommend a formal quantitative survey conducted at pre-determined sampling locations distributed evenly throughout the lake, accompanied by a general qualitative survey to map obvious species and augment the species list generated through the quantitative survey. Our primary goals in adopting this methodology are to:

[1] Knight, S., and J. Hauxwell. 2009. Distribution and abundance of aquatic plants- human impacts. *In*: G. Likens (editor-in-chief), *Encyclopedia of Inland Waters*. Elsevier, Oxford, United Kingdom.

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1) Collect quantitative data describing the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization for use in developing various management plans; and

2) Use the data to statistically compare aquatic plant variables over time and among lakes.

The importance of a statewide standardized protocol is that observed differences in a lake's plant community can be attributed to actual changes in the community over time, without the confounding variation that results from different field workers employing different sampling techniques.

The quantitative survey employs a point-intercept sampling design, adapted from terrestrial methods, with sites located on a geo-referenced sampling grid placed over the entire lake. At each site, the aquatic plant community is surveyed from a boat with a rake sampler to characterize species presence and rake fullness ratings. Although the presence/absence data cannot be used to estimate biomass or percent cover, it is less sensitive to interannual or seasonal variations in plant abundance[2]. The method is also relatively rapid and cost-effective and can be used on the large scale to collect baseline data and statistically compare communities over time[2,3]. In summary, it has the following attributes for estimation of aquatic plant distribution and abundance:

- Systematic, quantitative, and replicable
- Appropriate for lakes that vary in depth, size, region, shoreline complexity, and vegetation distribution
- Evenly spaced distribution of sites results in a good coverage of the entire lake, precluding the random exclusion of niche habitats
- Procedural simplicity
- Inexpensive implementation
- Results are easily analyzed with scientifically rigorous statistical methods
- Spatial data preserved and can be mapped for both the managers' use and for clearly communicating distributional data with the public

These guidelines are intended to work on most lakes. However, modifications may be required if a lake is uniquely shaped so that a uniform distribution of points isn't representative (long, skinny lake shape), or if obtaining rake samples is difficult due to substrate (rocky/cobble bottom).

Please note that these are "baseline" recommendations. Additional monitoring activities may be warranted if the goal is to assess a specific management activity. For example, to gauge the ability of chemical spot-treatments to control relatively small stands of an exotic species in a

[2] Madsen, J.D. 1999. Point intercept and line intercept methods for aquatic plant management. Aquatic plant control technical note MI-02. Army Engineer Waterways Experiment Station, Vicksburg, MS.
[3] Dodd-Williams, L., G.O. Dick, R.M. Smart and C.S. Owens. 2008. Point Intercept and Surface Observation GPS (SOG): A Comparison of Survey Methods – Lake Gaston, NC/VA. ERDC/TN APCRP-EA-19. Vicksburg, MS: U.S. Army Engineer Research and Development Center

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relatively large lake, we recommend additional mapping of the beds following the pre- and post-treatment protocol available in Appendix D of the Aquatic Plant Management guide[4].

Unlike the procedures used by the Citizen-Based Lake Monitoring Network, this protocol is not designed for most volunteers. The protocol requires at least one of the field workers be an experienced plant taxonomist and able to identify most plant species in the field. Less experienced volunteers may be able to help with data recording and navigation, but without the help of a professional aquatic ecologist, volunteers may not be able to conduct an entire plant survey without a significant degree of training or study.

SURVEY OVERVIEW

Sampling Sites

This method employs a point-intercept design in which a grid of sampling sites is distributed evenly over the entire lake surface (Figure 1). Lake organizations or individuals can request an electronic file of survey sites by contacting the WDNR Lake Coordinator from their region (see Appendix 1) with the lake name and county, as well as the town, range and section (TRS) or water body identification code (WBIC). Please make requests well in advance of planned field work to allow WDNR staff sufficient time for map creation (recommend at least 1 month). WDNR staff will determine the number of sites and grid resolution based on the estimated size of the littoral zone (the area in which plants grow) and shape of the lake. Grids will be scaled to produce a greater number of sites on lakes that are larger and have more complex shorelines. Lakes with a narrow littoral zone may be assigned a comparatively high number of sampling sites to achieve sufficient survey coverage. Once created, the sampling map (Figure 1) and an associated GPS text file containing the latitude and longitude information associated with each sample site will be provided electronically by the WDNR.

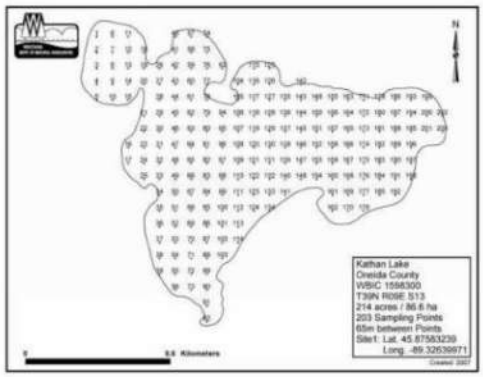

Figure 1: The point-intercept grid for Kathan Lake, Oneida County, WI, with 203 sampling sites.

Timing of Sampling

Surveys should be conducted between early July and mid August. Although certain plant community parameters (such as rake fullness and biomass) can change over the course of the

[4] Aquatic Plant Treatment Evaluation. http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-D.pdf

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growing season, presence/absence data is less sensitive to seasonal variation[2]; presence can often be detected throughout the season. For many species, including Eurasian water milfoil (EWM), plant biomass and density may increase as the season progresses, whereas some species like curly-leaf pondweed (CLP), senesce much earlier in the sampling season. Rake fullness data for these species must be interpreted carefully with the sampling date in mind. If early-senescing species such as CLP are targets of management actions, please contact the WDNR Lake Coordinator in your region to coordinate the best possible sampling time.

Time Spent Sampling

Depending on the size of the lake, a survey may be completed in a few hours, or it may take several days. Ideally, a crew spends one-half to three minutes per sample site; however, this may vary depending on the following factors:

- Distance between sample sites
- Weather (i.e. wind, rain, etc.)
- Rake fullness
- Ease of navigation
- Experience; less experienced field workers may take longer to identify unfamiliar plants. However, most field workers have found that the time spent per site drops dramatically with experience. Others have reported their speed increasing greatly with a few hours of training.

PREPARING FOR FIELD WORK

Field Gear

Necessary equipment:

- Appropriate watercraft and all equipment required by state law
- Double-sided sampling rake attached to a 15-ft (4.6m) pole
- Weighted sampling rake attached to a 40-ft (12m) rope
- Handheld GPS receiver with WDNR sample sites loaded
- Print-out of lake map with WDNR sample sites
- Print-out of WDNR field datasheets on waterproof paper
- Pencils
- Sealable storage bags for voucher specimens
- Waterproof voucher sample labels
- Cooler(s) with ice for storing voucher specimens
- Depth finder

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Helpful, but not required:

- Trolling motor for reaching shallow sites
- Bathymetric map
- Plant ID references or guides to aid in plant identification
- Hand lens to aid in plant identification
- Digital camera for plant specimens or field pictures
- Underwater video camera for viewing the maximum depth of plant colonization

Loading Sample Site Locations onto the GPS Receiver

Detailed instructions on loading sample site locations onto the GPS receiver depend greatly on the type of GPS receiver as well as the software used to translate site location from the text file to "waypoints" in the receiver. The WDNR commonly utilizes Garmin 76 model GPS receivers and the WDNR Garmin GPS Standalone Tool software. The WDNR Standalone Tool is only available to WDNR employees, and only works with Garmin GPS receivers. The Minnesota Garmin GPS Tool and appropriate guidance documents are available to the public and can be found online at the Minnesota DNR internet site[5]. The two programs are similar; their chief difference is that the Minnesota tool requires the GPS text file to be comma-delimited instead of tab-delimited. Procedures for other GPS models with a Wide Area Augmentation System (WAAS-capability) may be used; please refer to the manufacturer's instructions for details on uploading site locations.

Please note that storage capability varies by GPS model. Some GPS receivers are unable to store the large numbers of data sites required in some surveys. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files of sites as needed or work from multiple receivers in the field.

The instructions below describe how WDNR employees can use the WDNR Garmin Standalone Tool software to load sample site locations, or "waypoints," onto a Garmin 76 model GPS receiver.

To upload waypoints from a GPS text file to the GPS receiver, you will need:

- **PC/laptop with WDNR Garmin GPS Tool.** Your IT administrator can help you obtain and install the software.
- **GPS text file (.txt extension).** A tab-delimited text file containing the sample sites and their geographical information.
- **A Garmin 76 model GPS receiver with external data port.**

[5] Available online at: http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html (accessed September, 2009)

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- **PC interface cable (with USB or 9-pin serial connector).** Can be purchased online at http://www.garmin.com

Step 1: Set GPS to the "Simulating GPS" Mode

Operating the receiver in "Simulating GPS" mode prevents the GPS receiver from trying to acquire a satellite signal indoors.

1. Press and hold the red [ON/OFF] button for two seconds to turn the GPS receiver on.
2. Press [PAGE] to navigate through the welcome screens until the "Acquiring Satellites" page is visible.

3. Press the [MENU] button, select "Start Simulator", and press [ENTER]; the screen heading should now read "Simulating GPS."

Step 2: Set Serial Data Format (this setting will **not** have to be re-set upon each use)

Set the serial data format on the Garmin 76 receiver to GARMIN prior to transferring data. Failure to set the serial data format to GARMIN will cause a communication error.

1. Press the [MENU] button twice to reach the main menu, use the rocker key to select "Setup", and then press [ENTER].
2. Use the rocker key to scroll left or right until the "Interface" tab is highlighted. Use the rocker key to scroll down to highlight the drop-down box and press [ENTER].
3. A menu will appear; select "GARMIN" and press [ENTER]. Press [QUIT] twice to exit the menu.

Step 3: Plug in the PC Interface Cable

1. The GPS receiver should be on and in simulation mode.

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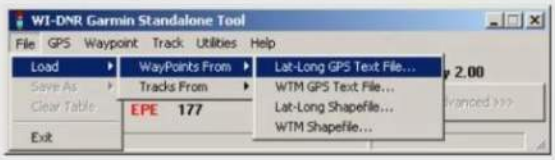
2. Plug the 9-pin serial connector cable into COM port #1 on your PC. If port #1 is in use, plug into the next available port and note the port number. The newest version of the WDNR Garmin GPS Tool (ver. 8.2.8) supports USB connectivity as an alternate to COM port connection.

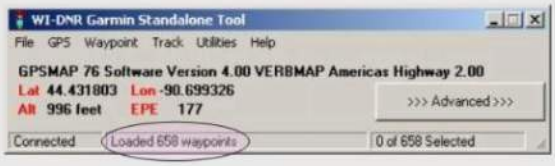
3. Plug the round end of the PC interface cable into the external data/auxiliary power port under the rubber panel on the back of the GPS receiver.

Step 4: Load the GPS text file into the WDNR Garmin Standalone Tool

1. Open the WDNR Garmin GPS Tool file on your computer. Select:
   File > Load > Waypoints From > Lat-Long GPS Text File.



2. Navigate to and select the appropriate GPS text file and select OK. The waypoints will be visible in the Tool's status bar.



3. If necessary, you can view and edit waypoints by clicking the [Advanced] button on the WDNR Garmin GPS Tool.

4. Troubleshooting COM-enabled setups
   a. Check that the correct COM port is selected in the WDNR Garmin GPS tool.
      i. GPS > Assign Port > select correct port #
   b. Check that the baud rate matches that of the GPS receiver.
      i. GPS > Assign Port >Baud Rate > 9600
      ii. A Garmin 76 receiver will transfer at 9600 bits per second

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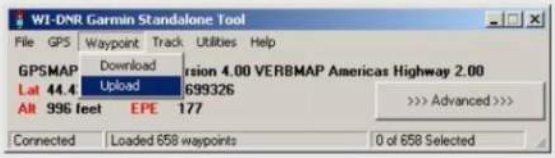
c. Check that the serial data format is set to "GARMIN" (see Step 2).

d. If your problem persists, please consult your GPS unit's user's manual.

Step 5: Upload Waypoint Data from the WDNR Garmin GPS Tool to the GPS receiver

1. In the menu bar, select: Waypoint > Upload



2. A pop-up window will indicate the completion of a successful upload. Click OK.

3. Check that the uploaded waypoints are visible on the GPS receiver: press [MENU] twice to get to the main menu, select "Points", press [ENTER], select "Waypoints", and press [ENTER].

4. Troubleshooting
   a. Storage capability varies by GPS model. In the event that the number of sampling sites exceeds your receiver's storage capacity, the text file containing the survey site information can be split into smaller text files. You will then be able to upload successive files as needed or work from multiple receivers in the field.
   b. For more help, please refer to the appropriate online documentation or user's manuals.

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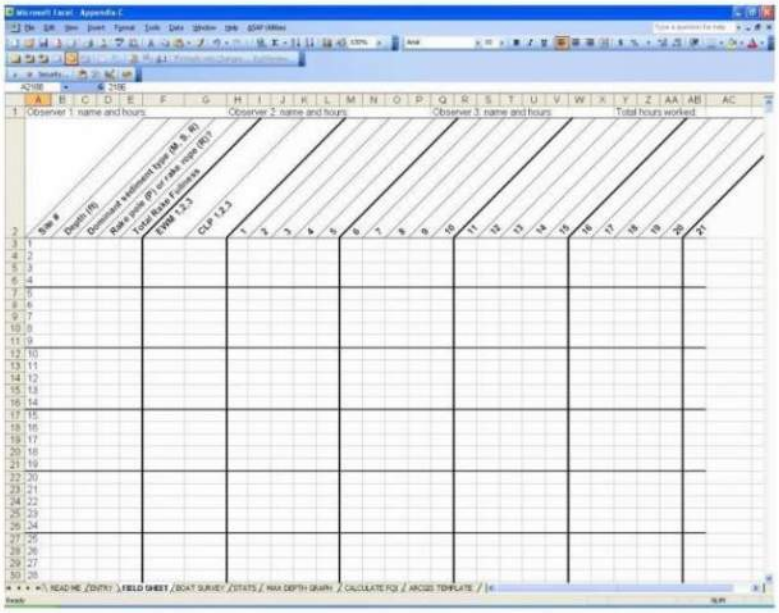
Printing Datasheets

The form used for recording data can be found on the tab labeled "FIELD SHEET" in the Aquatic Plant Survey Data Workbook, downloadable from the University of Wisconsin Extension website (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls). Print the field sheet (waterproof paper recommended), using the "Print Area > Set Print Area" function under the "File" menu to set the appropriate number of rows to print. Under Header (View > Header and Footer > Custom Header) record lake name, Waterbody Identification Code (WBIC), county and survey date.



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Constructing the Rake Samplers

The rake samplers are each constructed of two rake heads welded together, bar-to-bar, to form a double-sided rake head. The rake head is 13.8 inches (35 centimeters) long, with approximately 14 tines on each side. For use in shallow waters, mount a double-sided rake head to a pole that has the capability to extend to 15 feet (4.6 meters). For use in deeper waters, attach a second double-sided rake head to a rope; this rake head should also be weighted (Figure 2).

Pole Sampler

To make the pole samplers shown in the photographs, we removed the handles from 2 standard bow rakes (available at most hardware stores), and welded the rake heads together bar-to-bar. We mounted the rake head to an 8-foot (telescoping to 15.5 feet) pool skimmer handle purchased from a supply store (left, $50). For an even sturdier sampler we purchased an aluminum Co-Handle from Duraframe Dipnet and designed a rake pole which attaches and detaches into 3 sections (right, $200). For depth recording, mark the rake handle in one-foot increments. Electrical tape marked with permanent marker, then covered with a length of clear packing tape works well and holds up over time.

Rope Sampler

A similar rake head should be constructed and attached to a 40-foot-long rope or anchor line. In order to ensure a quick vertical descent to the lake bottom, attach a light weight (~5 lb) to the rake head, away from the tines. The rope sampler pictured here has a short piece of steel tubing welded to the rake head to serve as a handle through which 45 feet of rope is attached.

Figure 2: Examples of sampling rakes used during surveys.

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COLLECTING AND RECORDING FIELD DATA

Using the Rake Samplers

Collect one rake sample per sample site.

In water shallower than 15 feet deep, use the pole sampler. At each sample site, lower the rake straight through the water column to rest lightly on the bottom, twist the rake around twice, and then pull the rake straight out of the water.

In water deeper than 15 feet, drop the rope sampler straight into the water alongside the boat, drag the rake along the sediment surface for approximately one foot (0.3 m), and then pull the rake to the surface.

A large tray or bin may be used to aid in processing the entire sample.

Navigating to Sites

Accuracy

The location reported by the GPS receiver has an element of error that varies under different conditions. The total error from the GPS and your navigational error *combined* should not exceed half of the sampling resolution. Therefore, when sampling with a Garmin 76 receiver, navigate at no greater than an 80-foot zoom level and aim to completely cover the sampling site with the arrow. At 80-foot zoom, the locator arrow shown on the screen represents approximately 25 feet in length. In order to sample with acceptable accuracy, the arrow must completely cover the sample site on screen. At coarser zoom levels, because the size of the arrow remains constant, the boat may be more distant from the site even though the arrow completely covers the site. You can use a lower zoom level (120-feet is appropriate) in order to travel from site to site, but as you approach the target site, you must confirm your location at using at least the 80-ft zoom resolution to ensure you are sampling with acceptable accuracy.

Determining Maximum Depth of Plant Colonization

When sampling, you will have to determine the maximum depth at which the plants are rooted. The maximum depth of colonization (MDC) can vary greatly among lakes, from just a few feet to as deep as the physiological requirements of a species will allow. When sampling a line of sites heading from shore out to deep water, take samples until plants are no longer found on the

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rake. Continue sampling at least two sites deeper to ensure you sampled well over the maximum depth of colonization. If no plants are found at these sites, simply record the depth, sampling tool used, and dominant sediment type. Leave the rake fullness and species information blank. Depending on the lake bathymetry, you may choose to continue down the same row to the other side of the lake. Use a depth finder and begin sampling again when the depth reaches that of the last (no plant) site sampled. Alternatively, if the rows are very long, you may choose to move over to the next row and sample sites back into shore, working back and forth along the shoreline and around the lake. However, if the second row is shallower than the first, be sure to start sampling sufficiently far from shore so that the depth is similar to that at which you stopped sampling in the first row. By sampling in this way, over time you will begin to hone in on the maximum depth of plant colonization.

After working several rows crossing the edge of the littoral zone, estimate the maximum depth of colonization (e.g. 20 feet) and only continue to sample deeper sites within 6 feet of this estimation (all sites ≤ 26 feet). As you complete more rows and gain confidence in your estimation, you can then begin to gradually omit sampling depths that are too deep for plants to grow. Once you have sampled the deep end of your estimated maximum depth of colonization (i.e. 26 feet) at least three times and have not found any plants, then you can discontinue sampling at anything deeper, but continue to sample any sites shallower (≤ 25 feet). If you then sample a shallower depth three times (i.e. 25 feet) and find no plants at any of those sites, you may now discontinue sampling at these deeper sites and only sample sites shallower than this new sampling depth (≤ 24 feet). Continue to successively eliminate shallower depths in sequence until you establish the maximum depth of colonization. To account for patchiness and other sources of variation, never narrow the sampling window to less than 1.5 feet of the estimated maximum depth of colonization. Use your best judgment when eliminating depths, and remember that plant distribution may be uneven and that different areas of a single lake may have plants growing relatively deeper or shallower. It is good practice to err on the side of oversampling.

Recording Data

Completing the Field Sheet

1. General site information
   Complete the top portion of the "Field Sheet" with the lake name, county, WBIC, date, names of observers, and how many hours each person worked during the survey.

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2. Site number
   Each site location is numbered sequentially. Each site number will have one row of data on the "Field Sheet."

3. Depth
   Measure and record the depth to the nearest half-foot increment at each site sampled, regardless of whether vegetation is present. The pole mounted rake and rope sampler should be marked to measure the depth of water at a sample site. However, a variety of options exist for taking depth measurements, including sonar handheld depth finders (trigger models) and boat-mounted depth finders. If you are using a depth finder, it is useful to know that the accuracy may decrease greatly in densely vegetated areas. Depth finders sometimes report the depth to the top of the vegetation instead of to the sediment surface. In most cases, it is best to use depth markings on a pole-mounted rake for shallow sites.

4. Dominant sediment type
   At each sample site, record the dominant sediment type based on how the rake feels when in contact with the sediment surface as: mucky (M), sandy (S), or rocky (R).

5. Pole vs. Rope
   Record whether the pole (P) mounted rake or the rake-on-a-rope (R) was used to take the sample.

6. Rake fullness
   At each site, after pulling the rake from the water record the overall rake fullness rating that best estimates the total coverage of plants on the rake (1 - few, 2 - moderate, 3 - abundant; see Figure 3). Also identify the different species present on the rake and record a separate rake fullness rating for each. Account for plant parts that dangle or trail from the rake tines as if they were fully wrapped around the rake head. The rake may dislodge plants that will float to the surface, especially short rosette species not easily caught in the tines. Include the rake fullness rating for plants dislodged and floating but not collected on the rake. Record rake fullness ratings for filamentous algae, aquatic moss, freshwater sponges, and liverworts, but do not include these ratings when determining the overall rake fullness rating. While at a site, perform a brief visual scan. If you observe any species within 6 feet (2m) of the sample site, but not collected with the rake, record these species as observed visually ("V") on the field sheet. These species will be included in total number of species observed.

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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 3: Illustration of rake fullness ratings used during the survey.

7. Species names
   Note that the field datasheet does not include any species names, except for EWM (Eurasian water milfoil) and CLP (Curly-leaf pondweed). The sampling crew must write the species name in subsequent columns the first time that species is encountered. Names must be re-written on successive field sheets as they are encountered. You may use common or Latin names, but be sure there is no ambiguity in the name that will present problems during data entry. The use of standard abbreviations can greatly shorten this process. It is generally safe to shorten the names to include the first three letters of the genus name followed by the first three letters of the species name (i.e. *Ceratophyllum demersum* = CerDem).

8. Inaccessible sites
   It may be impossible or unsafe to reach some sample sites. Where the water is very shallow, rocks are present, or dense plant growth prevents navigation, field workers should attempt to access the site as long as doing so is safe and relatively practical. It is often possible to reach difficult sites by using oars or poling; however, keep safety in mind and practice good judgment. Do not get out and drag the boat through mucky sediment to reach a site. If the sampling site is shallow but the substrate is firm, you may be able to walk to the site from shore or from the boat. If you cannot access a site, leave the depth blank and record the appropriate comment on the field datasheet from the list below. Remember to also transfer these to the "Comments" column of the ENTRY sheet (see data entry section):

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a. NONNAVIGABLE (PLANTS)
1. Sample site cannot be accessed due to thick plant growth.
2. Aquatic plants that are visible within 6 feet of a non-navigable sample site (e.g. water lilies, cattails, bulrushes, etc.) should be recorded as visuals (V) on the datasheet.

b. TERRESTRIAL
1. Sample site occurs on land (including islands).
2. Aquatic plants visible within 6 feet of a terrestrial sample site (e.g. water lilies, cattails, bulrushes, etc.) may be included in the general boat survey list, but should not be marked as visuals (V) on the datasheet.
3. Only species rooted in water should be recorded as present or as part of the boat survey.

c. SHALLOW
1. Sample site is in water that is too shallow to allow access.
2. Aquatic plants that are visible within 6 feet of a shallow sample site should be recorded as visuals (V) on the datasheet.

d. ROCKS
1. Sample site is inaccessible due to the presence of rocks.

e. DOCK
1. Sample site is inaccessible due to the presence of a dock or pier.

f. SWIM AREA
1. Sample site is inaccessible due to the presence of a designated swimming area.

g. TEMPORARY OBSTACLE
1. Sample site is inaccessible due to the presence of a temporary obstacle such as a boater, swimmer, raft, loon, etc.
2. If possible, try to revisit this site later on during the survey once the temporary obstacle has moved.

h. NO INFORMATION
1. No information is available about the sample site because it was not traveled to (inaccessible channel, accidently omitted during survey, skipped due to time constraints, etc.).

i. OTHER
1. Site was not sampled for another reason; please provide a brief description.

9. Filling Out the Boat Survey Datasheet
Often there will be localized occurrences of certain species (e.g., floating-leaf or emergent species) that are missed by the point-intercept grid. For areas that are outside the grid or in between sampling sites, record the name of the plant and the closest site to the plant. This information will be entered into the "BOAT SURVEY" section of the data entry file. Emergent near-shore vegetation should only be recorded if it's rooted in water.

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Collecting and Identifying Voucher Samples

Voucher each plant species for verification and identification. You can often use plants collected on the rake as vouchers. However, if the sample is of poor quality or lacks reproductive structures, attempt to collect a better specimen. If a better specimen is unavailable, voucher and press what you are able to collect. Remember that the more material collected, the easier identification will be. Whenever possible, collect at least two specimens, and include reproductive material such as seeds, flowers, fruit, roots, etc. Place the voucher plant into a re-sealable plastic bag with a waterproof voucher label. The voucher label should include the species name, or in the case of unknown species, a unique identifier, the lake name, county, sample site, sediment type, collector's name, and the date. Additional information about habitat or co-occurring species may also be included on the tag. Place all specimens in a cooler for transport to the lab. See below, "Pressing Plants" for instructions once back at the laboratory.

Plant Identification and Troublesome Taxa

1. Plants should be identified to species whenever possible. Certain genera, including *Carex*, *Sparganium*, and *Sagittaria* must be flowering and/or fruiting to confirm identification and may not be identifiable to species without these parts.

2. Non-angiosperms such as *Chara* or *Nitella* are identified to genus only. Often, *Isoetes* can be identified to species by looking at spores, if present. Filamentous algae, aquatic moss, and freshwater sponge can be referred to simply as algae, moss, and sponge.

3. If a plant cannot be identified in the field, place the two voucher specimens in a re-sealable bag with a separate voucher label. Take these specimens back to the lab to verify the identity. The label should include a unique identifier, lake, county, the sample site number, and sediment type. The presence and fullness of the species should be recorded on the field datasheet under the same unique identifier name listed on the voucher label.

4. In the lab, try to identify the plant using plant identification keys and a stereo microscope. If you are still uncertain of the identity of the plant, contact a DNR biologist in your region to help with identification. Do not send specimens to an expert until you notify them of your intended shipment and they have instructed you to do so. Once the plant is identified, record this information so that the correct identification is used during data entry.

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ENTERING DATA ELECTRONICALLY

Worksheet Descriptions and Instructions

The Aquatic Plant Survey Data Workbook
(http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls) contains eight worksheets:

1. READ ME

   Provide a brief description of the six other worksheets included in the workbook.

2. FIELD SHEET

   The FIELD SHEET should be printed on waterproof paper for recording the field data.

3. ENTRY

   a. There are many formulas embedded in the ENTRY sheet that allow for the statistical calculations on the STATS sheet. Thus, **DO NOT add or delete columns or rows on the ENTRY or STATS sheets.**

   b. Data collected in the field is recorded on the FIELD SHEET and afterwards transferred to the electronic ENTRY sheet.

   c. Copy latitude and longitude information for the sample sites from the GPS text file and paste into the appropriate columns of the ENTRY sheet.

   d. Record the lake and county name, WBIC, survey date, and the names of the field workers.

   e. There is a column for comments on the ENTRY sheet. Please use the standardized comments discussed on page 18 of this protocol.

   f. Species' Latin names appear alphabetically in the first row of the spreadsheet. Species such as aquatic moss, freshwater sponge, filamentous algae, and liverworts are listed separately at the end of the alphabetical list.

   g. Additional species not already listed should be added in the columns at the end of the alphabetical list (sp1, sp2, etc.). Any vouchered specimens that are awaiting ID confirmation should be entered here as well. You should use the same unique voucher identifier established in the field to for ease of updating the information.

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h. We strongly recommend double-checking the electronically entered data against the original field datasheets to ensure that no errors or omissions occurred during the entry process.

4. BOAT SURVEY

a. Enter information on plants observed during the survey that were observed more than 6 feet away from a sample site.

b. Additional comments about field conditions, known management activities, or other observations can also be recorded in this worksheet.

5. STATS

The STATS worksheet automatically calculates summary statistics using the data entered into the ENTRY worksheet (see Appendix 2, Table 1). There are several summary calculations including:

a. **Individual Species Statistics:**
   i. **Frequency of occurrence within vegetated areas (%)**: Number of sites at which a species was observed divided by the total number of vegetated sites. Frequency of occurrence is sensitive to the number of sample sites included. Including non-vegetated sites will lower the frequency of occurrence.
   ii. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of sites a species was observed at divided by the total number of sites shallower than maximum depth of plants.
   iii. **Relative frequency (%)**: This is a proportional value that reflects the degree to which an individual species contributes to the sum total of all species observations. The sum of the relative frequencies of all species is 100%. Relative frequency is not sensitive to whether all sampled sites, including non-vegetated sites, are included. Relative frequency does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts.
   iv. **Relative frequency (squared)**: This value is only part of a calculation and is not used directly.
   v. **Number of sites where a species was found**: This is the sum of the number of sites at which a species was recorded on the rake.
   vi. **Average rake fullness**: Mean rake fullness rating, ranges from 1-3.
   vii. **Number of visual sightings**: This is the total number of times a plant was seen within 6 feet of the boat, but not collected on the rake.
   viii. **Present (visual or collected)**: Automatically fills in "present" if the species was observed at a sample site.

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b. **Summary Statistics:**
   i. **Total number of sites visited**: Total number of sites where depth was recorded, even if a rake sample was not taken.
   ii. **Total number of sites with vegetation**: Total number of sites where at least one plant was found on the rake.
   iii. **Total number of sites shallower than maximum depth of plants**: Total number of sites where the depth was less than or equal to the maximum depth at which plants were found. This value is used for frequency of occurrence at sites shallower than maximum depth of plants.
   iv. **Frequency of occurrence at sites shallower than maximum depth of plants**: Number of times plants were recorded at a site divided by the total number of sites sampled that were shallower than the maximum depth of plants.
   v. **Simpson's Diversity Index**: A nonparametric estimator of community heterogeneity. It is based on relative frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.
   vi. **The maximum depth of plants**: This is the depth of the deepest site sampled at which vegetation was present. Please note that this value does not take into account aquatic moss, freshwater sponges, filamentous algae, or liverworts. See "MAX DEPTH GRAPH" below for more information.
   vii. **Number of sites sampled using rake on rope (R)**
   viii. **Number of sites sampled using rake on pole (P)**
   ix. **Average number of all species per site (shallower than max depth)**: Mean number of species found at sample sites which were less than or equal to the maximum depth of plant colonization.
   x. **Average number of species per site (vegetated sites only)**: Mean number of species found at sample sites were vegetation was present.
   xi. **Average number of native species per site (shallower than maximum depth)**: This does not include Eurasian water milfoil, Curly-leaf pondweed, Purple loosestrife, Spiny naiad, or Reed canary grass.
   xii. **Average number of native species per site (vegetated sites only)**
   xiii. **Species richness**: Total number of species observed not including visual sightings. Please note that this value does not include aquatic moss, freshwater sponges, filamentous algae, or liverworts.
   xiv. **Species richness (including visuals)**: Total number of species observed including visual sightings recorded within 6 feet of the sample site (but does not include additional species found during the boat survey).

6. MAX DEPTH GRAPH

The maximum depth of colonization is an important metric to characterize accurately, as it can indicate changes in water clarity and water quality over time. This worksheet automatically displays a histogram of plant occurrences by water depth. Occasionally, unrooted plants floating in the water column are snagged by the rake, which can sometimes result in an inaccurate estimation of the maximum depth of colonization. It is

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important to examine the reported maximum depth of plant colonization in order to detect potential outliers. As a general rule, a single plant occurrence reported at a site which is 2 or more feet deeper than the next shallowest site with plants is considered an outlier, and should be excluded when determining the maximum depth of plant colonization (see Figure 4).

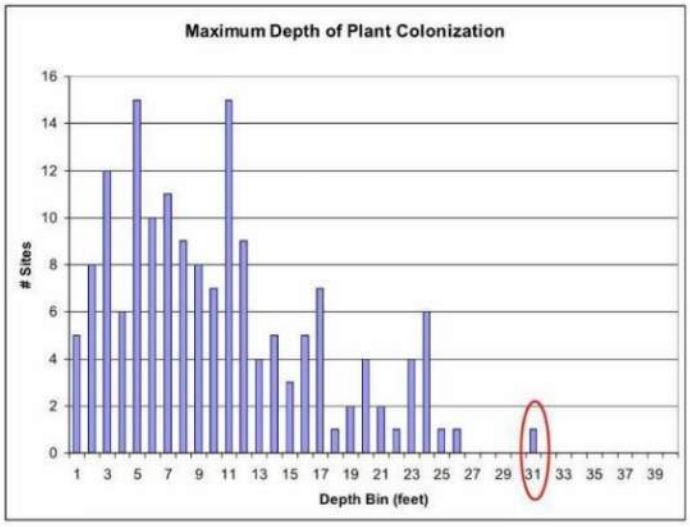

Figure 4: Distribution of plant occurrences versus water column depth. The value circled in red is more than 2 feet deeper than all other plants found during the survey, and is considered an outlier. Outliers should be omitted when determining the maximum depth of plant colonization.

It is necessary to delete the occurrence of this outlier from the ENTRY spreadsheet so that the automatically-calculated statistics will reflect the revised maximum depth of colonization. To do this, locate the sampling point number on the ENTRY worksheet where the outlier was found. Scroll across the row until you find the outlier to omit. Once you've located the cell with the outlier, press delete to clear the cell. Right click on the cell and select "Insert Comment". Briefly describe the occurrence of the outlier and the reason for omitting it. Follow the same steps with the overall rake fullness column, deleting out the contents of the cell and including a brief comment. Please also include information regarding any omissions of outliers and revised MDC directly on the STATS spreadsheet, typing all comments in the space below "See Max Depth Graph Worksheet to Confirm".

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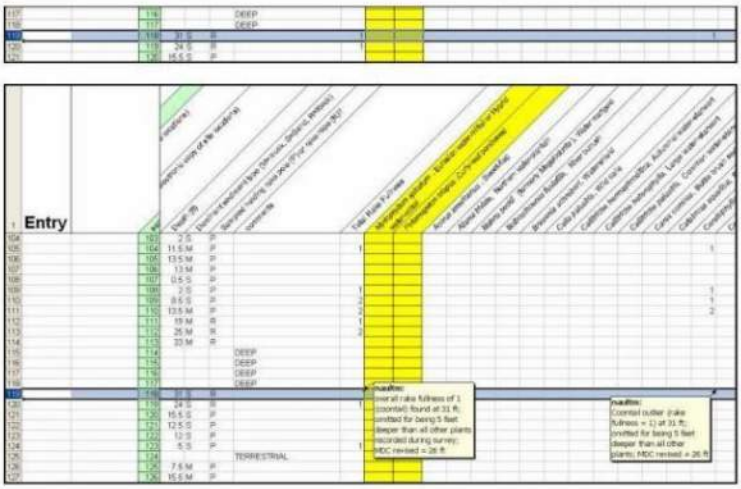

Figure 5: ***Top*** **- Ceratophyllum demersum outlier at 31 feet (sampling point #118).** ***Bottom*** **- C. demersum outlier at 31 feet deleted from both C. demersum and total rake fullness columns. Brief descriptive comments should be inserted in cells where outliers have been deleted.**

7. CALCULATE FQI

This worksheet automatically calculates the Floristic Quality Index (FQI) based upon the data entered into the ENTRY worksheet. The FQI metric is designed to evaluate the closeness of the flora in an area to that of undisturbed conditions[6]. The species list considered in this calculation is that which Nichols[6] originally considered, and the "C values" used in this spreadsheet reflect those currently accepted by the Wisconsin State Herbarium[7]. Species are counted as being present only if they are collected on the rake at some point during the baseline survey.

8. ARCGIS TEMPLATE

This worksheet of truncated species names is used when creating plant distribution maps using ArcGIS 9.3. See Appendix 3 for more information.

[6] Nichols, S.A. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management, 15(2):133-141.
[7] University of Wisconsin-Madison, 2001. Wisconsin Floristic Quality Assessment (WFQA). Retrieved October 27, 2009 from: http://www.botany.wisc.edu/WFQA.asp

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Saving the File

Once the data is electronically entered into the Aquatic Plant Survey Data Workbook (http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-C.xls), please save the file with a name indicating the lake, county, WBIC, and year sampled. The format we recommend is: Lake_County_WBIC_(year).xls. For example, Lake Mendota sampled in 2009 would be named: Mendota_Dane_805400_(2009).xls

Double-Checking the Data

We strongly recommend double-checking the electronic data against the field sheet to catch any errors made during the entry process.

Sending the Data

Send the final electronic file to the WDNR via email (DNRBaselineAquaticPlants@wisconsin.gov). There should be one file for each completed lake survey.

Creation of Plant Distribution Maps

Aquatic plant distribution maps can be easily created using the point-intercept data collected during the survey. Instructions on how to create these maps can be found in Appendix 3 and 4.

Statistical Analysis of Data

Statistical comparisons of datasets can easily be analyzed between pre- and post-management activities or between two survey years by using a simple chi-square analysis. The chi-square analysis is commonly used to examine whether or not there was a statistically significant change in the occurrence of a plant species between the survey years or after management activities have occurred. The "Compute Pre-Post Data" worksheet (available at: http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Apendix-D1.xls), allows users to enter in the number of sites at which a species was recorded during each survey, and provides an output indicating whether or not differences reflect a statistically significant change in the plant community.

PRESSING PLANTS – PREPARATION OF VOUCHER SPECIMENS

"Floating" Specimens

Because most aquatic plants, especially finely dissected specimens, tend to stick to paper as they dry, it is usually better to "float" the plant directly onto herbarium paper. However, if the plant is large and robust, or not entirely aquatic (such as bulrushes, emergent sedges or pickerelweed) you can press the plant in newsprint.

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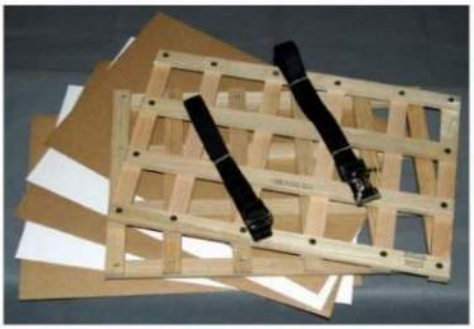
1. Use a pencil to label the mounting paper with the plant name, geographic location, date collected, and serial code (a unique identifier in a series that identifies all specimens you have pressed; we use the initials of the presser followed by the year and a sequential number; i.e. AM2009-01). Mount only one species per sheet, and do not cut herbarium sheets in half.
2. Carefully rinse the plant so it is free of epiphyton, silt, and other debris.
3. Fill a sink or tray with about one inch of water. Slip the labeled mounting paper into the water.
4. Float the plant in the water and arrange it onto the sheet.
5. If the plant has fine leaflets, such as water milfoil or bladderwort, cut off one leaf and display it floated out onto the paper so that leaflet characteristics can be readily observed.
6. The plant may be bent into a "V" or "W" or curled shape to fit on the sheet.
7. Slowly lift the paper out of the water by one end. Keeping the plant in place, let the water slowly drain off.
8. Use a toothpick or probe to spread out plant parts for better display, making sure to expose identifiable characteristics such as stipules, sheaths or seeds.

Pressing Specimens

- Cover the plant with a sheet of waxed paper or plastic wrap if it is especially delicate (we recommend this technique especially for bladderworts and other fine, delicate species).
- Place the specimen sheet inside folds of newspaper.
- Place the newspaper between two sheets of blotting paper, and the blotting paper between two sheets of corrugated cardboard.
- Place multiple specimens in a plant press. Use rope or straps to compress plants to keep specimens flat as they dry.



- Place the press somewhere warm and dry. Placing the press on its long edge on top of a ventilated aluminum or aluminum-lined box containing incandescent light bulbs allows for quick drying. Remove plants after several days when they are thoroughly dry.

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Suggested Herbarium Materials

Herbarium and science supply businesses such as the Herbarium Supply Company (www.herbariumsupply.com; 800-348-2338) sell many herbarium products including mounting paper, plant presses, blotting paper, and cardboard spacers. When ordering herbarium mounting paper, look for acid-free, non-glossy, 100% rag, and heavy or standard weights.

Preparing Dried Specimens for Shipment to an Herbarium

1. **Package specimens**. Place each dried specimen with unique identifier clearly marked on the newsprint or mounting paper in the fold of a single sheet of newspaper and place all of the newspaper/specimens between two pieces of cardboard. Tie or rubber band the cardboard bundle together, and put it into a padded envelope or a box. As long as the package is going to or from an educational institution, a special 4th class mailing rate called "Library Rate" can be used.

2. **Label information**. Both of the herbaria utilized by the WDNR label the dried plant specimens themselves. Prepare an electronic spreadsheet with the relevant information for each specimen. Send the file to Mark Wetter (mawetter@wisc.edu) for the Madison herbarium or to Robert Freckmann (rfreckma@uwsp.edu) for the Stevens Point herbarium. Each row (i.e. each specimen) in the file will need a unique identifier such as the collector's initials followed by a specimen number. Use the same identifier on the specimen so the herbaria can match the label to the specimen. Each row of the spreadsheet should include columns for the following (column heading in **bold**, example in plain text):

    a. **Specimen Identifier** CD2009-01
    b. **Collector Name** Isabel Velez
    c. **Preparer's Name** (If different from collector) Chad Douwe
    d. **Lake Name** Little John Jr.
    e. **County** Vilas
    f. **Date collected** 7 July 2009
    g. **Specimen ID** *Potamogeton spirillus,* Spiral-fruited pondweed
    h. **Habitat** muck over sand
    i. **Associated species (if known)** *Najas gracillima, Potamogeton friesii*
    j. **TRS** T41N R07E S29
    k. **WBIC** 1861700
    l. **More detailed location** (if known) SW edge of lake, 1 m depth
    m. **GPS lat/long coordinates** (if known) N 46°15.037' W090°01.804'
    n. **Herbarium of deposition** UWSP

3. **Send pressed plants** to Mark Wetter or Ted Cochrane (UW- Madison), or to Dr. Robert Freckmann (UW-Stevens Point). **Please notify the herbarium of your intention and wait for confirmation before sending plants**:

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Mark Wetter or Ted Cochrane
University of Wisconsin-Madison Herbarium
Department of Botany, Birge Hall
430 Lincoln Drive
Madison, WI 53706-1381
tel.: (608) 262-2792
FAX: (608) 262-7509
www.botany.wisc.edu/herbarium/

Dr. Robert Freckmann
Robert Freckmann Herbarium
0310 CNR Addition
1900 Franklin Street
Stevens Point, WI 54481
rfreckma@uwsp.edu

4. **Send electronic record to the WDNR.** Please send a copy of the electronic herbarium file along with the plant data to DNRBaselineAquaticPlants@wisconsin.gov.

CONCLUSIONS

There will be four products from each plant survey. First, there will be the raw data from the quantitative survey which provides a lakewide plant species list and distribution and rake fullness data for each species observed. Second, there will be summary statistics useful in characterizing and comparing populations. Third, there will be observations from the general boat survey. Fourth, voucher specimens will provide a catalog of plant species present in the lake and will bolster the state collections. All electronic data should be sent by email to the WDNR (DNRBaselineAquaticPlants@wisconsin.gov).

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to the WDNR Lake Coordinators and Aquatic Plant Management staff for recommendations and comments in the design, implementation, and applications of the data and the survey methodology. The many hours the field staff put into testing this methodology was integral to its successful development, and we are very grateful for all of their hard work.

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Appendix 1

Current (02/2010) contact information for regional WDNR aquatic plant management (APM) and lake coordinators

Northern Region (NOR)
(Ashland, Barron, Bayfield, Burnett, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Oneida, Polk, Price, Rusk, Sawyer, Taylor, Vilas, & Washburn Co.)

Frank Koshere
APM Coordinator
715-392-0807
frank.koshere@wisconsin.gov

Kevin Gauthier, Sr.
Florence, Forest, Langlade, Lincoln, Oneida, & Vilas Co.
715-365-8937
kevin.gauthiersr@wisconsin.gov

Pamela Toshner
Barron, Bayfield, Burnett, Douglas, Polk, & Washburn Co.
715-635-4073
pamela.toshner@wisconsin.gov

Jim Kreitlow
Ashland, Iron, Price, Rusk, Sawyer, & Taylor Co.
715-365-8947
james.kreitlow@wisconsin.gov

Southeast Region (SER)
(Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, & Waukesha Co.)

Heidi Bunk
: Ozaukee, Sheboygan, Walworth, Washington, & Waukesha Co.
262-574-2130
heidi.bunk@wisconsin.gov

Craig Helker
Kenosha, Milwaukee, & Racine Co.
262-884-2357
craig.helker@wisconsin.gov

South Central Region (SCR)
(Columbia, Dane, Dodge, Green, Grant, Iowa, Jefferson, Lafayette, Richland, Rock, & Sauk Co.)

Susan Graham
Lake & APM Coordinator
608-275-3329
susan.graham@wisconsin.gov

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Northeast Region (NER)
(Brown, Calumet, Door, Fond du Lac, Green Lake, Kewaunee, Manitowoc, Marinette, Marquette, Menominee, Oconto, Outagamie, Shawano, Waupaca, Waushara, & Winnebago Co.)

Mary Gansberg
Kewaunee, Door, Manitowoc, & Menominee Co.
920-662-5489
mary.gansberg@wisconsin.gov

Ted Johnson
Green Lake, Marquette, Waupaca, & Waushara
920-787-4686 ext. 3017
tedm.johnson@wisconsin.gov

Mark Sesing
Fond du Lac, Outagamie, & Winnebago Co.
920-485-3023
mark.sesing@wisconsin.gov

Jim Reyburn
Brown, Oconto, & Shawano Co.
920-662-5465
james.reyburn@wisconsin.gov

Greg Sevener
Marinette Co.
715-582-5013
gregory.sevener@wisconsin.gov

West Central Region (WCR)
(Adams, Buffalo, Chippewa, Clark, Crawford, Dunn, Eau Claire, Jackson, Juneau, La Crosse, Marathon, Monroe, Pepin, Pierce, Polk, Portage, St. Croix, Trempealeau, Vernon, & Wood Co.)

Scott Provost
APM Coordinator
715-421-7881 ext. 3017
scott.provost@wisconsin.gov

Buzz Sorge
Lake Coordinator
715-839-3794
patrick.sorge@wisconsin.gov

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Appendix 2

This appendix contains examples of statistical outputs created through the point-intercept sampling method for Kathan Lake, Oneida County. The data was collected during a survey conducted August 21-22, 2007.

Table 1. Summary Statistics

Total number of sites set-up	203
Total number of sites visited	171
Total number of sites with vegetation	149
Total number of sites shallower than maximum depth of plants	165
Frequency of occurrence at sites shallower than maximum depth of plants	90.30
Simpson Diversity Index	0.94
Maximum depth of plants (ft)	9.50
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	171
Average number of all species per site (shallower than max depth)	3.96
Average number of all species per site (veg. sites only)	4.39
Average number of native species per site (shallower than max depth)	3.56
Average number of native species per site (veg. sites only)	3.95
Species Richness	37
Species Richness (including visuals)	38
Species Richness (including visuals & boat survey)	40

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Table 2. Individual species frequency of occurrences

Common Name	Scientific Name	% Frequency (Littoral)	% Frequency (Whole lake)	% Frequency (in vegetated areas)	Relative Frequency (%)
Bushy pondweed	*Najas flexilis*	41.2	39.8	45.6	10.4
Common waterweed	*Elodea canadensis*	40.6	39.2	45.0	10.2
Eurasian water milfoil*	*Myriophyllum spicatum**	40.0	38.6	44.3	10.1
Filamentous algae	*Algae spp.*	26.1	25.1	28.9	6.6
Coontail	*Ceratophyllum demersum*	23.0	22.2	25.5	5.8
Stoneworts	*Nitella spp.*	21.8	21.1	24.2	5.5
Watershield	*Brasenia schreberi*	20.6	19.9	22.8	5.2
Small bladderwort	*Utricularia minor*	17.6	17.0	19.5	4.4
Small pondweed	*Potamogeton pusillus*	17.0	16.4	18.8	4.3
Common bladderwort	*Utricularia vulgaris*	16.4	15.8	18.1	4.1
Wild celery	*Vallisneria americana*	15.2	14.6	16.8	3.8
Flat stem pondweed	*Potamogeton zosteriformis*	13.9	13.5	15.4	3.5
Stiff pondweed	*Potamogeton strictifolius*	11.5	11.1	12.8	2.9
Ribbon leaf pondweed	*Potamogeton epihydrus*	9.1	8.8	10.1	2.3
White water lily	*Nymphaea odorata*	7.9	7.6	8.7	2.0
Muskgrasses	*Chara spp.*	7.3	7.0	8.1	1.8
Freshwater sponge	*Sponge spp.*	6.1	5.8	6.7	1.5
Moss	*Moss spp.*	6.1	5.8	6.7	1.5
Large-leaf pondweed	*Potamogeton amplifolius*	5.5	5.3	6.0	1.4
Spiny-spored quillwort	*Isoetes echinospora*	4.9	4.7	5.4	1.2
Waterwort	*Elatine minima*	4.2	4.1	4.7	1.1
Creeping spikerush	*Eleocharis palustris*	4.2	4.1	4.7	1.1
Water horsetail	*Equisetum fluviatile*	4.2	4.1	4.7	1.1
Northern water milfoil	*Myriophyllum sibiricum*	4.2	4.1	4.7	1.1
Thin floating-leaf bur-reed	*Sparganium sp.*	4.2	4.1	4.7	1.1
Spatterdock	*Nuphar variegata*	3.6	3.5	4.0	0.9
Spiral-fruited pondweed	*Potamogeton spirillus*	3.6	3.5	4.0	0.9
American bur-reed	*Sparganium americanum*	3.6	3.5	4.0	0.9
Shoreweed	*Littorella uniflora*	3.0	2.9	3.4	0.8
Brown-fruited rush	*Juncus pelocarpus f. submersus*	2.4	2.3	2.7	0.6
Variable pondweed	*Potamogeton gramineus*	2.4	2.3	2.7	0.6
Twin-stemmed bladderwort	*Utricularia geminiscapa*	1.8	1.8	2.0	0.5
Pipewort	*Eriocaulon aquaticum*	0.6	0.6	0.7	0.2
Clasping leaf pondweed	*Potamogeton richardsonii*	0.6	0.6	0.7	0.2
Broad-leaved arrowhead	*Sagittaria latifolia*	0.6	0.6	0.7	0.2
Thin-leaved pondweed	*Potamogeton sp.*	0.6	0.6	0.7	0.2
Flat-leaved bladderwort	*Utricularia intermedia*	0.6	0.6	0.7	0.2
Cattail	*Typha sp.*	Visual	Visual	Visual	Visual
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	Boat Survey	Boat Survey
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	Boat Survey	Boat Survey

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Table 3. Number of sites where species was found and average rake fullness rating

Common Name	Scientific Name	# sites where species was found	# sites where species was found (including visuals)	Average rake fullness rating
Bushy pondweed	*Najas flexilis*	68	68	1.28
Common waterweed	*Elodea canadensis*	67	67	1.28
Eurasian water milfoil*	*Myriophyllum spicatum**	66	71	1.47
Filamentous algae	*Algae* spp.	43	43	1.00
Coontail	*Ceratophyllum demersum*	38	38	1.37
Stoneworts	*Nitella* spp.	36	36	1.00
Watershield	*Brasenia schreberi*	34	58	1.68
Small bladderwort	*Utricularia minor*	29	29	1.10
Small pondweed	*Potamogeton pusillus*	28	28	1.14
Common bladderwort	*Utricularia vulgaris*	27	27	1.30
Wild celery	*Vallisneria americana*	25	26	1.36
Flat stem pondweed	*Potamogeton zosteriformis*	23	25	1.22
Stiff pondweed	*Potamogeton strictifolius*	19	19	1.16
Ribbon leaf pondweed	*Potamogeton epihydrus*	15	18	1.27
White water lily	*Nymphaea odorata*	13	42	1.69
Muskgrasses	*Chara* spp.	12	12	1.25
Freshwater sponge	Sponge spp.	10	11	1.00
Moss	Moss spp.	10	10	1.20
Large-leaf pondweed	*Potamogeton amplifolius*	9	10	1.33
Spiny-spored quillwort	*Isoetes echinospora*	8	11	1.00
Waterwort	*Elatine minima*	7	8	1.00
Creeping spikerush	*Eleocharis palustris*	7	9	1.14
Water horsetail	*Equisetum fluviatile*	7	15	1.43
Northern water milfoil	*Myriophyllum sibiricum*	7	7	1.00
Thin floating-leaf bur-reed	*Sparganium* sp.	7	7	1.00
Spatterdock	*Nuphar variegata*	6	22	1.17
Spiral-fruited pondweed	*Potamogeton spirillus*	6	6	1.00
American bur-reed	*Sparganium americanum*	6	11	1.50
Shoreweed	*Littorella uniflora*	5	5	1.00
Brown-fruited rush	*Juncus pelocarpus* f. *submersus*	4	5	1.25
Variable pondweed	*Potamogeton gramineus*	4	5	1.00
Twin-stemmed bladderwort	*Utricularia geminiscapa*	3	3	1.00
Pipewort	*Eriocaulon aquaticum*	1	2	1.00
Clasping leaf pondweed	*Potamogeton richardsonii*	1	1	2.00
Broad-leaved arrowhead	*Sagittaria latifolia*	1	1	1.00
Thin-leaved pondweed	*Potamogeton* sp.	1	1	1.00
Flat-leaved bladderwort	*Utricularia intermedia*	1	1	1.00
Cattail	*Typha* sp.	Visual	3	n/a
Needle spikerush	*Eleocharis acicularis*	Boat Survey	Boat Survey	n/a
Three-way sedge	*Dulichium arundinaceum*	Boat Survey	Boat Survey	n/a

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Appendix 3

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 9.3

This is a protocol for making a plant distribution map using ArcGIS 9.3 and the Excel (2003 version) file of data from the point intercept (PI) survey. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. After entering the PI survey data into the Aquatic Plant Survey Data Workbook (Appendix-C.xls), save the file using a unique name. We recommend the convention: Lake_County_WBIC_(YYYY).xls

2. Prepare <Lake_County_WBIC_(YYYY).xls> For Join
    a. Open file in Excel
    b. File → Save As → Lake_County_WBIC_(YYYY)_JOIN.xls (DO NOT MODIFY ORIGINAL FILE)
    c. Delete all worksheets except for ENTRY and ARCGIS TEMPLATE (make sure to scroll left and delete the README sheet)
        i. Click on worksheet tab; Edit → Delete Sheet → Delete
    d. Delete the following columns
        i. Entry columns (A & I) and calculated columns (B-H)
            1. Columns B-H are normally hidden. To "unhide" them, cursor over the column heading (A) at the top of the sheet and click/drag to highlight it and the adjacent column (I). Right click the highlighted region, then select unhide. Columns B-H are colored blue. Now delete all columns A-I.
        ii. Latitude, Longitude columns (possibly hidden, located between sampling point and depth columns)
        iii. Replace first row of ENTRY with ARCGIS TEMPLATE
            1. Copy the entire first row of truncated species names from the ARCGIS TEMPLATE worksheet
            2. Highlight the first row on the ENTRY worksheet and replace with the template (Edit → Paste)
        iv. Species columns with no data
            1. Add a count row to identify empty columns to delete
                a. Select all cells and remove any validation
                    i. Select All (Ctrl-A)
                    ii. Data → Validation → OK → Allow Any Value → OK
                b. In the row below the last sampled point, and in the first column under a plant species, enter the formula =counta(
                c. Then highlight the column up to the first sampling point. The beginning of this procedure is depicted below.

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d. Finally, add a closing) and hit enter. The final formula will be similar to this: =counta(G2:G500)
e. Point the cursor over the bottom right corner of the cell until cursor turns into a "+". Click/Drag this formula all the way across to the end of the species list.
f. Delete any columns where the sum row is equal to 0
g. Then delete the sum row

e. Delete any rows after the last applicable sample point
   i. The "sample_pt" column is usually populated up to 4000 points; delete any rows where the sampling point column is numbered, but these sample points are greater than the number of points set-up in the lakewide grid, and therefore the row doesn't contain any information.
f. Add a "dummy" row so all data imports into ArcGIS as "text"
   i. Add a row directly above the first sampled point
   ii. In this newly created row, under the Sampling Point column, enter the number equal to the total number of sample points plus 1 (i.e. total sampling points in example image is 187. The number 188 would be entered into the "dummy" row under the sampling point)
g. Enter "Z" in all other cells in all columns that contain any information

h. Save the file and close Excel

3. Save the lake specific polygon and point shapefiles to a folder on a local drive
   a. We'll refer to this folder as "MapFolder"

4. Open ArcMap
   a. Select to Start using ArcMap with "a new empty map" and click "OK"

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5. Add Data (either method "a" or "b")
    a. Using Add Data Button
        i. Select the "Add Data" button; or File → Add Data 
        ii. Navigate to MapFolder
        iii. Highlight both the lake polygon (lake_country_WBIC_poly.shp) and point (lake_county_WBIC_XXmpts.shp) shapefiles
        iv. Click on 'Add'
    b. Directly from ArcCatalog
        i. Situate ArcMap and ArcCatalog windows so that you can see both
        ii. Navigate to MapFolder in ArcCatalog
        iii. Highlight both the lake polygon (lake_county_WBIC_poly) and point (lake_county_WBIC_XXmpts) shapefiles
        iv. Drag and drop these shapefiles into ArcMap
        v. Note: Shapefiles should only be saved, deleted, moved, etc. in ArcCatalog. Using Windows Explorer with shapefiles can result in accidental deletion of individual shapefile files (i.e. *.shp, *.dbf, *.sbn, *.shx, *.sbx, and *.sbn files must all be stored together. ArcCatalog packages these files together so nothing gets lost)

6. Defining Shapefile Projections
    a. If after adding in your shapefiles a warning message regarding "Unknown Spatial Reference" appears, the shapefiles coordinate system is not defined
        i. To define and verify projection, please contact DNRBaselineAquaticPlants@wisconsin.gov
        ii. Alternatively, the shapefile projection can be defined manually by using the Define Projection Tool located in ArcToolbox
            1. ArcToolbox → Data Management Tools → Projections and Transformations → Define Projection
            2. Input Dataset or Feature Class
                a. Select the shapefile that needs a defined projection
            3. Click on the browse button (right side of dialog box)
            4. In the Spatial Reference Properties dialog box, click on the "Select" button
            5. Browse for the correct coordinate system
                a. Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj; Click Add.
                    i. Do not use the US Feet system
                    ii. The coordinate system name may also be displayed as NAD 1983 HARN Transverse Mercator
                    iii. Coordinate system parameters:
                        1. Projection → Transverse Mercator
                        False Easting → 520000.00000000
                        False Northing → -4480000.000000
                        Central Meridian → -90.00000000
                        Linear Unit → Meter

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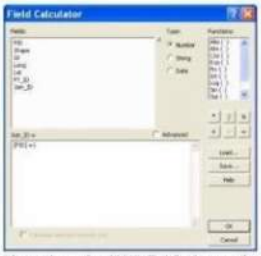
6. Select "OK" on Spatial Reference Properties dialog box, and "OK" on define projection tool

7. Edit Attribute Table for point shapefile
   a. Open Attribute Table
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select "Open Attribute Table"
   b. Add a Field
      i. Select the "Options" button → "Add Field"
      ii. Name: Join_ID
      iii. Type: Double
      iv. Precision: 10
      v. Scale: 3

   c. Populate Join_ID Column
      i. Right click on "Join_ID" column heading
      ii. Select "Field Calculator"
      iii. If Field Calculator warning message pops up, click "Yes"
      iv. Set expression by double-clicking FID in the "Fields:" box and typing +1. The white box under "Join_ID =" should now read **[FID] +1**
      v. Click "OK"
      vi. Your Join_ID column should now be populated in sequential order, starting with point #1 at the top
      vii. Close the attribute table
      viii. Note: This expression is assuming that each unique ID was based off of the calculation [FID] +1 when creating the initial point file. If the unique ID's were not created in sequential order based on the FID field, then calculate Join_ID field accordingly (example: Truncate a unique ID such as 'Como001' so that it just reads '001' in the Join_ID field.)



8. Join shapefile to <Lake_County_WBIC_(YYYY)_JOIN.xls>
   a. Right click on point shapefile in ArcMap table of contents
   b. Select Joins and Relates → Join…
   c. Set the following options:
      i. Join Attributes from a table
      ii. Join will be based on "Join_ID"
      iii. Choose the table to join to this layer
         1. Click on Window Folder (See arrow)

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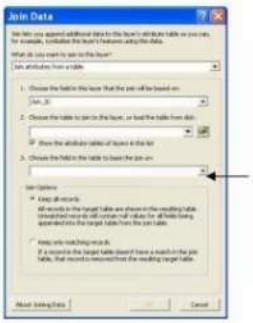
2. Navigate to and double-click on the Excel file saved in step 2
3. Double-click on the 'ENTRY $' sheet
4. Click "Add"

iv. Base the join on "sample_pt"
v. Join Options: Keep All Records (If using ArcGIS 9.2, these options can be viewed by clicking the "Advanced" button)
vi. Click "OK"
vii. If prompted to create index, select "Yes"



9. Export joined shapefile to make it permanent
   a. Right click on joined point shapefile in ArcMap table of contents
   b. Select Data → Export Data
   c. Set the following options:
      i. Export: All Features
      ii. Use the same coordinate system as: this layer's source data
      iii. Output shapefile or feature class: Save in MapFolder as **Lake_County_WBIC_ XXpts_YEAR_JOIN.shp**
   d. Click "OK"
   e. When asked if you want to add the exported data to the map as a layer, select "Yes"
      i. This final joined shapefile will now be referred to as "Joined Point Shapefile"
   f. Remove the Join from the original point shapefile
      i. Right click on point shapefile in ArcMap table of contents
      ii. Select Joins and Relates → Remove Join(s) → Remove All Joins
   g. In the table of contents, uncheck or remove the original point shapefile that was used to create the Joined Point Shapefile.

10. Check Join Results
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select "Open Attribute Table"
    c. Verify that Join was successful
       i. All data present in Excel file should now be located in the Joined Point Shapefile attribute table, and the Join_ID and Sample_Pt columns will be identical

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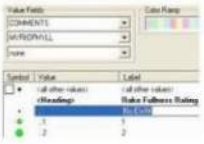
11. Display Plant Distribution Data
    a. Right click on the Joined Point Shapefile in the table of contents
    b. Select "Properties"
    c. Select "Symbology" tab
    d. On left side of dialog box under "Show:", select "Categories – Unique Values, Many Fields"
    e. Value Fields should be "Comments". Be sure to select the appropriate Comments field, as there may be two that appear similar.
    f. You will then choose additional Value Fields to display species information (i.e. If you want to display both EWM and CLP species information, then both EWM and CLP need to be chosen as Value Fields)
    g. Select "Add All Values"
        i. All possible values are now displayed, separated by a comma. Each position indicates the unique values for each Value Field you designated in steps e & f, in the order entered. That is, if you selected 'comments', 'EWM', and 'CLP' as your value fields, the first value might read: ' , , ' indicating points that were sampled, but had neither a comment, EWM, nor CLP present. The next value might read ' , ,1', which includes points with no comments, no EWM, and fullness rating of 1 for CLP.
        ii. Points with information for the 'comments' value field were likely not sampled; the comment listed should clarify how to work with these points.
    h. Un-check <all other values> box
    i. Double-click on symbol next to each value to set symbology
        i. You must now choose appropriate symbols and colors for the different variables being expressed.
        ii. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2, 3), a small light green circle for visuals (V), a small black dot for sites sampled that had no relevant plant data, and a small "x" symbol for all sites not sampled
    j. You can change the label name of the symbol being represented by clicking on the respective space under "Label". (e.g. change " , " to "No EWM"; " ,1" to "1"; " ,V" to "Visual"; "Deep, " to "Not Sampled")



    k. You can also group values together (e.g. No Information, Deep, Shallow, etc)
        i. Hold down the Shift key and highlight all rows that should be grouped

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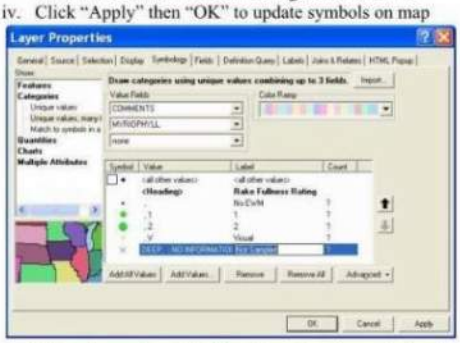
ii. Right click on highlighted rows and select "Group Values"
iii. The final Layer Properties dialog box should look similar to this: Note: If you want to change the order that these will appear in the legend, highlight a row and use the arrows on the right side to move.
iv. Click "Apply" then "OK" to update symbols on map



v. The polygon shapefile fill color and outline may also be modified similarly under the "Symbology" tab

12. Map Page Layout
a. Verify that the coordinate system is defined correctly for the Data Frame
i. Select View → Data Frame Properties → Coordinate System Tab
ii. If the coordinate system is incorrectly defined, browse for the correct coordinate system
1. Predefined → Projected Coordinate System → State Systems → NAD 1983 HARN Wisconsin TM.prj
b. View → Layout View
c. File → Page and Print Setup → Select Landscape or Portrait
d. Modify size/shape of data frame to fit on entire page and serve as map border
i. Right click data frame, select Properties, under the 'Frame' tab, change border to a thickness of 2 and select OK.
e. Insert → North Arrow
i. Size and position appropriately
f. Insert → Scale Bar
i. Select "Alternating Scale Bar 1" and click "OK"
ii. Double-click on Scale Bar in Layout view to edit properties
iii. Set the following properties:
1. Number of divisions: 2
2. Number of subdivisions: 1
3. Set units to kilometers

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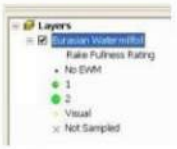
4. Click "OK"

g. Insert → Text
   i. Double-click on Text Box to edit information
      1. Create text box with the following information:
         a. Lake Name, County, Date Sampled, etc.
      2. Format text as appropriate using "Change Symbol…" button

h. Insert → Picture → Navigate to WDNR Logo (Black & White)
   i. Size and position appropriately
i. Legend
   i. In the table of contents, modify the displayed name of your shapefile as you would like it to appear in your legend by single clicking on the text
   ii. Insert → Legend
   iii. Choose which layers you want to include in your legend
      1. Include the layer that has the plant distribution symbology information
      2. You may have to remove the polygon layer by highlighting it under "Legend Items" and clicking the single left angle bracket (<), then select "Next"



   iv. Remove the word "Legend" from the Legend Title and select "Next"
   v. Continue selecting "Next" and then "Finish"
   vi. Format legend text
      1. Right click on Legend and select "Properties"
   vii. Size and position legend as appropriate
j. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as an ArcMap Template so you can use the same one each time
   i. File → Save As → Save As Type: ArcMap Template
k. Check printed map for color accuracy before you export (Step 13). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

13. Saving Map as JPEG
   a. File → Export Map
      i. Save as type: JPEG
      ii. Set Resolution: 300 dpi
      iii. Navigate to appropriate folder and Save

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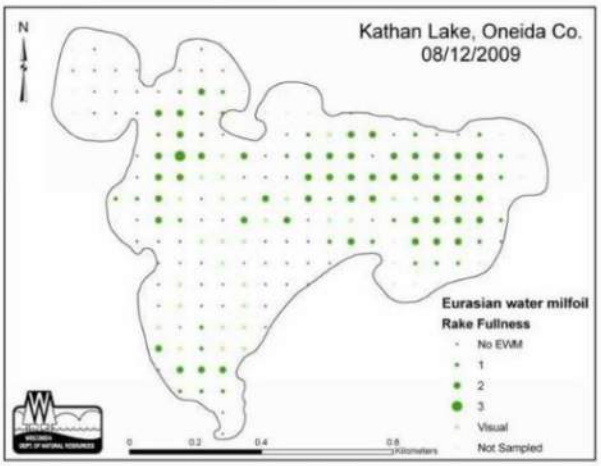

Figure 6: Example plant distribution map created using point-intercept data and ArcGIS 9.3 software for Kathan Lake, Oneida County.

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Appendix 4

Creating a Plant Distribution Map Using Point Intercept Data in ArcGIS 3.3

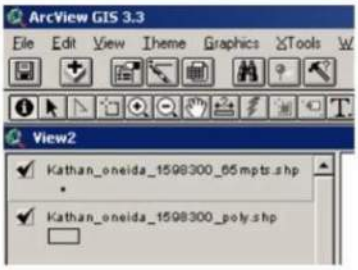
This is a protocol for making plant maps using ArcView GIS 3.3 and the Aquatic Plant Survey Data Workbook Excel file <Appendix-C.xls.>. This protocol can be changed in a number of different ways and still produce a similar product. The best way to make PI-based maps depends on the particular dataset; however, this procedure works well in most cases. Similar images may be created in PowerPoint or in photo editing software if the dataset is not large or complex.

1. Save the ArcView shapefiles (*.shp, *.dbf, *.sbn, *.shx, *.sbx, *.sbn) to a folder on a local drive.
   a. We'll refer to this folder as "MapFolder"

2. Open ArcView and create a new project with a new view.
   a. Click "yes" to add data

3. Add shapefiles from MapFolder
   a. You can add multiple files at once by holding down "shift" while you click the individual files

4. View window: select the point file
   a. Make sure both themes have the box checked in order to view them
   b. Click once on the point layer to activate that theme (raised box around that item)
   c. If necessary, drag the activated point layer above the polygon layer in order to see the sample points



5. Open theme table
   a. Theme > Table or
   b. The open theme table shortcut button

6. Start editing, add variable column
   a. Table > Start Editing
   b. Edit > Add Field
      i. Enter the name of the field (e.g. EWM_2009)
      ii. Specifications 'type', 'width', and 'decimal places' do not need to be changed
      iii. Click "OK"

7. Stop editing, save edits
   a. Table > Stop Editing, 'Yes' to save edits

8. Export point file

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a. File > Export
b. Select 'dBASE'
c. Select MapFolder to save file
d. Default will be named <table1.dbf>
e. Close table

9. Set-working directory
    i. File > Set Working Directory
    ii. Change working directory to MapFolder

10. Save project, exit ArcView
    a. File > Save Project As > save in MapFolder (for ease of reference, lets call the file EWM_Map.apr)
    b. Exit ArcView

11. Open file saved in step 8 with Excel
    a. Open excel; Open a file, when prompted to find the file, navigate to MapFolder
    b. In "Files of type" option bar select "All files"
    c. Open <table1.dbf>

12. List information under data field created (EWM_2009)
    a. Open PI data entry excel file (WiAPMS.xls)
    b. Copy columns "Sample point, Depth, Comments, & EWM"
    c. Paste special "values" into new excel workbook
        i. Edit > Paste Special > Values
    d. Highlight all data, sort by comments
        i. Data > Sort > Comments
    e. Enter the number 5 into EWM column for all unsampled sites (deep, terrestrial, non-navigable, etc) (this is so the legend can code these sites)
    f. Highlight EWM data column and replace all blanks with 0 (zero), and V (visuals) with 4
        i. Edit > Replace, replace all
    g. Highlight all data, re-sort by sampling site
        i. Data > Sort > Sampling Point
    h. Copy EWM column, excluding header, paste into the .dbf file (already open, originally created in step 8)
    i. "Save as" this file as the **original dbf** file's name (the copy you placed in MapFolder, not the original file, obviously)
        i. i.e. overwrite the ISS original (e.g. Kathan_Oneida_1598300_65mpts.dbf) with the new file you just modified in excel. The name must be EXACTLY the same!!
        ii. Close excel

13. Reopen project in ArcView
    a. Open existing project

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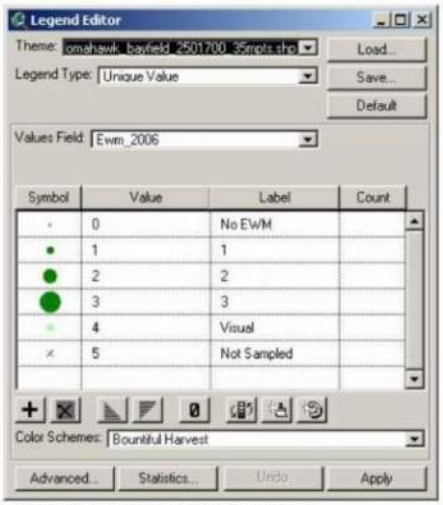
b. Open MapFolder and click on EWM_Map.apr (or whatever you chose to name it in step 9)

14. Create legend
    a. Double-click point symbol in the View frame to open the legend window
    b. In "Legend Type" option bar, choose "Unique Value"
    c. In "Values Field" option bar select "EWM_2009" column (or whatever column you want this map to show)
    d. Apply
    e. You must now choose appropriate symbols and colors for the different variables being expressed by the legend. You can change the symbol by double clicking on it
    f. Typically we use increasing sizes of a green circle for EWM density ratings (values: 1, 2 , 3), a small light green circle for visuals (value: 4), a small black dot for sites sampled, but without EWM, (value: 0), and a small "x" symbol for sites not sampled (value: 5).



    g. You can change the label name of the symbol being represented by clicking on the respective cell under "Label". (e.g. change "5" to "Not Sampled", change "4" to Visual)
    h. The color or shading of the polygon can also be changed by double clicking on the theme

15. Set units
    a. View > Properties
    b. Change map units to "meters" and distance units to "kilometers"

16. Layout
    a. View > Layout
    b. Select Landscape or Portrait
    c. Double-click 'View1' to change map title
    d. Double-click scale bar to adjust range or units
    e. If you're going to be switching between maps quickly to look at comparisons between years or species, we suggest making and refining the layout first, then saving it as a Template (Layout > Store as Template) so you can use the same one each time.

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f. Check printed map for color accuracy before you export (step 17). Sometimes the colors may look different on screen, but may print with the same hue and value, making interpretation impossible. You can set a custom color if necessary.

17. Save as JPEG
    a. Have the final layout window active
    b. Select File > Export
    c. In "List Files of Type" option bar, select JPEG
    d. Click 'Options' button
        i. Set resolution to highest number
        ii. Likely 144 DPI and Quality = 100
    e. Type file name, choose location in which to save the JPEG
    f. Click OK

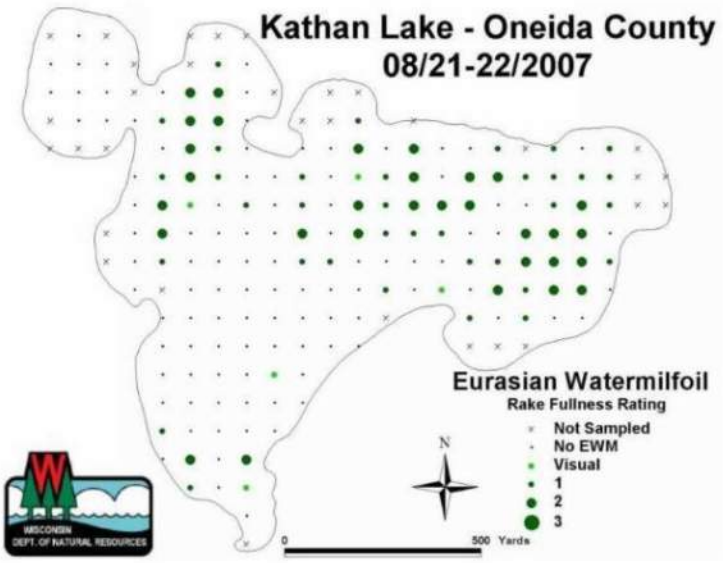

Figure 7: Example plant distribution map created using point-intercept data and ArcGIS 3.3 software for Kathan Lake, Oneida County.

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Document citation:

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA.

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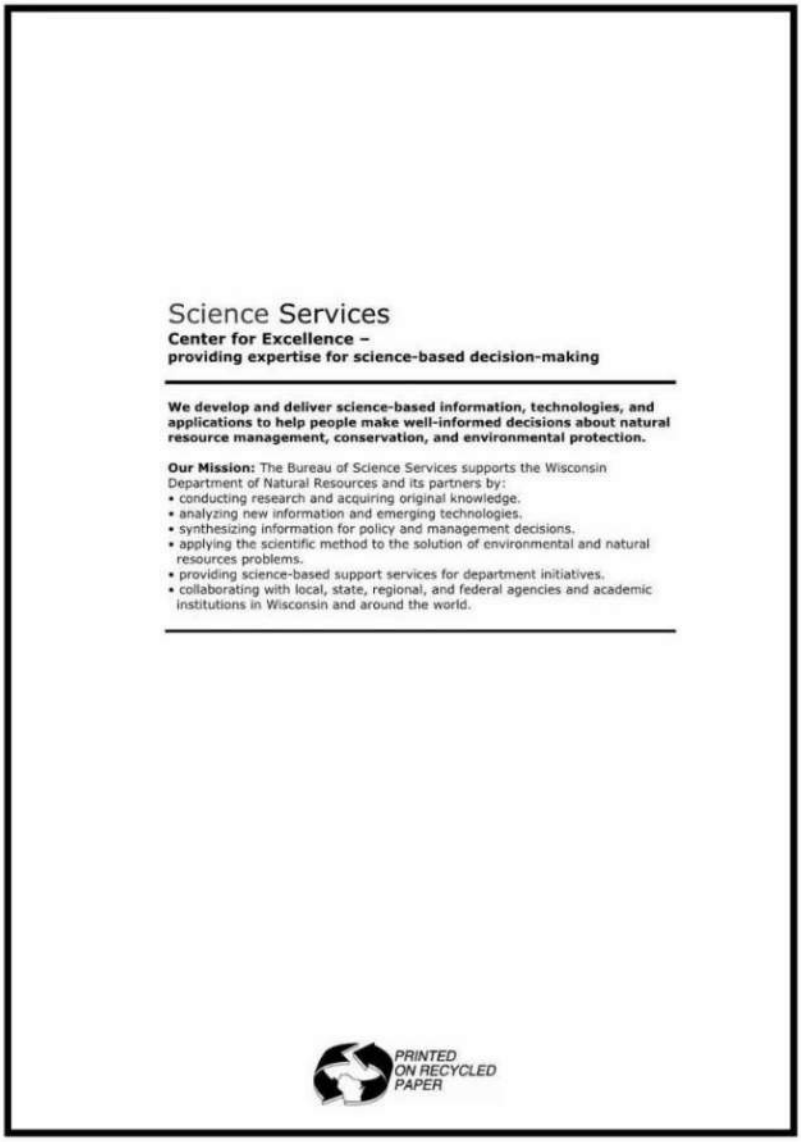

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Appendix 3 - Rapid Response Aquatic Species Sheet

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

Selected Regulated Aquatic Invasive Species in WI

Floating water hyacinth
(Eichhornia crassipes)

Starry stonewort
(Nitellopsis obtusa)

Hydrilla
(Hydrilla verticillata)

Anchored water hyacinth
(Eichhornia azurea)

Water lettuce
(Pistia stratiotes)

Faucet snail
(Bithynia tentaculata)

European frog-bit
(Hydrocharis morsus-ranae)

Brittle naiad
(Najas minor)

New Zealand mud snail
(Potamopyrgus antipodarum)

Spiny water flea
(Bythotrephes cederstroemi)

Malaysian trumpet snail
(Melanoides tuberculata)

Duck lettuce
(Ottelia alismoides)

Java waterdropwort
(Oenanthe javanica)

Quagga mussel
(Dreissena rostriformis)

Yellow floating heart
(Nymphoides peltata)

Brazilian waterweed
(Egeria densa)

Report any **prohibited** species as soon as possible by emailing: **Invasive.Species@wi.gov.**
This publication does not list all the regulated species. For the full list of Prohibited or Restricted species please visit:
www.dnr.wi.gov keyword: **invasives**

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Proposed Study Plan *Aquatic and Terrestrial Invasive Species Study*

Cornell Hydroelectric Project *Xcel Energy*
FERC No. 2639 *January 2020*
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Document Accession #: 20200713-5110 Filed Date: 07/13/2020

WATER QUALITY STUDY
CORNELL HYDRO FERC RELICENSING
Chippewa County, Wisconsin

Proposed study plan

Prepared for:
Xcel Energy
P.O. Box 8
Eau Claire, WI 54702

Prepared by:

GLEC
Great Lakes Environmental Center

1100 Pavelski Rd
Eau Claire, WI 54703

Principal contact:
Christopher J. Turner
Ph.: 715-829-3737
Fax: 715-874-5389
Email: cturner@glec.com

Date: April 6, 2020

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1.0 INTRODUCTION

Great Lakes Environmental Center, Inc. (GLEC) is pleased to submit a proposal to perform a water quality study in the Chippewa River, Chippewa County, Wisconsin at the Xcel Energy Cornel Hydro Powerhouse Dam (Project). This study was requested to assess any impacts of the dam operations on water quality, to determine if the public waters within the project area are meeting state water quality standards; to determine how their water quality profile may impact the downstream riverine areas, and to establish baseline data for total phosphorus (TP), chlorophyll a, Secchi depth, DO, temperature, conductivity, and pH. The Project is in the process of Federal Energy Regulatory Commission (FERC) relicensing, and potential effects of continued Project operation on water quality is a required evaluation. Data from this study will assist state and federal resources managers during the upcoming FERC relicensing process by describing water quality in and below the impoundment.

The 2016 Wisconsin Department of Natural Resources (WDNR) Directed Lakes Protocol (Hein and Ferry, 2016), and USEPA's National Lakes Assessment Field Operations Manual (USEPA, 2017) were reviewed and used to develop the scope of work for the water quality study for the Project. This proposal presents scope and costs per the email request from Xcel Energy received on February 29, 2020.

2.0 SCOPE OF WORK

GLEC proposes the tasks outlined below to complete the scope of work as requested by Xcel with input from WDNR.

TASK ONE: WATER QUALITY MEASUREMENTS AND SAMPLE COLLECTION

GLEC will perform field data and sample collection on three field days (approximately July 15, August 15, and September 15). On each field day, three sites will be visited as recommended by WDNR (see Figure 1):

1. Upper flowage (riverine area)
2. Cornell Flowage at its deepest point
3. Chippewa River immediately below the Cornell Hydro.

To maintain consistency, sites will be visited in the same order on each of the three field days starting at approximately the same time each day.

At each of the three sites and on each of the three field days, the following tasks will be performed:

1. Water transparency (e.g., Secchi depth to the nearest 0.1 meters) using a weighted 20 cm Secchi disk with marked lowering line (see GLEC SOP FLD 6004)
2. Hydrographic profile of *in situ* temperature, DO, conductivity, and pH beginning at the surface and including measurements every 1 meter to the bottom. A multi-parameter sonde which has been calibrated the morning of each filed day will be used for these measurements (see GLEC SOP FLD 6030).
3. Collection of water samples using a 2 meter integrated water sampler. Collected water will be homogenized and divided into:

a. a 2L chlorophyll-a sample which will be filtered within 12 hours of collection using a Metricel® membrane filter (see GLEC SOP FLD 6001) and
b. a 250 mL TP sample which will be preserved with sulfuric acid immediately after collection (see GLEC SOP FLD 6007).

To the extent possible, the methods above will be aligned with those specified in WDNR's Directed Lakes Protocol.

NOTE: potential modifications to the above tasks may be needed for the site located immediately below the Cornell Hydro due to potentially unsafe conditions in the tailrace and the lack of boat access. In the event that measurements and/or samples are collected from the deck of the hydro project, a single water grab sampler such as a Kemmerer or Van Dorn (see GLEC SOP FLD 6003) will be used in place of the integrated water sampler. Every effort will be made to collect the full hydrographic profile and an accurate Secchi depth, but flow conditions at this site may necessitate a single point measurement versus a full profile or a modified Secchi depth collection (e.g., from shore).

The TP samples and the chlorophyll-a filters will be sent via FedEx Priority Overnight shipping to GLEC's lab in Traverse City, MI.

TASK TWO: LAB ANALYSIS

GLEC's Traverse City, MI lab will analyze the TP and Chlorophyll-a samples per standard EPA methods 4500-P-F and 10200-H, respectively. Each sample will be analyzed within the holding time specified in each pertinent method. Chlorophyll-a results will be reported as µg/L and TP results will be reported as mg/L.

TASK THREE: REPORTING

At the end of the study, GLEC will submit a report to Xcel Energy that details all the field and lab activities, provides the full suite of field and lab data and describes any deviations from the planned tasks.

3.0 SCHEDULE

GLEC can initiate work as described in this proposal immediately upon authorization. Field work will be initiated following coordination with Xcel. Per the guidelines, the field work will be completed from approximately June 15 to September 15, 2020.

4.0 ASSUMPTIONS

This proposal includes only the tasks specified above. If the scope of work changes for any reason, including requests from Xcel for additional work, or unforeseen issues that may extend the service hours and expenses quoted in this proposal, GLEC will submit a request for additional funds to cover any service hours or expenses incurred above and beyond the original scope of work. Assumptions associated with this scope of work are listed below.

1. The proposed costs associated with this scope of work assume that the presented scope of work will be accepted by WDNR. If the proposed methods are deemed insufficient and additional survey work is required, proposed project costs may need amended to meet agency requests.

2. GLEC assumes all work will be performed in the 2020 field season.

5.0 COST

Refer to the project specific budget sheet for expected costs which include all travel, labor, lab analysis, equipment, etc. necessary to complete the tasks detailed above.

6.0 LITERATURE CITED

USEPA. 2017. National Lakes Assessment 2017. Field Operations Manual. EPA 841-B-16-002. U.S. Environmental Protection Agency, Washington, DC.

Hein and Ferry. 2016. Directed Lakes Protocol. Wisconsin Department of Natural Resources, Madison, WI.

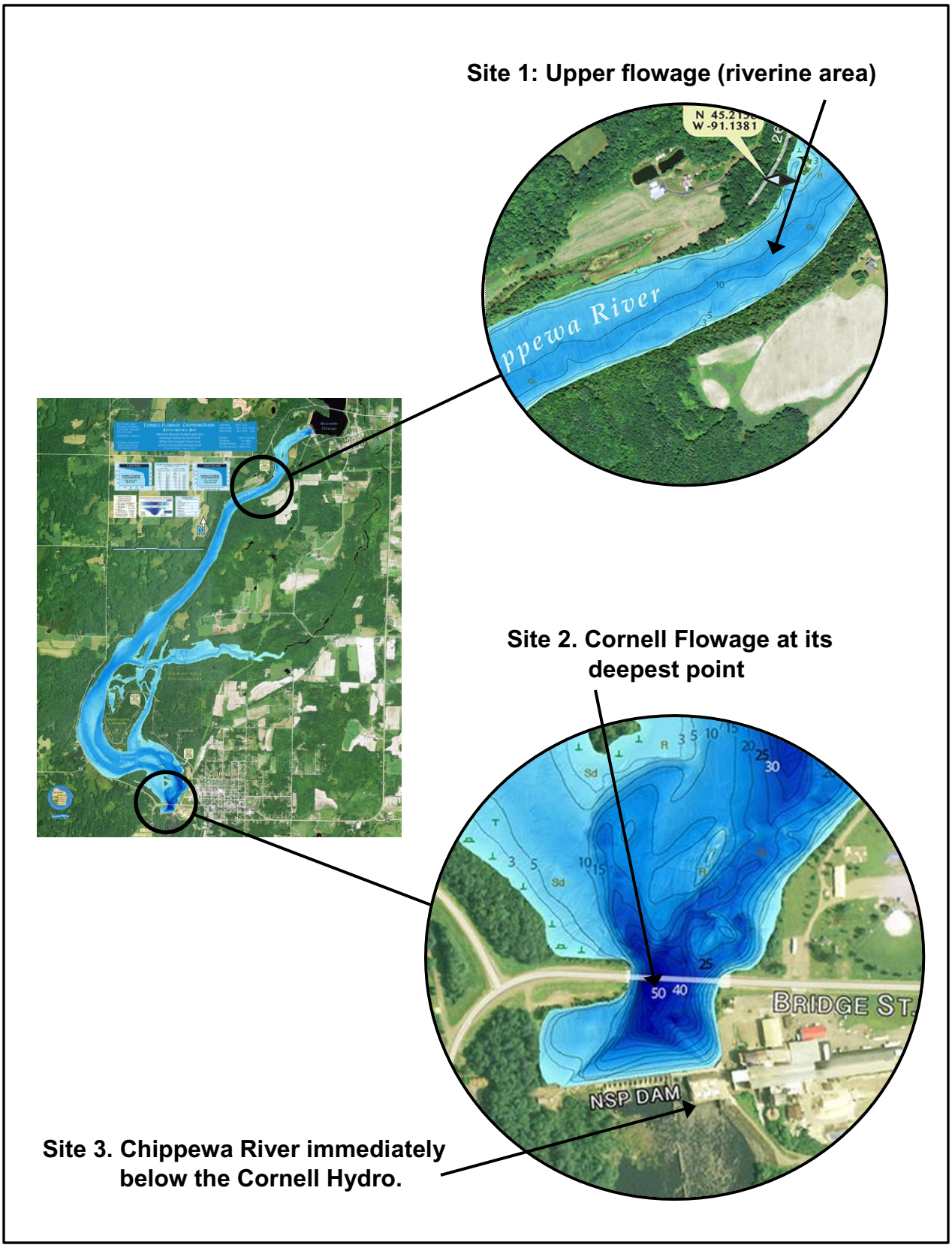

Figure 1. Proposed sites for 2020 water quality study, Cornell Hydro Project.

Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Friday, April 24, 2020 11:05 AM
To: Laatsch, Cheryl - DNR
Cc: Willger, Christopher J - DNR; Shawn Puzen; Darrin Johnson
Subject: RE: request non-wadeable wq sampling protocols for DNR
Attachments: GLEC_Cornell_Hydro_FERC_Water-Quality_Proposal_20200407.pdf

Thanks Cheryl – we will proceed with the attached proposal (same as the proposal submitted to you via e-mail on April 8) and follow the SOP for grab samples.

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Friday, April 24, 2020 10:04 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: FW: request non-wadeable wq sampling protocols for DNR

EXTERNAL email. **STOP** and **THINK** before opening links and attachments.

attached is our SOP for grab sampling of nutrients. I believe all we requested was some TP samples and for them to monitor DO with a handheld meter. --- from Chris

---

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, April 22, 2020 11:29 AM
To: Willger, Christopher J - DNR <ChristopherJ.Willger@wisconsin.gov>
Subject: request non-wadeable wq sampling protocols for DNR

Hi – I am finishing up some questions for Xcel regarding the wq sampling for Cornell hydro. I would like to give them the non-wadeable protocols, so they understand what was asked of them and the expectations.

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


Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Wednesday, April 8, 2020 8:32 AM
To: Laatsch, Cheryl - DNR
Cc: Shawn Puzen; Darrin Johnson
Subject: Cornell Hydro - Proposed Water Quality Study
Attachments: GLEC_Cornell_Hydro_FERC_Water-Quality_Proposal_20200407.pdf

Importance: High

Hi Cheryl,

Attached for your review and approval is Xcel Energy's proposed water quality study in regards to the relicensing of Cornell Hydro. The study includes the protocol recommended by the WDNR. Please let me know if the WDNR approves of the study plan so I may move forward with developing a contract for our consultant.

Matthew Miller
Xcel Energy | Responsible By Nature
Hydro License Compliance Consultant
1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702
P: 715.737-1353 **F**: 715.737.1077
E: matthew.j.miller@xcelenergy.com

XCELENERGY.COM

Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Tuesday, March 31, 2020 9:13 AM
To: Laatsch, Cheryl - DNR
Cc: Chris Turner; Shawn Puzen
Subject: RE: Cornell Water Quality and Mussel Study

Importance: High

Hi Cheryl,

Just a friendly reminder to follow-up with our consultant's questions below regarding the water quality sampling protocol for Cornell.

From: Miller, Matthew J
Sent: Monday, March 2, 2020 10:42 AM
To: 'Laatsch, Cheryl - DNR' <Cheryl.Laatsch@wisconsin.gov>
Subject: RE: Cornell Water Quality and Mussel Study

Will do.

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Monday, March 2, 2020 9:43 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>; Lepsch, Jodi A - DNR <Jodi.Lepsch@wisconsin.gov>
Cc: Chris Turner <cturner@glec.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: RE: Cornell Water Quality and Mussel Study

CAUTION EXTERNAL SENDER: Stop and consider before you click links or open attachments.
Report suspicious email using the 'Report Phishing/Spam' button in Outlook.

Hi folks – I will work with Jodi on this request. Matt – please continue to come through me for needed agency information, so we can be sure to provide the needed information, and track the details. THanks

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
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N7725 Hwy 28
Horicon WI 53032
(T) 920-387-7869 (Fax) 920-387-7888
Cheryl.laatsch@wisconsin.gov

dnr.wi.gov

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Monday, March 02, 2020 8:41 AM
To: Lepsch, Jodi A - DNR <Jodi.Lepsch@wisconsin.gov>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Chris Turner <cturner@glec.com>
Subject: FW: Cornell Water Quality and Mussel Study

Hi Jodi,

Our consultant, Chris Turner (Great Lakes Environmental Center), is drafting the water quality study plan for Cornell and has several questions below. Can you please provide him with some additional details regarding the sampling protocol?

From: Chris Turner <cturner@glec.com>
Sent: Monday, March 2, 2020 7:33 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Cc: Darrin Johnson <Darrin.Johnson@meadhunt.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>
Subject: Re: Cornell Water Quality and Mussel Study

CAUTION EXTERNAL SENDER: Stop and consider before you click links or open attachments.
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Yes, I will have ES work on costs for study plan development and field work based on WDNR mussel guidelines.
And I will work on the water quality study. Do you have a sense for any of the details such as :

- How many water samples will be needed in each location to establish the baseline requested?
- Do you have an idea of the best location for the riverine samples and the impounded samples? It looks to me like there are three distinct location: riverine, impoundment, below dam, is that correct?
- The DO proposed work document mentions a weekly DO reading below the dam during summer months. Is this June, July and Aug?
- Can the below-the-dam DO and water sample location be in an area accessible from shore or the dam? We already know putting in a boat downstream is difficult.
- The DO document also mentions "morning" samples for the downstream DO. I presume that we would take them whenever the plant is opened up, what time is that?

_____

Chris Turner
Principal Research Scientist
Great Lakes Environmental Center, Inc.
715-829-3737
cturner@glec.com

-

On Sat, Feb 29, 2020 at 1:36 PM Miller, Matthew J <Matthew.J.Miller@xcelenergy.com> wrote:

> Hi Chris,
>
> See the attached study parameters from the WDNR for water quality and mussel studies at Cornell. Would you be able to submit separate cost proposals for drafting the study designs and implementing the studies? For the mussel survey, we had discussed having you subcontract with Enviroscience to draft and implement the study plan.
>
> **Matthew Miller**
> **Xcel Energy | Responsible By Nature**
> **Hydro License Compliance Consultant**
> 1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702
> **P:** 715.737-1353 **F**: 715.737.1077
> **E:** matthew.j.miller@xcelenergy.com
>
> **XCELENERGY.COM**

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

FRESHWATER MUSSEL SURVEY ON THE CHIPPEWA RIVER FOR THE CORNELL HYDRO FERC RELICENSING

Chippewa County, Wisconsin

Prepared for:

GLEC

1100 Pavelski Road
Eau Claire, WI 54703

Project No.: 13335
Date: March 31, 2020

Prepared by:

EnviroScience
Excellence In Any Environment

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800-940-4025
www.EnviroScienceInc.com

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1.0 INTRODUCTION

EnviroScience, Inc. is pleased to submit a proposal to Great Lakes Environmental Center, Inc. (GLEC) to perform a freshwater mussel survey in the Chippewa River, Chippewa County, Wisconsin at the Xcel Energy Cornel Hydro Powerhouse Dam (Project). This survey was requested to determine the presence or absence of freshwater mussel resources located upstream and downstream of the Cornel Hydro Powerhouse Dam. The Project is in the process of Federal Energy Regulatory Commission (FERC) relicensing, and potential effects of continued Project operation on mussel resources is a required evaluation. Data from this survey will assist state and federal resources managers during the upcoming FERC relicensing process by describing freshwater mussel resources near the Project.

The information available regarding specific and cumulative impacts to mussels from hydroelectric dams is relatively understudied and difficult to conclude as a sole contributing factor to decline or loss of species. Many factors influence mussel community persistence in the Chippewa River and some may be directly and indirectly related to Project operation. Direct impacts affecting mussel persistence include the loss of riverine mussel habitat through the construction and operation of dams. Dams are one of the “single most important factors” to the decline in North American mussel fauna (Haag, 2012). Indirect impacts associated with dam operation relative to this Project might include habitat loss and disruption of reproductive success. Much information exists relative to mussels within dam environments as they are dynamic, and some impacts may be unique, compounding, and influencing factors to mussel community dynamics. In the context of this study, evaluating the freshwater mussel resources occurring within the Project is necessary to ascertain the effect continued operation will have on the mussel community locally.

Direct abiotic effects from high-volume discharges and abrupt shifts in operation (e.g., reducing or increasing operation capacity resulting in altered river flows downstream) may result in fluctuating water levels and instable riverbed substrates. Inconsistent and variable water velocity can expose boulders, bedrock, and result in depositional shifting sand, which is inhospitable to most freshwater mussels (Neck and Howells, 1994). Similarly, dam operation can change patterns of sedimentation, scour, and alter the ability of particulate matter (food source for mussels) to be transported throughout the stream (Baxter, 1977; Petts, 1980; Ward & Stanford, 1987; Ligon et al., 1995).

Indirect impacts of dam operations on mussel life history, reproduction, and habitat are often the most detrimental to mussel community persistence. Disruptions in mussel reproductivity and shifts in habitat are often attributed to acute or chronic declines in an assemblage over time. For example, because mussels temporarily parasitize and require a fish host, dams can limit fish passage and consequently mussel dispersal (Watters, 1996). As river habitat fluctuates, fish species composition can also shift influencing host availability for the resident mussel community. Often dam tailwaters exhibit fluctuating water temperatures during discharge or release, which can affect spawning and recruitment success of resident mussels.

Freshwater mussels may be present in the Project area based on a preliminary review of the Project location and the Endangered Resources Review (ER Log # 19-325). A desktop search resulted in records of 15 species for the Chippewa River in Chippewa County, including the state endangered Purple Wartyback (*Cyclonaias tuberculata*) and state species of concern

Round Pigtoe (*Pleurobema sintoxia*). All but two species records were dated prior to 1998 (WisDNR, 2018). Additionally, WisDNR has indicated that Salamander Mussel (*Simpsonaias ambigua*) has been historically recorded within the Project area. The WisDNR is interested in determining if any differences in species composition exists below and above the impounded portion of the Project (Lisie Kitchel of WDNR, Personal Communication, March 12, 2020).

The 2015 Wisconsin Department of Natural Resources (WisDNR) Guidelines for Sampling Freshwater Mussels in Wadable Streams (Guidelines; Piette, 2015), and other standard survey methodologies routinely used by EnviroScience were reviewed and used to develop the scope of work for the mussel survey for the Project. This proposal presents scope and costs per the email request from GLEC received on March 2, 2020. The objective of this study is to document the resident mussel community above and below the dam. Effects of dam operation on the mussels potentially present within zones of influence of the Project are not part of this study.

2.0 SCOPE OF WORK

EnviroScience proposes the tasks outlined below to compete the scope of work as requested by GLEC. The Guidelines provide information on minimum survey efforts for wadable conditions and have been modified for non-wadable conditions. Costs are provided as lump sum and include all labor and direct costs associated with project management, client health and safety requirements, reporting, and survey efforts per the modified Guidelines.

TASK ONE: MUSSEL SURVEY

The Guidelines provide information on minimum survey efforts for wadable conditions and have been modified below for non-wadable conditions. See the separate map of the two reaches for a visual representation of the proposed survey locations.

EnviroScience proposes to complete surveys in a 1,000m reach below the dam (Reach 1) and a reach 1000m long in a portion of the Chippewa River not influenced by the Project impoundment above the dam (Reach 2). Reach 1 is approximately 400m downstream out of the zone of influence of the dam tailrace (Latitude 45.1603, Longitude -91.1586) and extends 1000m downstream (Latitude 45.1525, Longitude -91.1617). Reach 2 is similar in river morphology as Reach 1; the downstream limit of Reach 2 is near Latitude 45.2011, Longitude -91.1527 and ends upstream near Latitude 45.20917, Longitude -91.1472. Suitable mussel habitat determined by the field staff will dictate the extents of each survey reach.

Surveys will consist of a series of transects extending bank to bank both above the Cornell impoundment and below. Transects will be spaced every 100m meters in each reach creating a series of 11 possible transects per reach. Transects will be numbered 0-10 from downstream to upstream, and a random number selector will be utilized to select five transects for survey; a total of 10 transects. Completing five transects with an assumed search rate efficiency of 20% would produce an 83.4% probability of detecting rare or threatened species if present (Smith, 2006).

Searches along each transect will be done in 10m long segments and searching will extend 0.5m on each side of the transect. A rapid visual search for signs of freshwater mussels (living or shell material) will be performed within the segment. The rapid visual search entails an initial search of 0.2 minutes per m^2 (min/m^2) along each 10m 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 1min/m^2. During the semi-quantitative search, divers will visually search, probe the substrate, and turnover rocks to detect small, burrowed, or mussels. Data from the semi-quantitative searches will be utilized to generate a species richness curve and can be used to determine a surface density estimate.

EnviroScience will record general stream conditions and morphology within the study area. 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.

Data and Mussel Handling

Live mussels found will be kept submersed in ambient river water and kept cool and moist during processing. All live mussels will be identified to species, counted, and sexed (sexually dimorphic species only) by the team malacologist. Dead shell specimens will be scored as fresh dead (dead <1 year, lustrous nacre), weathered dead (dead one to many years; chalky nacre, fragmented, and worn periostracum), or subfossil (dead many years to many decades; severely worn and fragmented). Detailed digital images of the study area and representative mussel species will be recorded and reported. A station location data sheet will also be populated per the Guidelines. Data will be recorded to allow distinction between time searches. Mussel taxonomy will follow the names presented by Williams et al., 2017.

If any living or dead federally listed species are encountered, GLEC will be notified immediately; per surveyor collection permits WisDNR and 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 into their places of origin.

TASK TWO: REPORTING

EnviroScience will provide GLEC with a draft report for review within 30 days of completion of field work. A final report for distribution to regulatory agencies will be completed within two weeks after receiving GLEC's comments. The report will include a description of mussel survey activities and provide summary tables of all data collected, including mussel species numbers, sizes, and distribution within the study area. GIS-based mapping will provide further visual presentations of the findings of the survey.

3.0 SCHEDULE

EnviroScience can initiate work as described in this proposal immediately upon authorization. Field work will be initiated following coordination with WisDNR, receipt of permits, and when suitable weather and river conditions allow. Per the Guidelines, mussel work can be completed from June 15 to September 31. Normal to low water conditions and good visibility must occur to conduct field work; project activities will be planned accordingly.

EnviroScience recommends authorizations be received by July 15 to complete all the necessary field work for Task 1 if survey is to be performed in the 2020 field season.

4.0 ASSUMPTIONS

This proposal includes only the tasks specified above. If the scope of work changes for any reason, including requests from GLEC for additional work, or unforeseen issues that may

extend the service hours and expenses quoted in this proposal, EnviroScience will submit a request for additional funds to cover any service hours or expenses incurred above and beyond the original scope of work. Assumptions associated with this scope of work are listed below.

1. The proposed costs associated with this scope of work assume that the presented scope of work will be accepted by WisDNR. If the proposed methods are deemed insufficient and additional survey work is required, proposed project costs may need amended to meet agency requests.
2. EnviroScience assumes all work will be performed in the 2020 field season.

5.0 COST

Refer to the project specific budget sheet for expected costs which include all travel, labor, equipment, etc. necessary to complete the tasks detailed above.

6.0 LITERATURE CITED

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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.

Wisconsin Department of Natural Resources (WisDNR). (2018). Wisconsin Mussel Monitoring Program. Retrieved June 25, 2019, from http://wiatri.net/inventory/mussels/MusselWatersState.cfm.

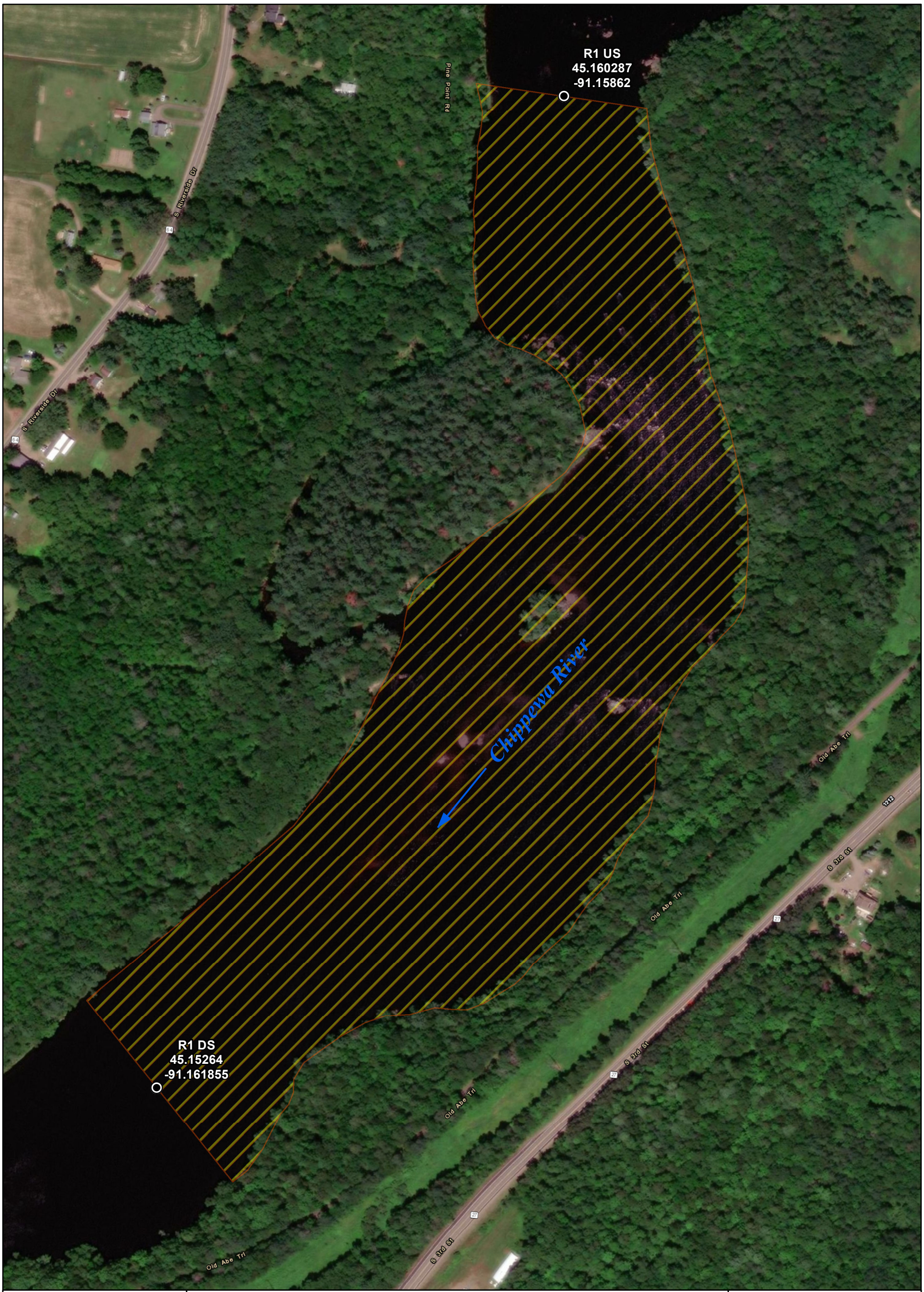

Figure 1. Proposed Downstream Mussel Survey (Reach 1) for the Cornell Hydro FERC Relicensing.

Survey Area

Survey Reach Endpoint

Reach 1

EnviroScience
Excellence In Any Environment

Date: 3/30/2020 Path: C:\Users\Gregory Hocevar\Desktop\13335_Cornell\Map1_Site.mxd

Basemap courtesy of Esri.

R2 US
45.209247
-91.14738

Chippewa River

239th Ave

Chippewa River

239th Ave

23th Ave

R2 DS
45.20111
-91.152717

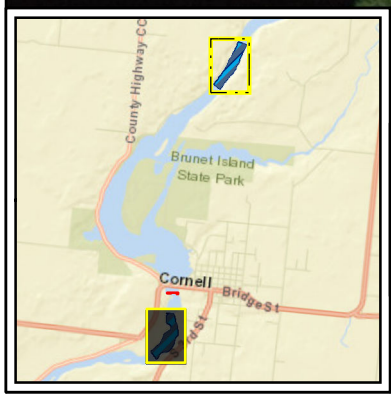

Figure 2. Proposed Upstream Mussel Survey (Reach 2) for the Cornell Hydro FERC Relicensing.

Survey Area Survey Reach Endpoint

Reach 2

0 150 300 600 Feet

0 40 80 160 Meters

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Date: 3/30/2020 Path: C:\Users\Gregory Hocevar\Desktop\13335_Cornell\Map1_Site.mxd

Basemap courtesy of Esri.

Shawn Puzen

From: James Fossum <jfbio@yahoo.com>
Sent: Thursday, April 30, 2020 2:19 PM
To: Miller Matthew J; Shawn Puzen
Cc: Allison Werner; Cheryl - DNR Laatsch; Nick Utrup; Angela Tornes; Darrin Johnson; Shawn Puzen
Subject: Re: Cornell study plan

Hi Shawn:

Regarding Cornell Hydro Project, Chippewa River

I have been thinking about your response to my recommendation for Xcel Energy to conduct, or contract for,
a mussel survey in the littoral zone of the Cornell Flowage as an additional element to the plan of study you sent the agencies and certain stakeholders to review.

You stated that XE rejects this relicensing study recommendation from the RAW.

I must say that one could easily argue the point in support for the study element another way. The FERC needs
up-to-date environmental information to prepare their Environmental Assessment and other environmental
documentation concerning the project as a basis to support FERC's independent analysis on what mitigation and enhancement measures (among many other factors) to include in the new license. Up-to-date environmental information in the impoundment as well as the headwaters and tailrace of the project is needed to document a "glimpse in time" of the condition of the resource in terms of the abundance and diversity of flora and fauna at the time of relicensing. Other up-to-date information required is of course T&E species, wetlands, fisheries, aquatic and terrestrial invasive species, land vegetative cover, recreational resources and so forth). To say that you do not expect many mussels, if any, to be found in the Cornell Flowage seems to me to be primarily speculation.

We believe the species diversity of mussels in the littoral zone is an important part of the baseline "record" and
is just as important as knowing the species of fish currently living in the flowage. Why is it more important to know the species and abundance of fish in the Cornell Flowage and not the mussel distribution in the flowage littoral zone?

I wanted to make this point..... food for thought.

Respectively submitted,

Jim Fossum
Hydro Consultant for the
River Alliance of Wisconsin

On Tuesday, April 28, 2020, 10:16:53 AM CDT, Shawn Puzen <shawn.puzen@meadhunt.com> wrote:

Hi Jim,

Thank you for your comments on the Mussel Survey Study Plan.

Regarding your comment about surveying the littoral zone, Xcel Energy is not proposing a change in operations as part of the relicense (reservoir fluctuation).

Therefore, there is no need to survey the mussel community at elevations below the current reservoir level fluctuation (in the Littoral zone) because such an action is not being proposed. Also, a survey within the current zone of fluctuation of the reservoir is not expected to identify the presence of any mussels. If mussels are present in the zone of fluctuation, they are mobile enough to not be adversely impacted by the fluctuation because they have adapted to the current fluctuations.

Although, your forward thinking is appreciated by Xcel Energy, the study request protocol requires there to be a nexus to the current operation. Since Xcel Energy is not proposing a change in the reservoir fluctuation as part of this license, the nexus of your request to what is being proposed by Xcel Energy does not exist. Your request will not be added to the study plan.

As always, thank you for your attention to detail.

Take Care Jim,

Shawn Puzen | FERC Licensing & Compliance

Mead & Hunt | 1702 Lawrence Drive | De Pere, WI 54115

Direct: 920-593-6865 | Mobile: 920-639-2480

shawn.puzen@meadhunt.com| meadhunt.com

https://www.linkedin.com/in/shawnpuzen

From: James Fossum <jfbio@yahoo.com>
Sent: Tuesday, April 14, 2020 4:14 PM
To: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Miller Matthew J <matthew.j.miller@xcelenergy.com>
Cc: Allison Werner <awerner@wisconsinrivers.org>; Cheryl - DNR Laatsch <cheryl.laatsch@wisconsin.gov>; Nick Utrup <nick_utrup@fws.gov>; Angela Tornes <angie_tornes@nps.gov>
Subject: Cornell study plan

Shawn, Matt:

Per your request, I reviewed the draft *Freshwater mussel survey* for a relicensing study at the Cornell Hydro Project.

Since the survey will follow Wisconsin DNR guidelines for monitoring mussels, I believe the survey will accomplish the intended results. I did have one suggestion however. It seems to me that a survey of the littoral zone of the Cornell Flowage would generate valuable information. This element is currently not part of the study plan. I believe the survey could be done without attempting to do an impact study on the "affects of project operation on the mussel community", which I agree would be very expensive and difficult to do. Since the flowage is an integral part of the Cornell Hydro Project, I recommend that a survey to identify mussel species and number of each species be conducted.

In my professional opinion, the data would be useful to the resource agencies responsible for managing this resource.

The opportunity to review this plan of study is appreciated.

Jim Fossum

Hydro Consultant for the River Alliance of Wisconsin

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Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Thursday, April 2, 2020 2:25 PM
To: (jfbio@yahoo.com)
Cc: Shawn Puzen; Darrin Johnson
Subject: FW: Cornell Mussel Survey, study plan and budget
Attachments: Cornell_Hydro_FERC_Mussel_Proposal_03312020.pdf; Cornell Mussel Survey 2020 Map.pdf

Importance: High

Hi Jim,

Attached is our proposed mussel survey plan for Cornell Hydro for your review and comment. It was developed in consultation with the DNR's mussel specialist, Lisie Kitchel.

From: Miller, Matthew J
Sent: Thursday, April 2, 2020 1:57 PM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>; 'Darrin Johnson' <Darrin.Johnson@meadhunt.com>
Subject: FW: Cornell Mussel Survey, study plan and budget
Importance: High

Hello Cheryl,

Attached is our consultant's proposal for the Cornell Mussel Survey which was developed in consultation with Lisie Kitchel. Please let me know if the DNR approves of the proposal so we can move forward with the contract.

From: Chris Turner <cturner@glec.com>
Sent: Tuesday, March 31, 2020 7:46 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: Cornell Mussel Survey, study plan and budget

CAUTION EXTERNAL SENDER: Stop and consider before you click links or open attachments.
Report suspicious email using the 'Report Phishing/Spam' button in Outlook.

Hi Matt:
Attached please find a proposed study plan and budget for the 2020 Cornell mussel survey. ES worked with Lisie at WDNR to develop the plan but WDNR has not "officially" reviewed it. The requirements led to just two sample reaches (one below the dam and one in the upper riverine area).

The work (pending approval) is planned for 4 days in 2020, yet to be scheduled.

Let me know if you have any questions.

Chris Turner
Principal Research Scientist
Great Lakes Environmental Center, Inc.
715-829-3737
cturner@glec.com

Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Thursday, April 2, 2020 1:57 PM
To: Laatsch, Cheryl - DNR
Cc: Shawn Puzen; Crotty, Scott A; Darrin Johnson
Subject: FW: Cornell Mussel Survey, study plan and budget
Attachments: Cornell_Hydro_FERC_Mussel_Proposal_03312020.pdf; Cornell Mussel Survey 2020 Map.pdf

Importance: High

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From: Chris Turner <cturner@glec.com>
Sent: Tuesday, March 31, 2020 7:46 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Subject: Cornell Mussel Survey, study plan and budget

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The work (pending approval) is planned for 4 days in 2020, yet to be scheduled.

Let me know if you have any questions.

_____

Chris Turner
Principal Research Scientist
Great Lakes Environmental Center, Inc.
715-829-3737
cturner@glec.com

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Kleinschmidt

March 11, 2020

VIA E-MAIL

Mr. Matthew Miller
Xcel Energy
1414 W. Hamilton Ave.
P.O. Box 8
Eau Claire, WI 54702

Proposal for Environmental Services (Proposal No. 1126008.00)
Cornell Hydroelectric Project Desktop Fish Entrainment and Turbine Passage Survival Study

Dear Matt:

Kleinschmidt Associates (Kleinschmidt) presents this proposal to Xcel Energy (Xcel) for a desktop fish entrainment and turbine passage survival study at the Cornell Hydroelectric Project (Cornell Project) (FERC No. 2639). The Wisconsin Department of Natural Resources (WIDNR) and River Alliance of Wisconsin requested that Xcel assess the risk of entrainment, assess the risk of impingement, and determine the probability of turbine passage survival for lake sturgeon, muskellunge, walleye, and redhorse sucker at the Cornell Project. The stakeholders also requested that Xcel evaluate the effects that a reduction in trash rack bar spacing would have on entrainment rates and turbine passage survival.

PROPOSED SCOPE OF WORK

Fish impingement and entrainment into the turbines at the Cornell Project may occur when fish enter the intake area during normal operation. For this analysis, fish that are small enough to pass through the trashrack bars (vertical bars spaced at 5.375-inches) will be considered susceptible to entrainment while those physically excluded due to size will be considered at risk of impingement. Fish size will consider length, width, and body depth.

The desktop study will be carried out in the following steps:

1. Calculate risk of entrainment and impingement
2. Conduct turbine blade strike and whole-station survival analysis for those species and lifestages that are small enough to pass downstream through the trashracks.

Kleinschmidt will build off the analysis completed in November 2016, which included a desktop study to estimate entrainment and turbine survival for muskellunge, walleye, and lake sturgeon at the Cornell Project based on the size of fish expected to be entrained through trashrack bars spaced at 1-inch (clear).

Entrainment and Impingement Risk

Entrainment and impingement risk will be evaluated for lake sturgeon, muskellunge, walleye, and redhorse sucker for two trash rack bar sizes: 5.375-inches (existing) and 2.5-inches (potential protective measure). Expected approach velocities will be calculated at the turbine intakes and compared to typical swim speeds of target fish species to assess potential entrainment avoidance by species and size class. Life history characteristics of individual species will also be considered to assess potential entrainment due to volitional downstream movements. Approach velocities at the intake will be determined by dividing the hydraulic capacity of the turbine by the size of its intake area.

Entrainment risk will be evaluated by comparing trashrack spacing to fish size and morphology. Fish that are less than the trashrack open spacing in any dimension (i.e. length, width, and depth) will be considered "at risk of entrainment." Fish with swim speeds that are less than intake velocities will be considered "at risk of impingement" if size is greater than trash rack spacing in all dimensions. Impinged fish will be considered to experience 100 percent mortality.

Blade Strike and Survival Analysis

STRYKE, a Python-based desktop model developed by Kleinschmidt, will be used to quantitatively estimate the probability of turbine blade strike survival and whole-station survival via a combination of downstream passage routes (e.g., turbine and spill) for each target fish species and size class. STRYKE is based on the U.S. Fish and Wildlife Service's Turbine Blade Strike Analysis desktop model.[1] Model variables include fish length, number of fish, and turbine characteristics (e.g., runner diameter, turbine type, turbine efficiency, hydraulic capacity, runner speed, and head).

Deliverables:

Study results will be presented in tabular format in a summary report. Results will include descriptions of entrainment and impingement risk for multiple size-classes of all target species and quantitative estimates of turbine passage and whole-station survival for all target species.

SCHEDULE

Kleinschmidt is prepared to begin this effort immediately upon receiving notice to proceed (NTP) and will provide a draft report within six weeks of the NTP. A final report will be provided within two weeks after receipt of consolidated Xcel comments on the draft report.

TASK	DUE DATE
Draft Report for Xcel to Review	Six weeks following NTP
Final Study Report	Two weeks following receipt of Xcel's comments on the draft report

[1] Towler and Pica 2018. A Desktop Tool for Estimating Mortality of Fish Entrained at Hydroelectric Turbines.

COST OF SERVICES

Kleinschmidt will perform the proposed work on an Hourly Rate plus Expenses basis for the estimated cost of **$17,000** (Seventeen Thousand Dollars).

TERMS AND CONDITIONS

The Proposed Scope of Work will be performed on an Hourly Rate plus Expenses Basis in accordance with this proposal and Kleinschmidt's 2020 Rate Schedule (Attachment A), Method of Payment (Attachment B), and Standard Terms and Conditions (Attachment C). If the terms of this proposal are acceptable, please issue a Purchase Order (PO) for the work and reference our Project Number 1126008.00 on the face of the PO.

Kleinschmidt appreciates the opportunity to provide this bid. If you have any questions regarding this proposal, please call or email me (Jared.Porter@KleinshmidtGroup.com or 608.455.6410).

Sincerely,

KLEINSCHMIDT ASSOCIATES

Jared Porter
Project Manager

Kelly Larimer
Vice President, Director of Science, Regulatory, and Modeling-GIST

JSP:jm
Attachments: Appendix A: Rate Schedule
Appendix B: Method of Payment
Appendix C: Standard Terms and Conditions
cc: Proposal Distribution

APPENDIX A
2020 RATE SCHEDULE

Shawn Puzen

From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Tuesday, April 28, 2020 8:34 AM
To: Shawn Puzen; Darrin Johnson
Subject: FW: Emailing: Fish Entrainment Proposal _Cornell Hydro___ 3-11-20.pdf

-----Original Message-----
From: Miller, Matthew J
Sent: Friday, April 24, 2020 1:36 PM
To: Gerbyshak, Joseph P - DNR <Joseph.Gerbyshak@wisconsin.gov>; Jared Porter <Jared.Porter@KleinschmidtGroup.com>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Benike, Heath M - DNR <Heath.Benike@wisconsin.gov>
Subject: RE: Emailing: Fish Entrainment Proposal _Cornell Hydro____ 3-11-20.pdf

Thanks Joseph for your comments. Unlike most of our other hydro projects, the design of the intake and turbines at Cornell only allow for them to operate at peak efficiency or higher, otherwise turbine damage can result from cavitation. I will move forward with the contract process for Kleinschmidt. Let me know if you have any further questions.

-----Original Message-----
From: Gerbyshak, Joseph P - DNR <Joseph.Gerbyshak@wisconsin.gov>
Sent: Friday, April 24, 2020 11:43 AM
To: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>; Jared Porter <Jared.Porter@KleinschmidtGroup.com>
Cc: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Benike, Heath M - DNR <Heath.Benike@wisconsin.gov>
Subject: FW: Emailing: Fish Entrainment Proposal _Cornell Hydro____ 3-11-20.pdf
Importance: High

EXTERNAL email. STOP and THINK before opening links and attachments.

Hi Matt and Jared,

I reviewed the Fish Entrainment Proposal for the Cornell Hydro and it looks like deliverable are what we asked for and this analysis will provide valuable information moving forward.

One question, and perhaps possible addition, is in regard to turbine efficiency. This quote was taken off of page 43 of the 2016 fish protection study on the Chippewa River: "Entrained fish are most likely to survive when turbines are operating near their peak efficiency, and smaller fish tend to suffer the least mortality (EPRI 1992)." Since entrainment mortality may be higher when the turbines are not operating at peak efficiency, entrainment mortality will have to be estimated for the amount of time that the turbines are operating at lower efficiency levels. Please let me know if this request can be built into the entrainment mortality analysis because it could a considerable impacts.

Thanks and have a great weekend,
Joseph

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.
Joseph Gerbyshak
Phone: (715) 461-0191
Joseph.Gerbyshak@wi.gov

-----Original Message-----
From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Wednesday, April 22, 2020 1:31 PM
To: Gerbyshak, Joseph P - DNR <Joseph.Gerbyshak@wisconsin.gov>
Subject: FW: Emailing: Fish Entrainment Proposal _Cornell Hydro____ 3-11-20.pdf
Importance: High

Please review this proposal ASAP. I thought I had sent it out to you... but now I cant remember. Matt Miller would like our comments he can get his contractors lined up. Thanks

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

-----Original Message-----
From: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>
Sent: Tuesday, March 31, 2020 9:07 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Cc: Shawn Puzen <Shawn.Puzen@meadhunt.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>
Subject: Emailing: Fish Entrainment Proposal _Cornell Hydro____ 3-11-20.pdf
Importance: High

Hello Cheryl,

Attached is our proposal for the Cornell Fish Entrainment Desktop Study along with the DNR's initial request for the study. Let me know if the proposal meets the DNR's recommendations so we can proceed with developing a contract with our consultant.

Matthew Miller
Xcel Energy | Responsible By Nature
Hydro License Compliance Consultant
1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702

P: 715.737-1353 F: 715.737.1077
E: matthew.j.miller@xcelenergy.com

XCELENERGY.COM

Document Accession #: 20200713-5110 Filed Date: 07/13/2020

Cornell Hydroelectric Project
FERC No. 2639

Final Study Plan

Recreation Study

Prepared for

Prepared by

Mead & Hunt

meadhunt.com

April 2020

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TABLE OF CONTENTS

APPENDICES

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LIST OF ACRONYMS

Applicant	Xcel Energy Services, Inc.
Commission	Federal Energy Regulatory Commission
CORP	Comprehensive Outdoor Recreation Plan
FERC	Federal Energy Regulatory Commission
Licensee	Northern States Power Company
NPS	National Park Service
Project	Cornell Hydroelectric Project
RAW	River Alliance of Wisconsin
SCORP	Statewide Outdoor Comprehensive Recreation Plan
WDNR	Wisconsin Department of Natural Resources
Xcel Energy	Xcel Energy Services, Inc.

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1. Introduction

Northern States Power Company – Wisconsin (NSPW, Licensee), d/b/a Xcel Energy, currently holds a license issued by the Federal Energy Regulatory Commission (FERC or Commission) to operate and maintain the Cornell Hydroelectric Project (Project). The Project is owner, operated and maintained by the Licensee. The current license, which designates the Project as FERC No. 2639, expires on November 30, 2023. In order to obtain a new license, the Licensee must submit a final license application to FERC no later than November 30, 2021. The final license application, in part, must include an evaluation of the existing recreational facilities associated with the Project along with any potential recreation enhancements.

On March 19, 2019, the Licensee held a Joint Agency Meeting to present information about the Project. At the meeting, and during the 60-day comment period immediately following, the Licensee received comments and study requests from several entities. The National Park Service (NPS), River Alliance of Wisconsin (RAW), Wisconsin Department of Natural Resources (WDNR), and the City of Cornell (City) requested a study of recreation facilities and an investigation of recreation enhancements as part of relicensing.

The NPS requested a study to identify opportunities such as improving access points, enhancing trails, enhancing campgrounds, beach areas, developing and installing wayfinding and interpretive signage, etc., among other needs currently lacking.

The RAW requested that the study evaluate the existing condition of recreational facilities and needed upgrades, evaluate the need for additional facilities to adequately serve the public, and update the recreation brochure[1] for the Project.

The WDNR requested identification of locations and options to improve shore access to the tailrace fishery and the impoundment including availability of parking, access from walkways or trails, public space areas, fishing platforms, barrier-free access, maps, and public awareness of public access features. After further consultation with the WDNR, Xcel Energy will be developing conceptual recreation designs for improvements to the shoreline fishing area downstream along the east bank of the tailwater including public access and parking improvements as well as a barrier-free fishing pier on the east shoreline adjacent to the City of Cornell's Mill Yard Park. The conceptual designs will be provided as part of the draft license application and any comments received will be addressed prior to submitting the final license application. Xcel Energy plans to fund these recreation improvements as part of the requirements for the new license.

The City of Cornell is updating its Comprehensive Outdoor Recreation Plan (CORP) which includes proposed improvements to Mill Yard Park (Park). The Park is adjacent to a narrow strip of land owned by Xcel Energy along the east shore of the Chippewa River. The City has requested that recreational improvements be included in the draft license application. Xcel Energy plans on working with the City of

[1] The project does not currently have a recreation brochure, but provides a sign that indicates the recreation resources in the area of the dam.

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Cornell on their proposed improvements to Mill Yard Park by granting them access rights or fee title to Xcel Energy's shoreline ownership adjacent to Mill Yard Park to accommodate the proposed Park improvements. One of the proposed improvements includes a barrier-free fishing pier on the shoreline adjacent to Mill Yard Park.

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2. Study Plan Elements

2.1 Study Goals and Objectives

The objective of this study is to obtain a subjective assessment of recreation facility conditions or enhancements needed but currently absent; determine capacity of existing facilities to address current and future user demand; and produce sufficient information to evaluate such impacts as well as provide the basis for making recreation enhancement recommendations.

2.2 Background and Existing Information

Recreation in the vicinity of the Project is dominated by the presence of Brunet Island State Park (with its 124,799 visitors in 2018 (City of Cornell CORP 2019). Since the park collects its own detailed recreation use records, Xcel Energy is not proposing any studies specific to Brunet Island State Park. However, there are several recreational use areas, both under and outside the control of Xcel Energy, that will be evaluated for recreational use and improvements.

The last Form 80 survey was completed in 2014 and was filed with the Commission on March 31, 2015. The Form 80 survey indicated campsites and the swim area provided in Brunet Island had the highest percentage of use. Reservoir fishing, picnic areas, trails, active recreation areas, and boat launch areas within the state park showed moderate use. The two boat launches outside of the state park also showed moderate use.

Using the 2015 Form 80 data as a guide, it appears additional information on facility conditions and capacity demand to address future recreational use is needed.

In October 2019, the City of Cornell adopted a CORP for the period of 2020-2025. The CORP addresses two primary recreation areas in the immediate Project vicinity where it recommends improvements. At the Mill Yard Park, the City recommends 24 improvements. Xcel Energy has already committed to provide assistance with the following 4 enhancements:

1) **Create trail access to the Chippewa River and incorporate handicapped accessible dock**
   Xcel Energy has agreed to work with the City of Cornell to grant them access or fee title to their shoreline ownership for future improvements.
2) **Create a canoe/kayak launch area**
   Xcel Energy has agreed to work with the city of Cornell to grant them access or fee title to their shoreline ownership for future improvements.
3) **Construct a multi-purpose trail along the Chippewa River**[2]
   Xcel Energy has agreed to work with the city of Cornell to grant them access or fee title to their shoreline ownership for future improvements.
4) **Acquire Land Rights from Xcel Energy for Shoreline for Mill Yard Park Improvements**

[2] This proposed trail also acts as a connection to the Old Abe Trail.

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Xcel Energy has agreed to work with the city of Cornell to grant them access or fee title to their shoreline ownership for future improvements.

At the public boat landing the City recommends 9 enhancements including such items as improving the boat ramp, paving the parking lot, new signage, restrooms, pavilion, barrier-free skid pier, additional picnic tables, expanding and adding camping areas, and a public boat dock. Currently, Xcel Energy has not committed to any assistance for this facility.

The Current Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2019-2023 places an emphasis on trails and access to water. Fortunately, the Project vicinity provides numerous opportunities to access trails (Old Abe Trail, Ice Age Trail, and trails in Brunet Island State Park). The Project vicinity also provides access to water along the western shore of the reservoir and river with the 266th St. informal access site, the Ice Age Trail trailhead and trail along the shoreline, the canoe portage take-out, canoe portage trail and canoe put-in, and along the eastern shore of the reservoir at Brunet Island State Park, the boat landing and picnic area just upstream of the Mill Yard Park, Mill Yard Park on Bay Road, and the tailrace fishing area.

2.3 Nexus between Project Operations and Effects on Resources

"*A clear nexus exists between project facilities that affect recreation opportunities and the proposed study; this study would fully describe existing conditions and enhancement opportunities to inform decision making and license application preparation*" (NPS 2019).

2.4 Study Area

Since it is believed no new recreation sites are necessary, the inventory and recreational use study will incorporate the recreation sites listed below in Table 2.4-1. For reasons stated earlier, Brunet Island State Park will not be part of the sites to be inventoried and surveyed. In addition, Xcel Energy has already committed to assisting the City of Cornell with 4 improvements at the Mill Yard Park including an interconnection with the Old Abe Trail. Since the needs of Mill Yard Park have already been determined in the CORP, it will not be inventoried and surveyed.

Table 2.4-1. Recreation Sites to be Inventoried and Surveyed for Existing Use

City of Cornell Public Boat Landing
266th St. Informal Access Site
Canoe Take-Out
Canoe Portage Trail
Canoe Put-In
Tailwater Fishing Area East Side
Informal Tailwater Fishing West Side[3]

[3] To be surveyed from the east side of the river.

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2.5 Methodology

2.5.1 Recreation Inventory

Each of the recreation sites listed in Table 2.4-1 will be inventoried during the summer using the form enclosed in Appendix 2 to collect information on recreation amenities and capacity**.** The following types of information will be recorded**:**

1) The primary type(s) of recreation provided at the site.
2) Existing sanitation facilities (if any).
3) Type of vehicle access and parking capacity (if any).
4) The presence and type (if any) of barrier-free facilities.
5) The GPS location of the facility.
6) Photographs of the recreation site, each amenity, each sign, the entryways to primary recreation sites from the main road(s), and any adverse impacts from the site on the resources, including shoreline erosion.

2.5.2 Facility Condition Assessment

During at least one recreation site visit to each of the recreation sites listed in Table 2.4-1, the condition of each component (including recreational wayfinding signs and interpretive signs) of the recreation site and its immediate vicinity will be assessed**.** A rating for the site will be made according to the following scale:

1) Not Usable and Needs Replacement
2) Needs Repair
3) Needs Maintenance or cleaning
4) Good Working Condition (does not need any attention)
5) Facility Lacking; need to install facility or otherwise add enhancement (identify item).

If a rating is awarded where additional attention is required, the specific item that needs additional attention will be noted on the form.

2.5.3 Recreation Use Survey

Regular site visits to each of the recreation sites listed in Table 2.4-1 will be made between the hours of 7:00 a.m. and 7:00 p.m. During the regular site visits, recreation observation data will be collected using the form enclosed in Appendix 3. Regular site visits will be conducted according to the following schedule in Table 2.5.3-1.

Table 2.5.3-1. Recreation Use Survey Schedule

Survey Month	Recurrence Interval
April	One randomly selected weekend.
May	One randomly selected weekend. One day during Memorial Day weekend.

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Survey Month	Recurrence Interval
June	One randomly selected weekday. Two randomly selected weekend day.
July	One randomly selected weekday. Two randomly selected weekend day.
August	One randomly selected weekday. Two randomly selected weekend day.
September	One weekend day the weekend following Labor Day weekend.

2.5.4 Future and Potential Recreation

To assess the future and potential recreation needs within the Project vicinity, the questionnaire enclosed in Appendix 4 will be sent to municipalities and other entities responsible for existing recreation within the Project vicinity. Specifically, the questionnaire will be sent to the Ice Age Trail Foundation local chapter, City of Cornell, WDNR FERC Coordinator for obtaining input on the Brunet Island State Park, Chippewa County, Town of Lake Holcombe, Town of Birch Creek, Town of Cleveland, and Town of Estella.

Each entity will be allowed 30 days to respond to the questionnaire and their responses will be incorporated into a draft study report. The report will summarize the need for additional recreational mitigation and enhancement recommendations (if any) to be included in the draft license application.

2.5.5 Study Report

A written draft report will be developed summarizing the monitoring results for Sections 2.5.1 through 2.5.4 of this study plan. Completed survey sheets will be appended to the report. Based upon the data collected, the draft report will also make additional recreational mitigation and enhancement recommendations (if any) to be included in the draft license application.

The report will be provided to the NPS, WDNR, RAW, and the City of Cornell no later than December 31, 2020 and will allow for a 30-day comment period. Comments received on the draft report will be incorporated into a final report, which will be included in the draft license application.

2.6 Consistency with Generally Accepted Scientific Practice

The overall approach to the recreational assessment is similar to that commonly used in relicensing proceedings and is consistent with generally accepted methods for recreation studies.

2.7 Project Schedule

The fieldwork for the recreation assessment will be completed in 2020 and a draft report will be provided to the NPS, WDNR, RAW, and the City of Cornell no later than December 31, 2020. The agencies will be afforded a 30-day comment period and their comments will be incorporated into a final report. A copy of the final report will be included in the draft license application.

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3. Consultation

On February 27, 2020, a draft of this study plan was provided to the NPS, WDNR, the City of Cornell, and RAW for comments. On March 10, 2020, the WDNR responded indicating they have no comments. On March 17, 2020, RAW responded indicating they have no comments. The City of Cornell did not respond with comments and the NPS provided comments on March 27, 2020. The NPS comments have been addressed as described in Appendix 5. Full documentation of consultation is also provided in Appendix 5.

4. References

City of Cornell. May 17, 2109. Comments on Pre-Application and Study Requests.

City of Cornell. October 2019. *Comprehensive Outdoor Recreation Plan*.

National Park Service (NPS). May 13, 2019. Comments on Pre-Application and Study Requests.

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Wisconsin Department of Natural Resources (WDNR). 2019. *Wisconsin Statewide Comprehensive Outdoor Recreation Plan 2019-2023*. Madison, WI.

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APPENDIX 1 – Study Requests

Sections pertaining to this study have been high-lighted in yellow.

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United States Department of the Interior

NATIONAL PARK SERVICE
Midwest Region, Wisconsin Field Office
626 E. Wisconsin Ave., Suite 400
Milwaukee, WI 53202

May 13, 2019

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

Electronic Filing

Re: National Park Service Comment on Pre-Application Document and Study Request; Cornell Hydroelectric Project, FERC Project No. 2639; Chippewa River, City of Cornell, Chippewa County, Wisconsin

Dear Secretary Bose:

The National Park Service (NPS) respectfully submits the following comments in response to the filing to the Federal Energy Regulatory Commission (FERC) of a Pre-application Document (PAD) and Notice of Intent for the Cornell Hydroelectric Project, FERC Number P-2639, dated November 29, 2018. The FERC agreed to Xcel Energy's request to use the Traditional Licensing Process (TLP) for relicensing on February 5, 2019. A joint agency meeting was held March 19, 2019.

The Project has an installed capacity of 30.75 megawatts and is licensed to Northern States Power (Xcel Energy). The impoundment (Cornell Flowage) is 897 surface acres with an allowed elevation fluctuation of half a foot in spring; one foot (during certain hours) in summer; and 2 feet at all other times. Minimum flow is 400 cubic feet per second.

Background

We offer the following comments and recommendations pursuant to section 10(a) of the Federal Power Act (18 CFR 4.38(a), 5.41(f)(4)-(6), and 16.8(a); the Outdoor Recreation Act (Public Law 88-29); the National Park Service Organic Act (39 Stat. 535); and the National Wild and Scenic Rivers Act (Section 11(b)).

It is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to relicensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting

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for those projects. Identifying opportunities to improve the recreation experience is consistent with NPS policy and FERC guidelines to identify future potential recreation needs.

Comments

The Chippewa River is a highly valued North Central Wisconsin river which provides an important focal point for the region's land and water based recreational opportunities. The Cornell Project is a long, linear impoundment and hosts a variety of recreational opportunities important to the community and visitors seeking an outdoor, natural experience. The project provides a crossroads or network hub of local trails within and linking to the City of Cornell, the Old Abe State Trail, and the federal Ice Age National Scenic Trail.

No recreation study nor enhancements are proposed in the PAD. However, recreation enhancements are needed and a study would provide information on which to base enhancement decisions.

The PAD describes some project-specific recreational facilities but misses important others. One recreation site not mentioned in the PAD is an actively used but informal tailwater fishing area on the east side not far downstream from the spillway. This site lacks safe access causing anglers to tread a narrow, rocky unsafe footpath pressed between a tall fence paralleling the river and a steep slope; the site also lacks signage, a restroom facility, formal parking, etc. In addition, the PAD does not mention the need for new and improved signage within the project boundaries so that recreational facilities are clearly identified from the road and wayfinding is easily made along the various trails. The PAD also lacks mention of an existing informal access point on the upper impoundment, west side near 260th Avenue, where users are eroding the steep slope to gain access. No mention is made of the condition of existing facilities such as boat ramps, waterside camping, trails within the shorelands buffer area, etc., within the project boundary in general and within Brunet Island State Park.

Several existing facilities within the project boundary have outdated management plans, included in the appendices, which identify outdated recreation needs. For example, the City of Cornell identified a need to update their 10-year old recreation plan which includes the Mill Yard Park; the City more recently identified enhancement needs at the park which includes a carry-in access site, riverwalk, a visitor center, a historic wood stacker, etc. Another example of an outdated plan is the 1986 management plan for Brunet Island State Park which includes camping, trails, boat launches, restroom facilities etc. The licensee has not determined current recreational needs at these and other areas within the project boundary.

Study Request

Recreation Study

The Pre-application Document (PAD) states a recreation study will be not be conducted. As indicated above, the PAD lacks critical recreation information and needs defined by FERC, clearly indicating the need for a recreation study. This proposed study methodology is in keeping with similar studies required by FERC to collect current recreational information associated with licensing.

Study Description and Objectives (§5.9(b)(1))

The objective of this study is to obtain subjective assessment of facility condition or measures needed but currently absent; determine capacity of existing facilities to address current and future user

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demand; and produce sufficient information to evaluate such impacts as well as provide the basis for making recreation enhancement recommendations.

Resource Management Goals (§5.9(b)(2)

It is within NPS authority to consult with the FERC and applicants concerning a proposed project's effects on outdoor recreation resources under the Federal Power Act (18 CFR §§ 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (PL 88-29) and the NPS Organic Act (16 USC et seq.). The WSR Act (section 11(b)) also directs the NPS to assist, advise, and cooperate with governments, landowners, or individuals to plan, protect, and manage river and river-related resources.

It is the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands while maintaining and enhancing a quality environmental setting for those projects. FERC guidelines and the Federal Power Act also provide direction to give equal consideration to other resources associated with the project.

Relevant Public Interest (§5.9(b)(3))

It is in the public interest to provide a full assessment of the project's impacts on recreation resources and opportunities as well as identify potential mitigation and enhancements to address those impacts.

The FERC requires that license applications must be consistent with comprehensive plans, one of which is the Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP), recently updated for 2019-2023. The SCORP mentions trails as the largest need statewide, stating that more trails would "enable people to experience natural setting… and access favorite sites." The 2019-2023 SCORP states "Access to water remains a universal need throughout the state" and identifies the demand for more camping opportunities. In addition, this SCORP states specifically for the Western Sands Region a need for several water and land based recreation demands including canoeing/kayaking, fishing, swimming in lakes and rivers, bird or wildlife viewing, trail use such as hiking and walking.

The Draft Ice Age Trail Chippewa County Corridor and Environmental Assessment states that the City of Cornell met with planners and managers of the Ice Age Trail and of the Old Abe Trail and identified their desire to better connect with trail users via wayfinding signage and other amenities to foster their desire to become a "Trail Town". The draft report states that "there is "strong opportunity for growth and demand," and that "Region 4 has a relatively low level of recreational land but receives heavy recreational use due to its proximity to the Twin Cities and the growing population of the region itself." Region 4 population has grown about twice as fast as the state of Wisconsin overall, yet has less than 6% of land in public ownership, relatively few compared to the rest of the state.

The study will identify opportunities such as improving access points, enhancing trails, enhancing campgrounds, beach areas, developing and installing wayfinding and interpretive signage, etc., among other needs currently lacking.

Existing Information (§5.9(b)(4))

The PAD includes several outdated recreation plans which further emphasize the need for a recreation study to provide current information:

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- City of Cornell Recreation Plan, 2010; although the City of Cornell has no up to date recreation plan, it has identified potential improvements to Mill Yard Park. These include a riverwalk, possible handicapped accessible (barrier-free) fishing pier along river, and canoe/kayak boat dock with access to water. Future development of the Mill Yard Park may also include an area for outdoor concerts and additional trails.
- Brunet Island State Park Concept Plan, 1986
- Chippewa County Outdoor Recreation Plan, 2010-2015; data from before 2010.

Other plans to reference:

- Updated Wisconsin SCORP 2019-2023, mentioned above
- Regional and Property Analysis: Chippewa Moraine State Recreation Area (Jan. 4, 2017 version); includes references to recreation demand in the project area such as Brunet Island, Ice Age Trail, City of Cornell, etc.
- Ice Age Trail Chippewa County Corridor and Environmental Assessment (currently in Draft form; estimated availability in December 2019

Nexus to Project (§5.9(b)(5))

A clear nexus exists between project facilities that affect recreation opportunities and the proposed study; this study would fully describe existing conditions and enhancement opportunities to inform decision making and license application preparation.

Study Methodology (§5.9(b)(6))

(1) Recreation Demand. This analysis involves assessing the quality of the visitor's experience through visitor and land manager surveys. The user contact survey would obtain user-feedback assessment on the adequacy of existing recreational facilities including access points, trails and trail network connectivity in the project and to the City of Cornell, camping areas, swimming beach, wayfinding and interpretive signs, and capability of current facilities to meet existing recreation demand. In addition, the surveys should obtain user feedback on facilities or operational measures, e.g., possible impacts of impoundment fluctuation on recreational use and shoreline erosion. Local planners and stakeholder/user group representatives should also be interviewed to collect their assessment of the adequacy of existing facilities and the need for future recreation facilities and opportunities. The parameters and methods of the visitor survey and user group interviews should be developed in collaboration with interested stakeholders.

(2) Recreation Opportunities Inventory and Assessment. All existing developed and dispersed recreation sites should be inventoried, including formal and informal trails, formal and informal access sites, and scenic viewing locations. The inventory should identify current use, current conditions, and any impacts that the project might have on these. We recommend consulting stakeholders in developing the survey instruments and protocol.

(3) Future and Potential Recreation Needs Assessment and Analysis. This study element involves assessing what the potential and future recreation needs are. This includes reviewing the recently released Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2019-2023 and other literature reviews of local recreation plans, demographic trends, and site-specific information collected from the study elements outlined above. This needs analysis would compile all the information

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including stakeholder input and make recommendations on recreation mitigation measures for the project. Needs for those with mobility impairments should be included.

(4) Recreation carrying capacity. This component would assess the suitability or capacity for various recreation opportunities at the project area to receive visitors without degrading recreational experiences or other resources. This assessment should also integrate the results of other biophysical study results. Various methods to use as a model include "Limits of Acceptable Change" or "Recreation Opportunity Spectrum." These estimates can then be used in development of the Recreation Plan.

(5) Aesthetics. This component would include collecting baseline information on aesthetics in the area, including entryways to primary recreation areas such as the tail race fishing area from the highway, and also assessing the impacts of the project on this resource, including shoreline erosion.

(6) Final Product. The final report should include an interim, draft, and final report with sufficient time for review and comment by stakeholders. The report should be used for discussions and decision-making with recreation stakeholders and recreation land managers to develop a draft Recreation Plan. The draft plan should include a provision to every five years monitor the recreation facilities condition, meet with local recreation stakeholders and land managers to identify enhancements, and improve facilities as needed throughout the license term.

Level of Effort and Cost (§5.9(b)(7))

This study request addresses the Federal Power Act Section 10(a) direction and the methodology is consistent with generally accepted practice in the professional outdoor recreation community. It would include field work, community/stakeholder outreach, and professional assessment. Study costs would depend on consultant fees (rate unknown), volunteer or student contributions, and the amount of available information. A rough estimate depending on limited existing information and sourcing of labor may range between $10,000 and $20,000.

CONCLUSION

We appreciate the opportunity to provide comments on the PAD and provide study recommendations for the project. We look forward to working with the licensee, stakeholders, and the Federal Energy Regulatory Commission on this license application. Should you have any questions regarding these comments, please contact me at 414.297.3605 or angie_tornes@nps.gov.

Sincerely,

Angela M. Tornes

Angela M. Tornes, Midwest Region Coordinator
Hydropower Assistance Program

5

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May 15, 2019

Mr. Shawn Puzen
Mead & Hunt, Inc.
2440 Deming Way
Middleton, Wisconsin 54115

Re: Preliminary Information Document (PAD) and recommended studies for relicensing the Cornell Hydroelectric (hydro) Project, Chippewa River (FERC No. 2639)

Dear Mr. Puzen:

The River Alliance of Wisconsin (RAW) has reviewed the PAD for the Cornell Hydro Project on the Chippewa River. We intend to participate in relicensing of this project and hope that you seriously consider our concerns and recommendations listed below as you prepare the draft Application for License.

COMMENTS ON THE PAD

Please address our comments on the PAD in the draft Application for License.

Page 8. 3.2.1.2. Powerhouse Section. It is stated that turbine units No. 1, 2, and 3, each have their own intake and that a vertical bar trash rack protects all three intakes from debris. The clear spacing between the vertical bars is 5.375 inches. We are very concerned that with such wide spacing between bars that larger bodied fish are susceptible to being entrained through the plant and thus, be subjected to injury or death from turbine runners and wicket gates. It is well documented in the scientific literature that many species of fish such as walleye, adult lake sturgeon, juvenile lake sturgeon, smallmouth bass, and northern pike move many miles seasonally upstream and downstream to spawning, wintering, and foraging habitat. Although larger fish likely have the swimming ability to avoid the through the rack intake velocity at Cornell, they may want to willingly move downstream to other habitats as part of their life cycle. Many turbine survival studies conducted at hydro projects on Wisconsin Rivers in the last 30 years have shown that turbine injury and mortality does occur. Fish survival rates are highly variable among sites. An entrainment study was conducted at Wissota Hydro in 1998-1999. It has a trash rack spacing of 3.75 inches. Data from this study is being used to predict fish survival at the Cornell Project, even though trash rack spacing is about two more inches wider than at Wissota. Our Consultant tells us that in his experience reviewing numerous entrainment studies, and the associated modeling that accompanies them, that in his professional opinion to extrapolate survival data among hydro sites risks accuracy. We believe reducing the clear spacing at the Cornell trash rack to two inches would exclude many larger round bodied fish and help considerably to minimize injury or death to them.

Natural Resources Fund (NRF). We recommend that the Cornell Project be promoted as eligible for proposals that are submitted annually to XE through the *Lower Chippewa River Settlement Agreement (LCRSA) – Natural Resources Fund (NRF)*.

RIVER ALLIANCE of WISCONSIN
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Rational. The RAW has been a member of the LCRSA – IT since its inception in 2003. The focus of most NRF projects have been at Dells, Jim Falls, Wissota, and Holcombe Hydro Projects. The IT has witnessed a very successful program of allocating funds from the NRF to applicants for projects which resulted in important environmental survey data or direct on-the-ground habitat improvement work in the Lower Chippewa River. We would like to see environmental improvement projects occur in the Cornell Project area as well during the period of the new license. This may require some minor restructuring of the LCRSA through the FERC.

RECOMMENDED STUDIES

1.Mussel survey. In consultation with the Wisconsin DNR and U.S. Fish and Wildlife Service (FWS) conduct a mussel study in the Cornell Flowage and in the tailwater of the dam.

Rational

1. *Identify the basis for determination of the recommended study*

Mussels are an important component of a river system and are sensitive to changes in flow discharge in the tailwater of a dam and to water level fluctuations in a reservoir. The Cornell Hydro Project is operated as a modified peaking operation. Mussels are not very mobile and can be easily adversely affected by hydro operations in terms of species diversity and relative abundance within the zone of fluctuating flow and fluctuating water levels. There is also good reason for a mussel study to document the presence of any State or Federal threatened or endangered species that may occur in the project area. For example, on page 31 of the PAD it is stated that the *purple warty back* mussel, listed as endangered in Wisconsin, is likely to occur in the Chippewa River in the project vicinity.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

It is stated on page 31 of the PAD that the Licensee has been unable to obtain any existing information on freshwater mussels. Therefore, there is good reason to conduct a mussel survey to determine what species could be affected by project operations.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or U.S. Fish and Wildlife Service (FWS) mussel experts. At a minimum, data on mussel species diversity and frequency of abundance should be obtained from sampling.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or FWS. Please consult resource agency staff.

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5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project*

Mussel data will be useful in the short term and long term if it is place on a state-wide data base administrated by the Wisconsin DNR. It will be useful for documenting what mussel species are present currently in the project area and useful in evaluating long term trends in the mussel community there. Further, if a water resource project is planned in the area, a current list of mussels will be needed by the developer to evaluate potential affects to the mussel community that could result from the project.

2.Aquatic and terrestrial Invasive species study (ATIS). Conduct an ATIS survey within the Cornell Flowage and in in the tailwater. The species to be sampled should include *Restricted Species* per Wisconsin Administrative Code (NR 40): invasive species already established in Wisconsin. We note from page 37 of the PAD that Cornell is currently being monitored for purple loosestrife as part of a larger effort on the Chippewa River pursuant to an *Exotic Control Plan*. However, there are many other invasive species to consider.

Rational

1. *Identify the basis for determination of the recommended study*

Species such as purple loosestrife, Eurasian watermilfoil, and curly-leaf pondweed are invasive wetland plants which out-compete many other valuable wetland plants and can dominate the species composition of a wetland or aquatic macrophyte bed in a few years. Terrestrial invasive plants have the same pattern and can out-compete native vegetation as well. There is little food value for wildlife from purple loosestrife; accordingly, infestation of valuable wetlands by this plant is extremely undesirable and harmful. Eurasian watermilfoil and curly-leaf pondweed can rapidly cause aquatic weed problems and alter fish communities by providing too much refugia leading to overpopulation and/or growth stunting problems in the reservoirs and flowages. Likewise, rusty crayfish and zebra mussels can cause pronounced ecological changes in rivers and impoundments. The Zebra mussels rapid reproduction, coupled with its consumption of microscopic plants and animals, adversely affects the aquatic food web and can place valuable sport fisheries at risk. In addition, zebra mussel infestation can severely reduce native mussel populations by displacing their habitat and by actually attaching to an individual mussel's shell. Measures to control invasive species are limited, but control measures such as use of beetles, weevils, spot herbicide spraying, and hand harvesting have shown to be effective.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

Reference information under No. 1, above.

3. *Explain why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR.

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4. *Document that the use of each study methodology recommended is a generally accepted practice*

The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR. Please consult resource agency staff.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The ATIS data will be very useful to the resource agencies, academia and the public if it is housed in a statewide data base administrated by the Wisconsin DNR. The study will show species and species frequency of abundance currently at Cornell. The data can be used over the long term to demonstrate success of any control practice implemented.

1.Recreation. Evaluate the existing condition of recreational facilities and needed upgrades. Evaluate the need for additional facilities to adequately serve the public. Update the recreational brochure for the project to reflect new improvements. Prepare a draft *Recreation Plan* for the project to be reviewed by the resource agencies and other stakeholders.

Rational

1. Identify the basis for determination of the recommended study

The reservoirs and riverine sections of rivers impounded by hydroelectric dams have long ago become major sources of recreation for the public. The FERC and the publics' permission for a Utility to use of a river to generate hydropower requires that recreational facilities be installed within the project boundary and kept in good condition for public use. When a project undergoes relicensing, that is the logical and most practical time for a Utility to do a recreational use study and develop a *Recreational Plan*.

2. *Discuss its understanding of the resource issues and its goals and objectives for these resources*

People are entitled through the *Public Trust Doctrine* to use the reservoirs and riverine sections impounded by dams for recreational use. This includes fishing, boating, hiking picnicking, camping, and other non-consumptive wildlife-oriented uses.

3. *Explain why each study methodology recommended is more appropriate than any other available methodology alternatives, including those identified by the potential applicant*

The study methodology used should be one that is accepted as credible and valid by the Wisconsin DNR and/or National Park Service (NPS). Please consult resource agency staff.

4. *Document that the use of each study methodology recommended is a generally accepted practice*

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The study methodology will be an accepted practice if it is endorsed by the Wisconsin DNR and/or NPS.

5. *Explain how the studies and information requested will be useful to the agency, Indian Tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.*

The information generated by a recreational use study will be useful to the understanding of the resource agencies, Indian Tribes, and general public in terms of what recreational facilities are present, where they are within the project boundary, what condition they are in and what types of recreation they accommodate. The *Recreation Plan* will be an informative document to all parties that participate in relicensing. Further it will provide a plan for the Licensee to implement during the period of the new license.

We look forward to further participation in relicensing this project to help accomplish environmental protection and improvement at this project. If you have questions on our comments, please contact me at (608) 257-2424 (ext. 115). Also, please feel free to call our Hydro Consultant, Mr. James Fossum at (507) 429-9129.

Sincerely,

Raj Shukla
Executive Director

Cc: Ms. Kimberly D. Bose, Secretary, Washington DC
Matt Miller, Xcel Energy, Eau Claire, WI
Nick Utrup, USFWS, Bloomington, MN
Angela Tornes, NPS, Milwaukee, WI
Cheryl Laatch, Wisconsin DNR, Horicon, WI
Jim Fossum, *JDFossum Environmental Consulting*, Winona, MN

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STACKER CITY
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Email: cornellcityoffice@centurytel.net • www.cityofcornell.com

May 17, 2019

RE: Cornell Hydroelectric Project
FERC No. 2639
Licensee: Northern States Power (Xcel Energy)

To Whom it May Concern:

Recreation is an important resource in the City of Cornell. The Cornell Flowage of the Chippewa River is a focal point in our community; one that draws visitors and residents year-round. The Cornell Hydroelectric Dam has shaped the community to what it is today and it is important that our park is a place where everyone can enjoy the beauty of the area and the great outdoors.

The City is currently updating its Comprehensive Outdoor Recreation Plan. The Plan includes specific improvements in Mill Yard Park, which is adjacent to land owned by Northern State Power and the Chippewa River. We are requesting that recreational improvements be included in the draft license application being submitted by Xcel Energy for the Cornell Hydroelectric Project. We are currently finalizing the Comprehensive Outdoor Recreation Plan and will have it completed by September 30, 2019. It will then be available for review and use by FERC and Xcel Energy.

A few items of interest that are included in our initial draft are:

1. obtaining shoreline rights along the river:
   a. to construct and maintain a trail and trailhead facilities
   b. to control invasive plant species
   c. to control underbrush to allow for viewing of this beautiful segment of the river (it's been mentioned that this site with the islands in the backdrop provides one of the most beautiful sunsets you'll ever witness);
2. improvements of the tail race area for fishing to include possible boat access;
3. a kayak/canoe launch area;
4. a barrier free fishing pier.

HOME OF THE HISTORIC WOOD STACKER & BRUNET ISLAND STATE PARK

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The City would appreciate working closely with Xcel on these and other potential recreational system improvements.

Please let me know if you have any questions.

Sincerely,

Judy Talbot

Judy Talbot, Mayor

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State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
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Tony Evers, Governor
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May 17, 2019

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

Matt Miller, Xcel Energy
1414 West Hamilton Avenue
PO Box 8
Eau Claire, Wisconsin 54702-0008

RE: Wisconsin Department of Natural Resources Proposed Studies for the Cornell Hydroelectric Dam, p-2639

Dear Ms. Bose and Mr. Miller:

The department appreciates the opportunity to participate in the process to relicense the Cornell hydroelectric dam, as proposed in the Preliminary Application Document (PAD), filed with the Federal Energy Regulatory Commission (FERC) on November 29, 2018.

Many of our requests for studies or information are directly correlated to the 2000 Lake Sturgeon Management Plan, which states that it is a high priority to ensure the impacts of dams and habitat needs of species are considered during the FERC relicensing process. The departments Ten-Year Strategic Plan for Fisheries Management in Wisconsin 2015-2025 has a defined goal of using an integrated ecosystem approach to protect, restore, and enhance sustainable aquatic habitat and fish populations. Additionally, studies and information for water quality and invasive species management are directly connected to our requirements under the Clean Water Act to maintain water quality standards, and to our NR40 requirements to manage invasive species.

The department has limited information regarding natural resource information associated with the Cornell hydroelectric project. Studies and additional information have different purposes, from a short term, long term, and cumulative impact perceptive. This information is needed to determine permitting needs, along with protection, mitigation, and enhancement of our natural resources. Our requests for information and studies focus on the continued operation of the Cornell hydroelectric dam.

As Xcel begins to evaluate the array of study requests and informational requests, and determine their study proposal and next steps, the department will continue to provide guidance and recommendations. Please be aware that Scientific Collectors Permits may be required to complete various surveys. Please work with the department to obtain appropriate permits and approvals prior to the collection of data. To save time and costs,

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the department recommends that Xcel meet with the stakeholders who have requested studies to explore options to minimize costs, and still achieve desired data collection. We look forward to working with you.

Sincerely,

Cheryl Laatsch

Cheryl Laatsch
Wisconsin Department of Natural Resources State FERC Coordinator

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Study Requests and Request for Information
Relicense of Cornell Hydroelectric Dam

WILDLIFE HABITAT: Provide information in the license application to document current wildlife diversity, habitat types, and general abundance within the project area. This information may be used to evaluate the effects of the distribution and composition of vegetation and wildlife habitats, including wetlands, and the effects operations of those actions on wildlife inhabiting those habitats.

AQUATIC INVASIVE SPECIES SURVEY: The invasive species survey is to provide baseline data on the presence/absence of NR 40 listed aquatic invasive species. This data will be used to understand the baseline of native species, diversity and density of invasive species, and prevent the spread of other nearby invasive species. Additionally, this information will be used to better understand the impacts associated with water level manipulations.

Limited information is available. A comprehensive survey will provide needed information to understand the relationship between native and non-native plants, and other aquatic invasive species to determine appropriate short-term and long-term management of the river, along with impacts associated with water level manipulation, and best management practices for the dam operations.

Please work with department to determine which department protocols are appropriate for both the impoundment and the riverine portions of the project area. The departments protocols for Point Intercept Survey and Lakes Early Detection Protocols to ensure scientific integrity. The information collected from this study includes an assessment of the frequencies of occurrence of different plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization.

WATER QUALITY STUDY WITHIN THE PROJECT AREA: The information from these studies is primarily used in the licensing process but may also be used for other decision making by the department in FERC related actions. To adequately assess any impacts of the dam operations on water quality, sampling must occur within the impounded area (in-lake) as well as up and down stream of the impounded area (riverine). Data is necessary to understand if state water quality standards are being met.

The water quality study should determine if the public waters within the project area are meeting state water quality standards; and determine how their water quality profile may impact the downstream riverine areas.

The department protocols should be used as they have been determined to meet the expectations of the Environmental Protection Agency, including guidelines established within the Clean Water Act to ensure that the department is providing appropriate management of public waters and meeting state standards. WisCALM or other department approved protocols shall be used and provides consistent comparison across resource assessments.

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- Impounded Area: Changes in retention times can affect water temperature and nutrient release which can have detrimental effects downstream. Impoundments can influence various water quality parameters that impact downstream DO levels. DO is critical to health and survival of aquatic organisms. Baseline data is needed to determine effects of dam operations on water quality. The assessment should establish baseline data for total phosphorus (TP), chlorophyll a, and secchi depth, DO, temperature, conductivity and pH profiles.

- Riverine Area Above and Below the Impoundment: There is currently no information relating to DO levels, and other water quality parameters, downstream of impoundment. Please assess the TP concentrations, DO, conductivity, and temperature in the riverine portions of the project area.

MUSSEL STUDY: The qualitative and quantitative survey of mussels will provide information on freshwater mussel species present, their diversity, density, and a better understanding of baseline conditions and associated management needs for the Cornell hydro dam; and any appropriate management to protect or enhancement the existing freshwater mussel population.

There is limited information on freshwater mussel species within the project area. The following two species have been historically reported, Salamander Mussel and Purple Wartyback mussels. Salamander Mussel requires specific habitat, thus the department would need to review the sampling plan prior to any field data collection.

The change in water levels in the project area associated with operations, and the outflows of the hydro dam could affect mussel species and habitat. The results of the freshwater survey will help FERC and the department determine if any protection, mitigation, or enhancements would be necessary for the freshwater mussel population; and the information will be beneficial for best management practices associated with future drawdowns and repairs.

Methods should follow the WDNR's Guidelines for Sampling Freshwater Mussels in Wadable Stream. A formal study plan should be approved by the department prior to field data collection.

FLASHBOARD FAILURE AND REPLACEMENT, INCLUDING ALTERNATIVES TO MINIMIZE OR REDUCE FLASHBOARD FAILURE: Drawdowns for flashboard replacement can have negative effects on aquatic vegetation, invertebrates and fish species. As part of the license application, please identify alternative flashboard options. Evaluate the drawdown frequency, duration, and other negative environmental impacts associated with each option. Identify flashboard alternatives that would minimize drawdown frequency, duration, and resource impacts.

ASSESSMENT OF IMPACTS ASSOCIATED WITH WATERLEVEL FLUCTUATIONS WITH CURRENT OPERATIONAL RANGE: The existing Lower Chippewa River Settlement Agreement

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(Agreement) was established January 17, 2001. This Agreement sets forth operational requirements for the Cornell hydroelectric dam. When the Agreement expires, operations associated with Cornell may need further review and modification.

> Per the Agreement "The parties recognize, however, that the existing 50-year license for the Cornell Project is not synchronized with the license expiration dates for the other five projects and it is impossible at this time to rectify that difference. Therefore, the parties agree that the term of this settlement should extend to September 30, 2033 which is the license expiration date for the Jim Falls Project and is nearly the same as the January 13, 2034 license expiration date for the Chippewa Falls Project."
>
> Per the Agreement, the Cornell Project is bound to maintain the following operational requirements. NSPW may operate the Cornell Project in a daily peaking mode providing that an instantaneous minimum flow of 400 cubic feet per second (cfs) shall be released from the project at all times. Additionally, NSPW shall maintain the surface water elevation of the Cornell Flowage in accordance with Article 13 of the current FERC license, as issued December 26, 1973, except for the following time period: From April 1 to June 7, the flowage shall be maintained within 0.5 ft of full pool (elevation 1001.5 to 1002.0 ft) to enhance fish spawning.

Cornell hydro has the largest operating range of the six lower Chippewa River dams owned by Xcel which can lead to extensive dewatering of backwater areas that can have negative effects on aquatic and semiaquatic organisms. The Department would like to see a wetted perimeter assessment completed to determine the extent of dewatering in the impoundment at various operating conditions up to 2ft fluctuation. Bathometry and Lidar data would be preferred to be able to understand the dynamics of water level changes affecting the rivers edges.

If the operating range is determined to lead to extensive dewatering of backwater areas, then the operating range will need to be modified when the settlement agreement expires in 2033.

MINIMIUM FLOWS AND OPERATIONAL IMPACTS TO FISH HABITAT: Rapid or frequent changes in water levels can have negative impacts on water resources. Additionally, low water conditions and dewatering of critical habitat can lead to declines in fish populations.

An Instream Flow Incremental Methodology (IFIM) study was conducted in 1997 during the relicensing of other hydro facilities on the Chippewa River. The results should be evaluated to determine if the current minimum flow is allowing for optimal habitat utilization.

Please review the IFIM summary from 1997 to evaluate habitat suitability at a range of minimum flows for smallmouth bass, walleye, lake sturgeon, and redhorse suckers. Using the IFIM, determine habitat utilization of smallmouth bass, walleye, lake sturgeon, and redhorse suckers at different minimum flows (400cfs and above). The minimum flow permitted is 400cfs which may not allow optimal habitat utilization for many aquatic species.

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If higher minimum flows allow for substantially greater habitat utilization, then a higher minimum flow may be required.

ESTIMATE FISH ENTRAINMENT MORTALITY AND DETERMINE METHODS TO MINIMIZE IMPACTS TO LARGE RIVERINE FISH SPECIES: Entrainment through hydro facilities can lead to high mortality especially in adult fish. The Cornell hydro dam has the largest trash rack spacing of any of the dams on the lower Chippewa River at 5 3/8" allowing all life stages of fish, including lake sturgeon up to 40", to become entrained which may be preventing the fishery from reaching its full potential. Specifically, the department is concerned with species impacts to lake sturgeon, muskellunge, walleye and redhorse suckers.

Through desktop models, determine the probability of entrainment mortality for lake sturgeon, muskellunge, walleye, and redhorse suckers for all lengths that can pass through the existing trash racks. The study should evaluate and determine the size of fish that would be excluded and the approach velocities for 2.5" trash rack spacing. If desktop modeling suggests substantial entrainment mortality of the previously mentioned fish species at the current trash rack spacing, then follow up studies will be needed to confirm entrainment or measures will need to be taken to minimize entrainment mortality.

PUBLIC ACCESS TO THE CHIPPEWA RIVER: As part of the license application, please identify locations and options to increase and/or improve shore access to the tailrace fishery and to the impoundment. Improvement identification should include, available and needed parking, access from walkways or trails, public space areas, fishing platforms, handicap accessible options and locations, maps and public awareness of public access features. Costs, land ownership, improvement capabilities, and maintenance should be discussed as part of options to increase or improve public access.

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Appendix 2 – Recreation Site Inventory Form

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Recreation Inventory and Condition Assessment											
Location:								Date:			
Cornell Hydroelectric Project P-2639											
Survey Person:											
GPS Location:											
Amenity Photo Numbers:											
Shoreline Photo Numbers:											
Entryway Photo Number:											
Type of Amenity:		**Quanitity of Amenities:**	**Condition of Amenity:** -Not Usable (N) -Needs Repair (R) -Needs Maintenance (M) -Good Working Condition (G)				**Notes:**	**Barrier Free?** (Y or N)			
Boat Launch		Lanes: Launches:	N	R	M	G					
Portage Take-Out			N	R	M	G					
Portage Put-In			N	R	M	G					
Portage Trail		Length:	N	R	M	G					
Skid Pier			N	R	M	G					
Fishing Pier			N	R	M	G					
Picnic Tables			N	R	M	G					
Restroom			N	R	M	G					
Trash Receptacles			N	R	M	G					
Trail			N	R	M	G					
Other			N	R	M	G					
Parking		**Total Spaces:**	**Number of Spaces (each type):**				**Notes:**	**Condition:**			
			Standard:					N			
			Barrier-Free:					R			
			Trailer:					M			
			Other:					G			
Signage:	**Number:**	**Condition:**					**Comments: Provide Details on which signs need attention.**				
FERC Project Sign		N	R	M	G						
Regulations Signs		N	R	M	G						
Directional		N	R	M	G						
Interpretive		N	R	M	G						
Additional Comments: Describe any signs of overuse or anything observed that is not already documented above.											

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Appendix 3 – Recreation Use Survey Form

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Recreation Observation Form																
Date:						Time:										
Cornell Hydroelectric Project P-2639																
Survey Person:														Note: Please list primary activity by placing a "P" in the box. Use and "S" for secondary activities.		
Temperature:		Weather:				Wind Speed:										
			Recreation Activities													
Recreation Site		Number of People	ATV/Snowmobile	Shore Fishing	Boat Fishing	Swimming	Hiking/Walking/ Jogging	Bicycling	Picnicking	Bird Watching	Wildlife Viewing	Non-Powered Boating	Power Boating	Other (specify)	Notes	
City of Cornell Boat Landing																
266th Street Informal Access																
Portage Put-In																
Portage Trail																
Tailwater Fishing-East Side																
Tailwater Fishing -West Side																
Additional Comments:																

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Appendix 4 – Future and Potential Recreation Questionnaire

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Cornell Hydroelectric Project – FERC Project No. 2639
Chippewa River – City of Cornell, Chippewa County, Wisconsin
Recreation Questionnaire

Xcel Energy is in the process of relicensing the Cornell Hydroelectric Project (Project) located on the Chippewa River in Wisconsin using the Traditional Licensing Process. Xcel Energy is gathering information about potential recreation needs in the vicinity of the Cornell Hydroelectric Project.

The Project vicinity is defined as the area upstream and downstream of the Cornell Dam within ¼ mile of the shoreline extending upstream to the Holcombe Dam and downstream ¼ mile of the Cornell 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.

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Cornell Hydroelectric Project – FERC Project No. 2639
Chippewa River – City of Cornell, Chippewa County, Wisconsin
Recreation Questionnaire

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. Do any of your sites or amenities listed in 2a and 2b ever exceed capacity or not have enough parking capacity? ***(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.

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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 for potential follow-up contact by Xcel Energy or Xcel Energy's 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: _____

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Cornell Hydroelectric Project – FERC Project No. 2639
Chippewa River – City of Cornell, Chippewa County, Wisconsin
Recreation Questionnaire

Additional Information or Comments:
(***Please indicate applicable section***)

Please return this questionnaire to Xcel Energy in the enclosed self-addressed, stamped envelope within 30 days of receipt to allow for follow-up contact by Xcel or Xcel's representative, if needed. *Not responding within 30 days will indicate you or your agency are not aware of any relevant information regarding potential recreation needs in the vicinity of the Cornell Hydroelectric Project* .

Comments, questions, and/or this completed questionnaire may also be sent via email to:
Matthew.J.Miller@Xcel.com

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Appendix 4 – Documentation of Consultation

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National Park Service Comments and Responses to Comments

NPS Comment:

We note that in our May 13th, 2019 letter we had identified several specific existing recreation informal access areas found lacking in the PAD such as the actively used informal tailwater fishing area on the east bank downstream of the spillway. This site lacks safe access causing anglers to tread a narrow, rocky unsafe footpath pressed between a tall fence paralleling the river and a steep slope; the site also lacks signage, a restroom facility, formal parking, etc.

We had identified these and others for inclusion in the study so that use and condition could be documented in a study report followed by stakeholder discussions. These discussions would identify deficiencies and impacts along with potential mitigation and enhancement measures to include in the license.

Response:

Both the informal bank fishing area on the east side of the river and the informal access site on the northwest side of the reservoir are included in the list of sites to be surveyed. Therefore, there is no need to make any revisions to the proposed study plan are warranted.

NPS Comment:

While we support discussing proposed mitigation measures any time during relicensing, early conversations on facility elements, design, and location should include stakeholders who've submitted comments regarding the facility in order to develop a well-supported proposal. In this case, Xcel Energy states they will consult with WDNR before developing conceptual recreation designs "for improvements to the shoreline fishing area downstream along the east bank of the tailwater including public access and parking improvements as well as a barrier-free fishing pier on the east shoreline adjacent to the City of Cornell's Mill Yard Park." Please include the National Park Service, City of Cornell, and River Alliance of Wisconsin in your preliminary discussions since each of these has expressed interest in recreation facilities. We recommend setting up a work group to meet initially through conference calls followed by screen-sharing technology if needed.

To clarify, Xcel currently offers these proposed mitigation measures:

- *develop the two concept plan(s) mentioned above*
- *fund recreation improvements included in the concept plans to include: 1) public access and parking improvements for the east bank shoreline fishing area downstream of the tailwater; and 2) a barrier-free fishing pier on the east shoreline adjacent to the City of Cornell's Mill Yard Park.*
- *grant the City access rights or fee title to Xcel's shoreline ownership adjacent to Mill Yard Park to accommodate proposed park improvements. This enhancement would provide permanent access necessary to install and maintain three proposed Mill Yard Park enhancements listed in "Study Plan Elements" Section 2.2 "Background and Existing Information". Other than the aforementioned barrier-free fishing pier, Xcel has not committed to funding other measures identified in the City's plan, i.e., trail access to the Chippewa River; a canoe/kayak launch area; along the Chippewa River construct a multi-purpose trail that also serves as a connection to the old Abe Trail. Note that no indication is yet provided of Xcel's intent to fund purchase,*

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construction/installation, or provide management funds for these project-related facilities is provided.

Response:
Comments Noted. The WDNR will be consulted with first because the WDNR originally recommended they be developed. It is expected any conceptual designs will be included in the draft license application and consultation will occur through that process.

NPS Comment:
We recommend including the informal canoe/kayak launch on the west side of Brunet Island State Park in Table 2.4.1 Recreation Sites to be Inventoried and Surveyed for Existing Use. The Form 80 data from 2014 (submitted 2015) would not capture the explosive use of recreationists using canoes and kayaks in the state park since 2014. This explosion is documented across the country and exhibited in the park by campers brining in their own craft as well as an active paddlecraft rental operated in the park. The informal put-in area is overused, in need of a sustainable solution such as a removable pier.

Identify where recreational wayfinding signs and interpretive signs are lacking/needed throughout the project including dispersed locations not identified in Table 2.4.1.

Response:
The comment asks for monitoring use of an informal site in the State Park where the license has no authority or control over the needs of the park. The park master plan was last updated in 1986. Generally, a state park will make improvements based upon known need. There is no need to survey use of the informal area in the State Park because the questionnaire included in the study plan will be sent to the State Park through the WDNR and they will have an opportunity to comment on needs within the State Park. The purpose of the survey is to capture the same information the NPS suggestion is attempting to collect.

In addition, the City of Cornell has already recognized the need for more canoe/kayak launch facilities on the reservoir. In October 2019, the City of Cornell adopted its comprehensive outdoor recreation plan and proposed to add a canoe/kayak launch area at Mill Yard Park. The licensee has already committed to work with the City of Cornell at Mill Yard Park by granting the rights to use of the shoreline to allow for the proposed improvements. If improvements for kayak/canoe launches are to be made, they should be made in a location that is accessible to the general public outside of the fee-only State Park for diversification of access facilities.

The study plan has been amended to include a review for the need of signage as part of the recreation site assessment.

NPS Comment:
In addition to the four conditions listed ((1) Not Usable and Needs Replacement 2) Needs Repair 3) Needs Maintenance or cleaning 4) Good Working Condition (does not need any attention)), please add a new one: "5) Facility Lacking; need to install facility or otherwise add enhancement (identify item)."

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Complete this assessment early enough so that the subjective evaluation may be sent to the local manager of the site to be inventoried and surveyed for their expert, local opinion. For efficiency, this could be sent at the same time as the questionnaire identified in Section 2.5.4.

Response:
A fifth category has been added. The study plan intentionally separates the inventory and condition assessment by the licensee from the questionnaire in Section 2.5.4. The purpose of the separation is to gain an independent opinion from the local recreation site managers. In addition, the majority of the local recreation site managers have already participated in the relicensing process and have provided their initial input. The questionnaire will not be the only opportunity to provide input in this process and the study plan will not be modified to send the results of the inventory and condition assessment with the questionnaire.

NPS Comment:
We recommend changing the survey use schedule in Table 2.5.3-1 as follows:

- *April – add one weekend day in April to capture increased recreation use with warmer season; substitute for March if necessary*
- *May – add a randomly selected weekend day or substitute it for the randomly selected weekday. This will capture use on weekends when use is higher; weekdays receive lower use.*
- *June – switch the proposed number of weekdays (2) with weekends (1) so that (2) weekends and (1) weekday capture the higher weekend use when demand for and impact on facilities is greater*
- *July – same as recommended for June*
- *August – same as recommended for June*
- *September – since facility planning addresses meeting the demand of a typical peak use rather than holiday weekends, substitute the proposed one day for Labor Day weekend with a randomly selected weekend day when seasonal use remains high*
- *October – eliminate, not necessary since higher demand will be captured in the previous months*

Response:
The schedule has been amended as requested.

NPS Comment:
Please specify that the questionnaire will be sent to WDNR's Brunet Island State Park Superintendent who is best able to complete it. Include for those managers of sites inventoried and condition assessed a request to review and comment upon the condition report. See section 2.5.2 Facility Condition Assessment comments above.

Response:
The plan has been modified accordingly to include to the Brunet Island State Park Superintendent. Under WDNR request, all correspondence for FERC relicensing is to be first provided to the WDNR FERC Coordinator (Cheryl Laatsch). The comment regarding the inventory and condition assessment results has already been addressed in the previous NPS comment where it was originally recommended.

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United States Department of the Interior
NATIONAL PARK SERVICE
Interior Regions 3, 4, 5
Wisconsin Field Office
626 E. Wisconsin Ave., Suite 400W
Milwaukee, WI 53202

March 27, 2020

Mr. Shawn Puzen

Mead and Hunt

1702 Lawrence Drive

De Pere, WI 54115

Re: National Park Service Comment on Proposed Recreation Study Plan; Cornell Hydroelectric Project, FERC Project No. 2639; Chippewa River, City of Cornell, Chippewa County, Wisconsin

Dear Mr. Puzen,

The National Park Service (NPS) respectfully submits the following comments in response to the Cornell Hydroelectric Project Proposed Recreation Study Plan. The National Park Service letter of May 13, 2019 submitted comments on the Pre-application Document (PAD) and a recreation study request. We respond to the draft proposed plan below.

Introduction and Study Plan Elements

We note that in our May 13th, 2019 letter we had identified several specific existing recreation informal access areas found lacking in the PAD such as the actively used informal tailwater fishing area on the east bank downstream of the spillway. This site lacks safe access causing anglers to tread a narrow, rocky unsafe footpath pressed between a tall fence paralleling the river and a steep slope; the site also lacks signage, a restroom facility, formal parking, etc.

We had identified these and others for inclusion in the study so that use and condition could be documented in a study report followed by stakeholder discussions. These discussions would identify deficiencies and impacts along with potential mitigation and enhancement measures to include in the license.

While we support discussing proposed mitigation measures any time during relicensing, early conversations on facility elements, design, and location should include stakeholders who've submitted

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comments regarding the facility in order to develop a well-supported proposal. In this case, Xcel Energy states they will consult with WDNR before developing conceptual recreation designs "for improvements to the shoreline fishing area downstream along the east bank of the tailwater including public access and parking improvements as well as a barrier-free fishing pier on the east shoreline adjacent to the City of Cornell's Mill Yard Park." Please include the National Park Service, City of Cornell, and River Alliance of Wisconsin in your preliminary discussions since each of these has expressed interest in recreation facilities. We recommend setting up a work group to meet initially through conference calls followed by screen-sharing technology if needed.

To clarify, Xcel currently offers these proposed mitigation measures:

- develop the two concept plan(s) mentioned above
- fund recreation improvements included in the concept plans to include: 1) public access and parking improvements for the east bank shoreline fishing area downstream of the tailwater; and 2) a barrier-free fishing pier on the east shoreline adjacent to the City of Cornell's Mill Yard Park.
- grant the City access rights or fee title to Xcel's shoreline ownership adjacent to Mill Yard Park to accommodate proposed park improvements. This enhancement would provide permanent access necessary to install and maintain three proposed Mill Yard Park enhancements listed in "Study Plan Elements" Section 2.2 "Background and Existing Information". Other than the aforementioned barrier-free fishing pier, Xcel has not committed to funding other measures identified in the City's plan, i.e., trail access to the Chippewa River; a canoe/kayak launch area; along the Chippewa River construct a multi-purpose trail that also serves as a connection to the old Abe Trail. Note that no indication is yet provided of Xcel's intent to fund purchase, construction/installation, or provide management funds for these project-related facilities is provided.

Study Area

We recommend including the informal canoe/kayak launch on the west side of Brunet Island State Park in Table 2.4.1 Recreation Sites to be Inventoried and Surveyed for Existing Use. The Form 80 data from 2014 (submitted 2015) would not capture the explosive use of recreationists using canoes and kayaks in the state park since 2014. This explosion is documented across the country and exhibited in the park by campers brining in their own craft as well as an active paddlecraft rental operated in the park. The informal put-in area is overused, in need of a sustainable solution such as a removable pier.

Identify where recreational wayfinding signs and interpretive signs are lacking/needed throughout the project including dispersed locations not identified in Table 2.4.1.

Methodology

2.5.2 Facility Condition Assessment

In addition to the four conditions listed ((1) Not Usable and Needs Replacement 2) Needs Repair 3) Needs Maintenance or cleaning 4) Good Working Condition (does not need any attention)), please add a new one: "5) Facility Lacking; need to install facility or otherwise add enhancement (identify item)."

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Complete this assessment early enough so that the subjective evaluation may be sent to the local manager of the site to be inventoried and surveyed for their expert, local opinion. For efficiency, this could be sent at the same time as the questionnaire identified in Section 2.5.4.

2.5.3 Recreation Use Survey

We recommend changing the survey use schedule in Table 2.5.3-1 as follows:

- April – add one weekend day in April to capture increased recreation use with warmer season; substitute for March if necessary
- May – add a randomly selected weekend day or substitute it for the randomly selected weekday. This will capture use on weekends when use is higher; weekdays receive lower use.
- June – switch the proposed number of weekdays (2) with weekends (1) so that (2) weekends and (1) weekday capture the higher weekend use when demand for and impact on facilities is greater
- July – same as recommended for June
- August – same as recommended for June
- September – since facility planning addresses meeting the demand of a typical peak use rather than holiday weekends, substitute the proposed one day for Labor Day weekend with a randomly selected weekend day when seasonal use remains high
- October – eliminate, not necessary since higher demand will be captured in the previous months

2.5.4 Future and Potential Recreation

Please specify that the questionnaire will be sent to WDNR's Brunet Island State Park Superintendent who is best able to complete it. Include for those managers of sites inventoried and condition assessed a request to review and comment upon the condition report. See section **2**.5.2 Facility Condition Assessment comments above.

Conclusion

Thank you for the opportunity to review the proposed recreation mitigation measures and proposed recreation study plan. We look forward to working with you and other stakeholders to enhance the project area for the recreating public. Should you have any questions regarding these comments, please contact me at 414.297.3605 or angie_tornes@nps.gov.

Sincerely,

Angela M. Tornes

Angela M. Tornes, Coordinator
Hydropower Assistance Program
National Park Service Interior Region 3,4,5

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Shawn Puzen

From: James Fossum <jfbio@yahoo.com>
Sent: Tuesday, March 17, 2020 5:12 PM
To: Shawn Puzen; Matthew J. Miller
Cc: Allison Werner; Angela Tornes
Subject: Cornell Hydro

Shawn, Matt:

I have reviewed the Cornell Recreational Survey Study Plan you sent the River Alliance of Wisconsin to review.

It seems very complete to me and thus I have no comments on the study plan.

The opportunity to review the plan is appreciated.

Jim Fossum
Consultant for the RAW

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Shawn Puzen

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Tuesday, March 10, 2020 10:27 AM
To: Shawn Puzen
Subject: RE: Cornell Recreation Survey Study Plan for Comment

No comments

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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

From: Shawn Puzen <Shawn.Puzen@meadhunt.com>
Sent: Thursday, February 27, 2020 4:31 PM
To: 'James Fossum' <jfbio@yahoo.com>; Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; Tornes, Angie <Angie_Tornes@nps.gov>; Ouellette, Melissa - MUN <cityoffice@cityofcornell.com>
Cc: Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>; Crotty, Scott A <scott.a.crotty@xcelenergy.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>; Shawn Puzen <Shawn.Puzen@meadhunt.com>; Judy Talbot, Mayor <judya.talbot@yahoo.com>; Darrin Johnson <Darrin.Johnson@meadhunt.com>; rshukla@wisconsinrivers.org
Subject: Cornell Recreation Survey Study Plan for Comment

Hi Cheryl, Angie, Dave, and Jim,

Per your study request, Xcel Energy has had the enclosed Study Plan Developed to complete a recreation use and inventory at Cornell as part of the relicensing effort.

Please provide your comments within 30 days.

If you have any questions, please feel free to contact me or Matt Miller. I can forward any questions requiring decisions to Matt for you.

Thanks,

Shawn Puzen | FERC Licensing & Compliance
Mead & Hunt | 1702 Lawrence Drive | De Pere, WI 54115
Direct: 920-593-6865 | Mobile: 920-639-2480
shawn.puzen@meadhunt.com| meadhunt.com
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Shawn Puzen

From: Shawn Puzen
Sent: Thursday, February 27, 2020 4:31 PM
To: 'James Fossum'; cheryl.laatsch@wisconsin.gov; Tornes, Angela; City of Cornell
Cc: Miller, Matthew J; Crotty, Scott A; Darrin Johnson; Shawn Puzen; Judy Talbot, Mayor; Darrin Johnson; rshukla@wisconsinrivers.org
Subject: Cornell Recreation Survey Study Plan for Comment
Attachments: 20200227 Recreation Use Study Plan Send for Comments.pdf

Categories: Filed by Newforma

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Thanks,

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The City of Cornell did not respond with comments.

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