GRESHAM
MUNICIPAL UTILITIES
1126 Main St. • P.O. Box 50
Gresham, WI 54128
(715) 787-3244 • Fax (715) 787-1313

February 7, 2018

FERC Project No. 2484 and 2464

Ms. Kimberly D. Bose, Secretary
The Federal Energy Regulatory Commission
ATTN: OEP/DHAC
888 First Street NE
Washington, DC 20426

Dear Secretary Bose:

Article 404 Upper Red Lake Dam and Article 406 Weed Lake Dam Hydroelectric Project: Invasive Species Monitoring and Control Plans

Per Articles 404 and 406 respectively of the Orders Issuing Subsequent Licenses for the Upper Red Lake Dam and the Weed Lake Dam Hydroelectric Projects (FERC Project Nos. 2484 and 2464) dated February 7, 2017, Gresham Municipal Utilities (GMU) is required to file with the Federal Energy Regulatory Commission (Commission) for approval, Invasive Species Monitoring and Control Plans within one year of the Orders.

Enclosed is the combined Invasive Species Monitoring and Control Plan for both hydroelectric projects. It was developed in consultation with the Wisconsin Department of Natural Resources (WDNR) and the U.S. Fish and Wildlife Service (FWS) and is being submitted for Commission approval.

The WDNR provided comments on the plan on January 22, 2018 and again consulted via conference call on January 25, 2018. The FWS responded with no comments. Documentation of consultation is included within the plan.

Should you have any questions, please do not hesitate to contact me at 715-787-3994 or Shawn Puzen at 920-593-6865.

Sincerely,

Brian Carroll
Operations Manager

cc: Cheryl Laatsch-WDNR
Nick Utrup-FWS

Invasive Species Monitoring and Control Plan

Upper Red Lake Dam and Weed Dam Hydroelectric Projects

FERC Project Nos. 2484 and 2464

Red River
Shawano County, Wisconsin

Prepared for
Gresham Municipal Utilities
Gresham, Wisconsin

Prepared by
Mead & Hunt
www.meadhunt.com

January 2018

Table of Contents

Tables

Appendices

1. Introduction

In March of 2008, the Red Lakes Protection & Rehabilitation District[1] (the District), in cooperation with the Wisconsin Department of Natural Resources (WDNR), released a comprehensive management plan for Red Lakes in Shawano County, Wisconsin[2] (Appendix A). Red Lakes consist of the reservoirs for the Upper Red Lake Dam (Upper) Hydroelectric Project and Weed Dam (Weed) Hydroelectric Project (FERC Project Nos. 2484 and 2464).

As part of the comprehensive management plan development process, a comprehensive aquatic plant survey, utilizing a point intercept method was completed in 2006. The results of the 2006 survey were mapped and served the basis of the management recommendations in the comprehensive plan. The primary invasive species identified during the 2006 survey were Eurasian watermilfoil (EWM) and curly leaf pondweed (CLP). Invasive species control activities in in the 2006 comprehensive plan focused on mechanical harvesting.

On February 7, 2017, Gresham Municipal Utilities (GMU) was issued subsequent licenses for both their Upper Red Lake Dam Hydroelectric Project and their Weed Dam Hydroelectric Project. Both licenses contained requirements to monitor and control invasive species at the hydroelectric projects. Article 404 of the license for Upper and Article 406 for Weed both contain the following language:

> Within one year of license issuance, the licensee must file with the Commission, for approval, a plan to monitor invasive species at the project. The purpose of the plan is to document the extent of the presence of invasive species at the project, and if such species are having a significant adverse effect on fish and wildlife populations or public access, licensee must implement measures to limit their spread. The plan must include, but not necessarily be limited to, the following:
>
> 1) A description of the licensee's proposed monitoring methods;
> 2) The proposed frequency of monitoring;
> 3) The proposed criteria to be used to determine when control measures will be implemented;
> 4) A schedule for filing monitor reports with WDNR and U.S. Fish and Wildlife Service (FWS) and the Commission;
> 5) Measures proposed to mitigate the effects of the invasive species if the monitoring reports indicate that the invasive species are having a significant adverse effect on fish and wildlife populations or public access at the project; and
> 6) A description of, and implementation schedule for, the plan for providing public information about the species.
>
> The licensee must prepare the plan after consultation with WDNR and FWS. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

[1] The lake district is a special purpose unit of government with taxing authority. It was created in 1991 by shoreland property owners for the management of both lakes.

[2] http://dnr.wi.gov/lakes/grants/LPL-1099-06/LPL-1098-06andLPL-1099-06RedLakesShawano_Mar2008_Final.pdf

> The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

In 2016, as part of a current effort to update the comprehensive management plan, the District, in cooperation with the WDNR, completed field studies including an early season aquatic invasive species survey, point intercept surveys, and aquatic plant community mapping on both the Upper Red Lake Dam Reservoir (Upper Red Lake) and Weed Dam Reservoir (Lower Red Lake). The results are currently not publicly available and will be published as part of the revised comprehensive management plan[3] expected to be completed prior to the 2018 recreation season. However, initial results indicate the continued prevalence of EWM and CLP on both reservoirs.

[3] It is expected the comprehensive management plan will include updated fisheries information.

2. Upper Red Lake Dam and Weed Dam Hydroelectric Project Boundary Areas

The Upper Red Lake Dam Reservoir and the Weed Dam Reservoir are located on the Red River in Shawano County, Wisconsin.

The Upper Red Lake Dam Reservoir has a surface area of approximately 250 acres at a normal maximum elevation of 933.0 feet National Geodetic Vertical Datum (NGVD).

The Weed Dam Reservoir is located about 1.5 miles downstream of the Upper Red Lake Dam and has a surface area of approximately 270 acres at a normal maximum elevation of 897.2 feet NGVD.

The Reservoir areas contained within the Hydroelectric Project boundaries are depicted on the approved Exhibit G documents included in Appendix B.

3. General Project Area Description

The Upper Red Lake Dam Project is located on the Red River, north of the Village of Gresham in Shawano County in Sections 33 and 34, T28N, R14E. The Village of Gresham is a small community located in the north central portion of Shawano County, approximately 12 miles northwest of the City of Shawano. Portions of the Upper Red Lake Dam Project are in the Town of Herman and the Town of Red Springs.

The Weed Dam Project is located on the Red River, downstream of the Village of Gresham in Sections 2 and 3, T 27N, R14E. Portions of the Weed Dam Project are located in the Village of Gresham, the Town of Herman, and the Town of Red Springs.

East-central Wisconsin, including Shawano County, experiences a humid, continental-type of climate characterized by cold, snowy winters, and relatively short, warm summers. Changes in weather occur every few days, especially during the winter and spring months.

The region's climate is also characterized by moderately moist conditions. Average annual precipitation (including water content of snow) is 30.41 inches. Typically, most of the precipitation falls during the growing season and June is the wettest month, with an average of 3.60 inches of precipitation.

The terrain in the Gresham area is relatively hilly with elevation changes of up to 250 feet. Within the Village, land generally slopes toward the shorelines of Upper Red Lake Reservoir and Weed Dam Reservoir.

The WDNR reports approximately 43 percent of the land area of Shawano County is forested. Most forest lands are privately owned. Areas north and west of the Village of Gresham, particularly along shoreline areas, are predominately wooded. However, areas near the Hydroelectric Project vicinity include significant areas of grassland.

The Village of Gresham contains a mix of single- and multiple-family housing, surrounding a traditional central “downtown” with commercial and government uses. Commercial uses have been established along County Highway U in the southern area of the Village. Industrial businesses have been established in the Industrial Park located on Industrial Street in the southern area of the Village.

4. Invasive Species Previously Identified Within the Projects

Per the WDNR website: http://dnr.wi.gov/lakes/lakepages/, the following invasive species have been identified and verified within the Hydroelectric Project boundaries.

4.1 Eurasian watermilfoil

EWM was verified to occur within Upper Red Lake Dam Reservoir and Weed Dam Reservoir in 1994.

4.2 Curly leaf pondweed

CLP was verified to occur within Upper Red Lake Dam Reservoir in 2006 and Weed Dam Reservoir in 2012.

4.3 Banded mystery snail

The banded mystery snail was verified to occur within Upper Red Lake Dam Reservoir in 2008 and Weed Dam Reservoir in 2012.

4.4 Chinese mystery snail

The Chinese mystery snail was verified to occur within Upper Red Lake Dam Reservoir in 2008 and Weed Dam Reservoir in 2012.

4.5 Hybrid Eurasian/northern watermilfoil

Hybrid Eurasian/northern watermilfoil was verified to occur within both the Upper Red Lake Dam and Weed Dam Reservoirs in 2015.

4.6 Rapid response invasive species

Although not all are known to occur within the Hydroelectric Project boundaries, there are several aquatic invasive species in a rapid response list maintained by the WDNR (See Table 4-1 and Appendix C). Additional diligence is required at access points to assure most of these species do not become established.

Future rapid response invasive species

Invasive species can be introduced to an area or region at any time; therefore, the list of monitored invasive species within the Hydroelectric Project boundaries should be continually adjusted and updated accordingly. Invasive species will be added for monitoring only if the species has been observed in Wisconsin or Michigan, is currently not common to the area or region, and early, limited control and detection will stop the species from spreading.

The WDNR will have the opportunity to add invasive species to the monitoring list during their review of and comments on the Monitoring Report, as described in Section 10. The WDNR may also include additional invasive species for future monitoring at any time outside the reporting schedule according to the restrictions described above.

Table 4-1. Additional Aquatic Invasive Species

Common Name	Scientific Name *(Genus species)*
European frog-bit	*Hydrocharis morsus-ranae*
Yellow floating heart	*Nymphoides peltata*
Water chestnut	*Trapa natans*
Brazilian waterweed	*Egeria densa*
Hydrilla	*Hydrilla verticillata*
Aquatic forget-me-not	*Myosotis scorpiodes*
Spiny naiad	*Najas marina*
Fanwort	*Cabomba caroliniana*
Parrot feather	*Myriophyllum aquaticum*
Water spinach	*Ipomoea aquatica*
Asian marshweed	*Limnophilia sessiliflora*
Water hyacinth	*Eichornia crassipes and Eichornia azurea*
Indian swampweed	*Hygrophila polysperma*
Killer algae	*Caulerpa taxifolia*
Water lettuce	*Pistia stratiotes*
Flowering rush	*Butomus umbrellatus*
Japanese hop	*Humulus japonicus*
Didymo	*Didymoshenia geminata*
Giant Salvinia	*Salvinia molesta*
Asian clam	*Iris psuedacorus*
Chinese mystery snail[4]	*Cipangopaludina chinesis*
Banded mystery snail[5]	*Viviparus georgianus*
Red swamp crayfish	*Procambarus clarkii*
Faucet snail	*Bithynia tentaculata*
Zebra mussel	*Dreissena polymorpha*
Yellow iris	*Iris pseudacorus*
Java waterdropwort	*Oenanthe javanica*
Quagga mussel	*Dreissena rostriformis*
Rusty crayfish	*Oronectus rusticus*
Brittle naiad	*Najas minor*
Floating marsh pennywort	*Hydrocotyle rananunculoides*
New Zealand mud snail	*Potamopyrgus antipodarum*
Spiny water flea	*Bythotrephes cederstroemi*
Duck lettuce	*Ottelia alismoides*
Curly-leaf pondweed[6]	*Potamogeton crispus*
Malaysian trumpet snail	*Melanoides tuberculata*
Starry stonewort	*Nitellopsis obtusa*

[4] Chinese mystery snails have already established themselves within the Hydroelectric Projects. Therefore, rapid response monitoring is no longer necessary.

[5] Banded mystery snails have already established themselves within the Hydroelectric Projects. Therefore, rapid response monitoring is no longer necessary.

[6] Curly leaf pondweed has already been established within the Hydroelectric Projects. Therefore, rapid response monitoring is no longer necessary.

5. Rapid Response Monitoring

5.1 Project areas subject to rapid response monitoring

The following Commission-regulated recreation facilities will be subject to monitoring for the species described in Section 4.6:

- South Shore Boatlanding
- Riverside Park Boatlaunch
- Geider Road Boatlanding
- Red River Walk-In Site

These recreation facilities are shown on the Commission-approved Exhibit G found in Appendix B.

5.2 Rapid response monitoring schedule and methods

Rapid response monitoring for invasive species within the Hydroelectric Project boundaries will be completed every year beginning in 2019, per the following conditions:

- All monitoring will occur during the summer months of late July and August.
- All monitoring will be conducted by personnel familiar with the visual characteristics of the invasive species identified in Section 4.6.
- For zebra mussel veligers and spiny water fleas, GMU will collect a water sample at each of the four access points using a 54 µm net with two 2-meter tows in 5-10 feet of water. The samples will be sent to the WDNR invasive species coordinator for analysis.
- The other aquatic search methods will approximate the WDNR protocols such that the intent is met. Each of the access sites will use rake sampling along 200' of shoreline and within 100' the shore. Each area will be searched for 30 minutes and will also, within that time-frame, involve the over-turning of rocks in shallow water to attempt to identify invasive macro-invertebrates.
- Monitoring for invasive species of mollusks, crustaceans, macro-invertebrates, or fish will be completed by observing the trash racks that screen the intakes. Throughout the year, powerhouse operations at the facilities require frequent cleaning of the trash racks using a special-purpose rake. Each cleaning event offers an opportunity to monitor for invasive mollusks, crustaceans, macro-invertebrates, and fish on entrained debris or the racks themselves. Any stockpiled debris will be reviewed during the rapid response monitoring for the presence of invasive species[7].
- WDNR data sheets will be populated with information for each new occurrence of an invasive species identified in Section 4.6.
- Data concerning the locations of new occurrences of invasive species identified in Section 4.6 will be collected using a handheld Global Positioning System (GPS).

[7] Due to the size of certain invasive mollusk species (faucet snail, New Zealand mud snail, Malaysian trumpet snail) and species such as spiny water flea, early identification will be unlikely and GMU has proposed collection of water samples to identify the presence of these species.

- Monitoring of all current and future invasive species identified in Section 4.6 shall only occur until a point at which the species becomes prevalent in the area or limited local control measures of areas contained within the Hydroelectric Project boundaries will no longer be instrumental to stop the spread of the invasive species identified in Section 4.6.

See Section 10 for the reporting protocol.

6. Curly Leaf Pondweed and Eurasian Watermilfoil Monitoring

The District has been coordinating with the WDNR to continue the management of invasive species (currently EWM and CLP) on both the Upper Red Lake Dam Reservoir and the Weed Dam Reservoir.

GMU will contribute $3,000[8] to the District on an annual basis, beginning in February 2019, for its on-going efforts to monitor and control invasive species.

If the District no longer actively cooperates with the WDNR and no longer conducts focused efforts towards the monitoring and/or control of invasive species on both the Upper Red Lake Dam Reservoir and the Weed Dam Reservoir, GMU will assume the local stakeholders no longer believe it is necessary and will end its contribution to the Distirct. GMU will also consult with the WDNR determine future need (if any) and responsibility of activities currently undertaken by the District for monitoring and control of EWM and CLP.

[8] Each year the maximum value will be increased by the published U.S. Department of Labor Bureau of Statistics Annual Consumer Price Index percent changes for All Urban Consumers (CPI-U) Midwest-Non-seasonal from the previous year. For example, the 2020 maximum will be calculated by multiplying $3,000 by the negative or positive percentage change from 2018 to 2019.

7. Measures to Increase Public Awareness of Invasive Species

GMU will undertake the following measures to increase public awareness of invasive species within the Hydroelectric Project boundaries:

- Display WDNR-provided invasive species signs at Commission-regulated recreation facilities.
- Assess the condition of existing WDNR-provided invasive species signs at Commission-regulated recreation facilities during scheduled monitoring activities. A new sign will be installed if replacement is warranted and the WDNR agrees to provide a replacement sign.
- Provide the public with invasive species information at the GMU office; the invasive species information will be provided by the WDNR.
- Display District information about invasive species management activities on the Village of Gresham website.

8. Management Practices to Prevent the Spread of Invasive Species

GMU will take precautions to prevent the spread of invasive species during transportation of equipment used for the operation and maintenance of its Upper Red Lake Dam and Weed Dam Hydroelectric Projects. Equipment used for Project purposes that contacts water on a regular basis will be decontaminated per the WDNR best management practices for the decontamination of boats, equipment, and gear to prevent the spread of aquatic invasive species between waters. Currently, the information can be found as follows: http://dnr.wi.gov/topic/invasives/disinfection.html.

9. Control Measures

9.1 Rapid response species

Control measures shall only be recommended by the WDNR and implemented by GMU if limited local control of areas contained within the Hydroelectric Project boundaries can be instrumental to stop the spread of the invasive species throughout the area.

The WDNR shall be responsible for notifying and directing GMU to control for invasive species documented to occur within the Hydroelectric Project boundaries.

The need for any invasive species control measures will further be evaluated based on the availability, practicality, and cost versus benefits of the suitable control measures. In instances where established control measures will yield immediate benefits, GMU may initiate controls at their discretion. GMU will utilize suitable methods for all control activities. All control measures implemented by GMU shall be in accordance with technical assistance obtained through the procedure outlined in Section 10.

Implementation of control measures shall begin no earlier than 2019.

The total cost incurred by GMU for control measures in any given year shall not exceed a maximum value of $3,000.00 in 2019[9].

9.2 Eurasian watermilfoil and curly leaf pondweed control

The control efforts on the part of GMU for EWM and CLP are outlined in Section 6.

[9] Each year the maximum value will be increased by the published U.S. Department of Labor Bureau of Statistics Annual Consumer Price Index percent changes for All Urban Consumers (CPI-U) Midwest-Non-seasonal from the previous year. For example, the 2020 maximum will be calculated by multiplying $3,000 by the negative or positive percentage change from 2018 to 2019.

10. Reporting

In the event a new occurrence of an invasive species is identified during monitoring, the WDNR will be notified at invasive.species@wisconsin.gov as soon as possible, but no later than 5 working days after its discovery. The notification will also include pictures and submittal of the on-line WDNR reporting form.

An annual notification to the WDNR and the Commission with the date the monitoring was completed will be made by December 31st of each year.

Beginning in 2023 and every five years thereafter, the notification will be expanded and replaced by a letter report due to the WDNR for a 30-day comment period by December 31st summarizing the following:

- A summary of the monitoring results conducted by GMU, any control activities implemented by GMU (if applicable), and any public communication undertaken by GMU,
- A summary of the invasive species related activities implemented by the District (including public communication),
- Confirmation of the annual contributions to the District,
- A spreadsheet showing a summary of each contribution to the District beginning in 2019 and what CPI percentage was used to calculate the contribution amount, and
- A spreadsheet showing the maximum costs to be incurred GMU for the control of rapid response species and how the cost was calculated beginning in 2019.

The letter report will also include completed WDNR forms for any new occurrences observed for invasive species cited in Section 4.6. The WDNR forms are included in Appendix D. Photographs of newly identified occurrences of invasive species, and the WDNR confirmation. The letter report shall also include future recommendations for invasive species control.

If the WDNR modifies the reporting forms at any time in the future, they shall notify where or how GMU can obtain the updated forms. GMU will utilize the revised forms for future monitoring activities.

WDNR comments will be addressed and the letter report will be filed with the Commission by February 15 every five years beginning in 2023.

11. Procedures for Obtaining Technical Assistance

This Invasive Species Monitoring and Control Plan focuses on early identification and response for certain aquatic species. GMU will rely on the WDNR to provide them with the identifying factors for rapid response aquatic invasive species monitoring.

This Plan primarily focuses on GMU's efforts to control of species that are not already prevalent in the area and where early detection and control will have an impact on the prevalence of the invasive species in the area. Some control measures have the potential for negative impacts on aquatic communities and non-invasive species; therefore, GMU will seek technical assistance and consultation from control experts from the WDNR or the University of Wisconsin – Extension, as appropriate, prior to implementing any invasive species control measures.

12. Documentation of Consultation

Appendix E presents a summary of consultation between GMU, WDNR, and additional agencies during the development of this plan. The WDNR provided comments on January 22, 2018. The FWS did not respond with comments. A conference call was held with the WDNR on January 25, 2018 to come to resolution on the comments. The comments have been addressed in the plan and responded to in Exhibit E.

Appendix B. Exhibit G Documents

APPLICANT STATEMENT

I have reviewed the Upper Red Lake Dam Hydroelectric project boundary shown herein. The licensee either owns in fee simple or possesses flowage easements over all lands shown on this map that are inside the project boundary. The project boundary lines that are not contour lines were based on GIS parcel information provided by the Shawano County Land Information Office.

ART BAHR, GRESHAM MUNICIPAL UTILITIES — Date 11-7-13

WISCONSIN — SEAN WALSH S-2016 SAUK CITY WIS. — LAND SURVEYOR

SURVEYOR'S STATEMENT

I HEREBY STATE THAT THE PROPOSED PROJECT BOUNDARY DELINEATION FOR THE UPPER RED LAKE DAM PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE MAPPING ACCURACIES AS REQUIRED IN 18CFR4.41. THE UPPER RED LAKE DAM PROJECT BOUNDARY LINE WAS ADJUSTED OR ROTATED TO BEST FIT GRAPHICALLY WITH USGS QUADRANGLE MAP FEATURES OR HIGHER ACCURACY GEOSPATIAL DATA OBTAINED LOCALLY AND WAS NOT FIELD SURVEYED.

BY _____ DATE 11/5/2013

SHAWANO COUNTY, WI

TOWNSHIP 28N, RANGE 14E
Town of Red Springs

TOWNSHIP 27N, RANGE 14E
Town of Herman

E: 2,275,714.68 N: 379,745.79

E: 2,283,501.14 N: 379,615.59

E: 2,283,631.26 N: 375,850.59

POINT OF INTERSECTION: 2,209.64 FT ALONG WEST SECTION LINE SOUTH OF NW CORNER SECTION 33

PROJECT BOUNDARY

CONTOUR ELEVATION 934.2 FT

FLOWAGE EASEMENTS TO CONTOUR ELEVATION 934.2 FT COVER LANDS WITHIN THE PROJECT BOUNDARY

UPPER RED LAKE

LOWER RED LAKE

UPPER RED LAKE RD

MORGAN RD

CITY TK A

CITY TK G

HOFFMAN LA

UPPER LAKE DR

ZOELMAN LA

PARK HILL DR

PARK ST

MAIN ST

E PLEASANT ST

SOUTH SHORE BOAT LANDING

DAM

72" PENSTOCK

SURGE TANK

POWERHOUSE

STEP-UP SUBSTATION

UTILITY SUBSTATION (NON-PROJECT)

See Detail Map 1

CORPORATE BOUNDARY

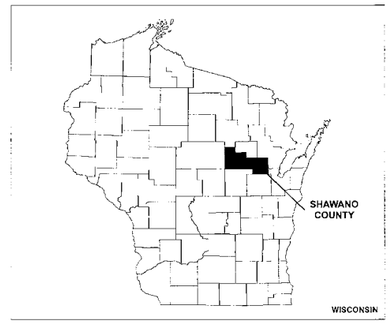
Village of Gresham

L100 L101 L109 L110 L111

PROJECT BOUNDARY COURSE TABLE

Segment	Distance (ft)	Bearing	Note
L100	1,876.71	S74° 54' 54" E	From NW Corner Section 3
L101*	1,813.14	S39° 21' 55" E	From NW Corner Section 34 to contour elevation 934.2 ft
L109*	65.45	N00° 10' 24" W	To Contour elevation 934.2 ft
L110	300.35	S84° 29' 05" E	
L111*	154.32	S75° 10' 49" E	To Contour elevation 934.2 ft
L112	171.67	S19° 33' 18" E	
L113	116.51	S57° 31' 43" E	
L114	104.59	S19° 58' 59" W	
L115	360.22	S60° 15' 18" E	
L116	232.12	S47° 37' 20" E	
L117	75.83	S00° 02' 24"W	
L118	35.21	S55° 41' 35" E	
L119	210.76	S72° 46' 32" E	
L120	70.85	N88° 31' 18" E	
L121	111.99	S01° 59' 50" E	
L122	61.24	S87° 03' 51" W	
L123	65.23	N01° 48' 54" W	
L124	228.71	N70° 24' 35" W	
L125	67.92	S89° 57' 34" W	
L126	43.84	N00° 31' 50"S W	
L127	61.38	N71° 23' 02" W	
L128	48.05	N62° 07' 19" W	
L129	110.62	N46° 36' 11" W	
L130	395.34	N55° 35' 30" W	
L131	54.53	S32° 33' 23" W	
L132	131.03	N80° 11' 58" W	
L133	92.43	N55° 20' 21" W	
L134	132.70	S32° 39' 49" W	
L135	346.63	N52° 31' 03" W	
L136*	81.86	N47° 46' 50" E	To Contour elevation 934.2 ft

** Project boundary is based on GIS information. When project boundary description references specific points or lines, those references shall govern over bearing and distance references in case of conflict.*



LEGEND

- PROJECT BOUNDARY
- REFERENCE POINT
- EXISTING PROJECT FEATURE
- EXISTING NON-PROJECT FEATURE
- TRANSMISSION LINE
- OPEN WATER
- R RECREATION SITE
- MUNICIPAL BOUNDARY
- RAILROAD
- FEE SIMPLE OWNERSHIP
- FLOWAGE EASEMENT
- PARCEL LINE
- 1 PARCEL WITH OWNER INFO (See Map Number on Map 2 of 2)

MN 3° 37' W

2013 Magnetic north declination at Upper Red Lake Dam

SCALE IN FEET

0 250 500 1,000 1,500 2,000 2,500 Feet

Reference coordinates are in Wisconsin Stateplane Central Zone FIPS 4802, NAD83. Coordinate units are in U. S. Survey feet. Project boundary elevation contour is referenced to NGVD 1929.

"THIS DRAWING IS PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED

THIS 7TH DAY OF NOVEMBER, 2013.

BY: _____ APPLICANT

EXHIBIT G-1

GRESHAM MUNICIPAL UTILITIES — GRESHAM, WI

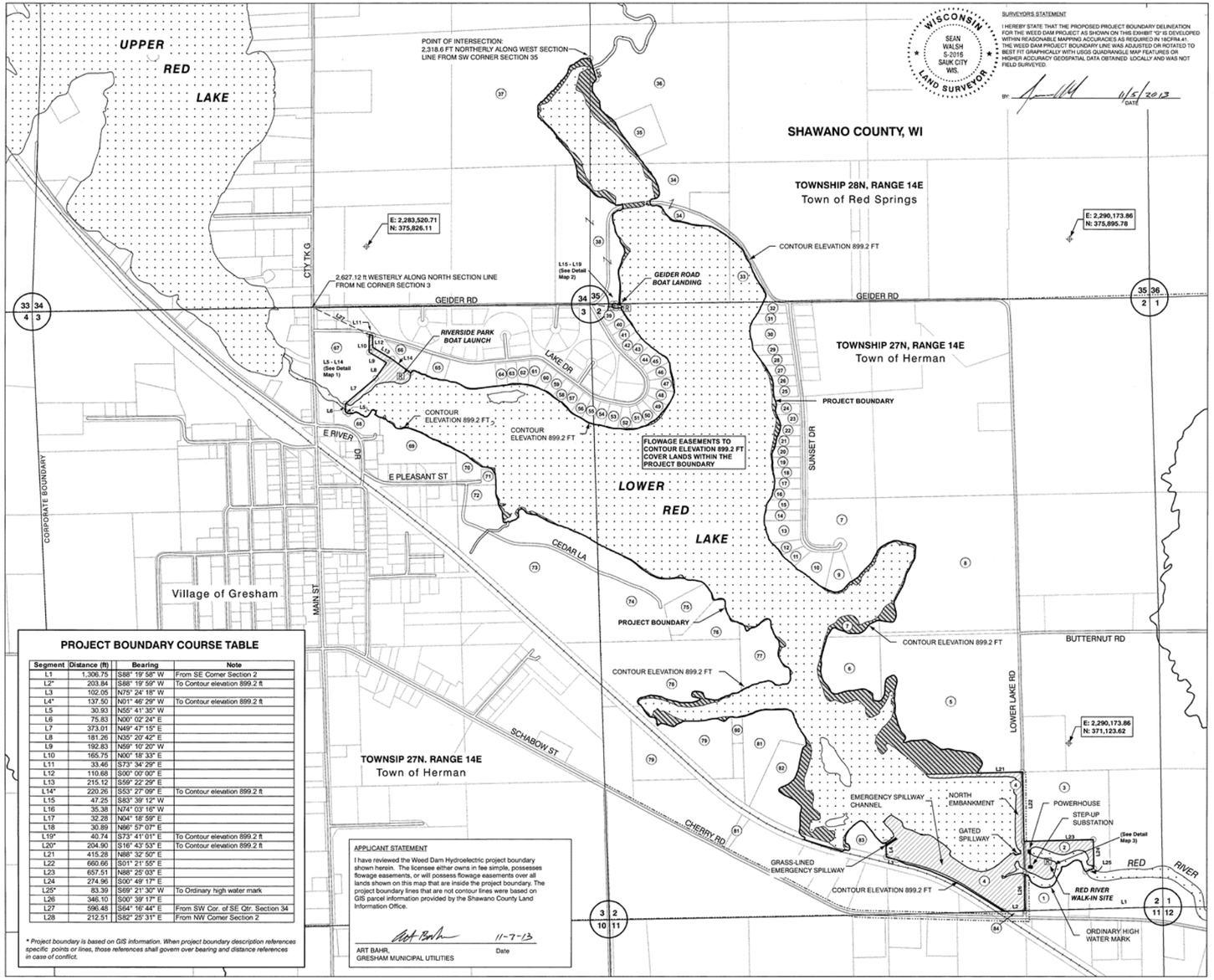
UPPER RED LAKE DAM HYDROELECTRIC PROJECT
F.E.R.C. PROJECT No. 2484
RED RIVER
SHAWANO COUNTY, WI

PROJECT BOUNDARY

Mead & Hunt

SCALE: AS SHOWN
DATE: FEB 2017

P-2484-1005



SURVEYORS STATEMENT

I HEREBY STATE THAT THE PROPOSED PROJECT BOUNDARY DELINEATION FOR THE WEED DAM PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE MAPPING ACCURACIES AS REQUIRED IN 18CFR4.41. THE WEED DAM PROJECT BOUNDARY LINE WAS ADJUSTED OR ROTATED TO BEST FIT GRAPHICALLY WITH USGS QUADRANGLE MAP FEATURES OR HIGHER ACCURACY GEOSPATIAL DATA OBTAINED LOCALLY AND WAS NOT FIELD SURVEYED.

WISCONSIN SEAN WALSH S-2016 SAUK CITY WIS. LAND SURVEYOR

BY: _____ 11/5/2013 DATE

LEGEND

- PROJECT BOUNDARY
- REFERENCE POINT
- EXISTING PROJECT FEATURE
- TRANSMISSION LINE
- PARCEL LINE
- OPEN WATER
- R RECREATION SITE
- MUNICIPAL BOUNDARY
- RAILROAD
- FEE SIMPLE OWNERSHIP
- FLOWAGE EASEMENT
- (1) PARCEL WITH OWNER INFO (See Map Number on Map 2 of 2)

3° 30' W

2013 Magnetic north declination at Weed Dam

SCALE IN FEET

0 250 500 1,000 1,500 2,000 2,500 Feet

Reference coordinates are in Wisconsin Stateplane Central Zone FIPS 4802, NAD83. Coordinate units are in U. S. Survey feet. Project boundary elevation contour is referenced to NGVD 1929.

"THIS DRAWING IS PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED

THIS 7TH DAY OF NOVEMBER 2013 "

BY: _____
APPLICANT

PROJECT BOUNDARY COURSE TABLE

Segment	Distance (ft)	Bearing	Note
L1	1,306.75	S88° 19' 58" W	From SE Corner Section 2
L2*	203.84	S88° 19' 59" W	To Contour elevation 899.2 ft
L3	102.05	N75° 24' 18" W	
L4*	137.50	N01° 46' 29" W	To Contour elevation 899.2 ft
L5	30.93	N55° 41' 35" W	
L6	75.83	N00° 02' 24" E	
L7	373.01	N49° 47' 15" E	
L8	181.26	N35° 20' 42" E	
L9	192.83	N59° 10' 20" W	
L10	165.75	N00° 18' 33" E	
L11	33.46	S73° 34' 29" E	
L12	110.68	S00° 00' 00" E	
L13	215.12	S59° 22' 29" E	
L14*	220.26	S53° 27' 09" E	To Contour elevation 899.2 ft
L15	47.25	S83° 39' 12" W	
L16	35.38	N74° 03' 16" W	
L17	32.28	N04° 18' 59" E	
L18	30.89	N86° 57' 07" E	
L19*	40.74	S73° 41' 01" E	To Contour elevation 899.2 ft
L20*	204.90	S16° 43' 53" E	To Contour elevation 899.2 ft
L21	415.28	N88° 32' 50" E	
L22	660.66	S01° 21' 55" E	
L23	657.51	N88° 25' 03" E	
L24	274.96	S00° 49' 17" E	
L25*	83.39	S69° 21' 30" W	To Ordinary high water mark
L26	346.10	S00° 39' 17" E	
L27	596.48	S64° 16' 44" E	From SW Cor. of SE Qtr. Section 34
L28	212.51	S82° 25' 31" E	From NW Corner Section 2

** Project boundary is based on GIS information. When project boundary description references specific points or lines, those references shall govern over bearing and distance references in case of conflict.*

APPLICANT STATEMENT

I have reviewed the Weed Dam Hydroelectric project boundary shown herein. The licensee either owns in fee simple, possesses flowage easements, or will possess flowage easements over all lands shown on this map that are inside the project boundary. The project boundary lines that are not contour lines were based on GIS parcel information provided by the Shawano County Land Information Office.

_____ 11-7-13
ART BAHR, GRESHAM MUNICIPAL UTILITIES — Date

EXHIBIT G-1

GRESHAM MUNICIPAL UTILITIES — GRESHAM, WI

WEED DAM HYDROELECTRIC PROJECT
F.E.R.C. PROJECT No. 2464
RED RIVER
SHAWANO COUNTY, WI

PROJECT BOUNDARY

Mead & Hunt

SCALE: AS SHOWN
DATE: FEB 2017

P-2464-1010

Appendix C. Rapid Response Invasive Species

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**

Asian clam
(Corbicula fluminea)

Floating marsh pennywort
(Hydrocotyle ranunculoides)

Didymo
(Didymoshenia geminata)

Giant salvinia
(Salvinia molesta)

Red swamp crayfish
(Procambarus clarkii)

Water spinach
(Ipomoea aquatica)

Killer algae
(Caulerpa taxifolia)

Asian marshweed
(Limnophila sessiliflora)

Indian swampweed
(Hygrophila polysperma)

Aquatic forget-me-not
(Myosotis scorpiodes)

Spiny naiad
(Najas marina)

Curly-leaf pondweed
(Potamogeton crispus)

Zebra mussel
(Dreissena polymorpha)

Rusty crayfish
(Orconectes rusticus)

Chinese mystery snail
(Cipangopaludina chinensis)

Yellow Iris
(Iris pseudacorus)

Prohibited Species **Restricted Species**

www.dnr.wi.gov keyword: **invasives**

Bureau of Science Services
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

PUB-SS-1162 2016

Appendix D. WDNR Reporting Forms

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Plant Incident Report

Form 3200-125 (R 2/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive plant on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email

Monitoring Location

Waterbody Name	Township Name	County

Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?: ☐ Curly-leaf Pondweed ☐ Eurasian Water-milfoil ☐ Purple Loosestrife ☐ Brittle Naiad ☐ Hydrilla ☐ Brazilian Waterweed ☐ Yellow Floating Heart

Where did you find the invasive plant?

Latitude:	Longitude:

Approximately how large an area do the plants occupy?

☐ A Few Plants ☐ One or a few beds ☐ Many beds ☐ A Whole Bay or Portion of Lake
☐ Widespread, covering most shallow areas of lake ☐ Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted? ☐ Floating ☐ Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

☐ Rhinelander ☐ Spooner ☐ Green Bay ☐ Oshkosh ☐ Did not take plant sample to a DNR office
☐ Fitchburg ☐ Waukesha ☐ Eau Claire ☐ Superior ☐ Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

Print... | Submit by Email | Clear Data

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Invasive Plant Report

Form 1700-056 (R 5/13)

Notice: Information provided on this form will be used in a statewide volunteer effort to locate, eradicate and monitor selected invasive plants. Your cooperation in reporting these species is much appreciated. Personal information collected may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.].

Collection Information

State	County	Date Collected / Observed

Collector Name

Address	City	State	ZIP Code

Phone Number	Email

Characteristics & Location

Plant Name (Common and/or Latin name)

Size & density of infestation. Describe spread and estimate numbers.

Habitat description. Describe general habitat type such as forest interior, forest edge, old field, prairie, wetland, lakeshore, crop field, pasture, disturbed ground, urban setting type. Is it public or private land?

Location landmarks. Provide enough details so site can be found again. Note nearby landmarks such as city name, roads, intersections, driveways, lake edges and other natural and cultural features.

Geographic Coordinates (Pinpoint site using http://itouchmap.com/latlong.html)

Complete one:

1. Latitude ____ N Longitude ____ W
2. UTM ____ E ____ N
3. Township ____ N Range ____ E W Section ____ Part Section ____
4. ____
   Specify other datum used (WGS 84, WI Transverse Mercator, etc.)

Submittal

Save document on your computer and send as an attachment, along with any photos to: Invasive.Species@wisconsin.gov

Mail specimen with this report form to: Invasive Plants Project
Wisconsin DNR
P.O. Box 7921
Madison, WI 53707-7921

Questions? Call (608) 267-5066
Website: http://dnr.wi.gov/topic/Invasives/

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Aquatic Invasive Animal Incident Report

Form 3200-126 (R 02/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive species on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email

Monitoring Location

Waterbody Name	Township Name	County	Boat Landing (if you only monitor at a boat landing)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time

Information on the Aquatic Invasive Animal Found (Fill out one form for each species found.)

Which aquatic invasive did you find? ☐ Zebra Mussel ☐ Quagga Mussel ☐ Spiny Waterflea ☐ Freshwater Jellyfish
☐ New Zealand Mud Snail ☐ Banded Mystery Snail ☐ Chinese Mystery Snail ☐ Rusty Crayfish ☐ Red Swamp Crayfish

Where did you find the invasive animal?

Latitude:	Longitude:

Measurements from where the invasive was found (optional)

Water Temperature Degrees F / Degrees C (circle one)	Dissolved Oxygen (mg/l)

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

If you found Zebra Mussel(s)

Water depth where Zebra Mussels were found _____ Feet / Meters (circle one) | Total Number of Zebra Mussels Found _____

What were the Zebra Mussels attached to?

☐ Dock/pier ☐ Dam ☐ Rocks ☐ Plants ☐ Boats or Gear ☐ Plate Sampler(s) ☐ Logs, acorns, pine cones or other woody structure
☐ Other: _____

Size of Largest Zebra Mussel Found	Size of Smallest Zebra Mussel Found (individual measurements on back of page)

Voucher Sample

Did you collect a sample (voucher specimen) and bring it to your local DNR office? If so, which office?

☐ Rhinelander ☐ Spooner ☐ Green Bay ☐ Oshkosh ☐ Did not take sample to a DNR office
☐ Fitchburg ☐ Waukesha ☐ Eau Claire ☐ Superior ☐ Other Office: _____

Please collect up to five specimens and bring a copy of this form, along with the sample and a map showing where you found the suspect invasive species to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

While field collecting, specimens can easily be kept alive in a bucket or other container with just about 1/2 inch of water in the bottom. Freeze specimens at the end of the day in a ziploc bag without water. If freezing is not possible for a long period of time preservation in rubbing alcohol (except for Jellyfish - leave fully in water) is sufficient.

For DNR AIS Coordinator to fill out

AIS Coordinator or qualified field staff who verified the occurrence: _____

Statewide taxanomic expert who verified the occurrence: _____
(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)

Was the specimen confirmed as the species indicated above? ☐ Yes ☐ No	If no, what was it?
Museum where specimen is housed: _____	Museum Specimen ID
Have you entered the results of the voucher in SWIMS? ☐ Yes ☐ No	

AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.

Length of Zebra or Quagga Mussels from Sample (if applicable)

If more than 20 zebra or quagga mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels.

Number	Length (mm)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Note: All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained

Appendix E. Documentation of Consultation

Mead & Hunt

Transmittal

1345B North Road, Green Bay, WI 54313

PROJECT:	Weed and Upper Red Lake As Needed Servic 0718900-170595.01	DATE:	1/2/2018
SUBJECT:	Upper Red Lake Dam and Weed Dam Invasive Species Monitoring and Control Plan-Comments Due No Later Than Friday February 2, 2018	TRANSMITTAL ID:	00004
PURPOSE:	For your review and comment	VIA:	Info Exchange

FROM

NAME	COMPANY	EMAIL	PHONE
Shawn Puzen 1345B North Road Green Bay, WI 54313		Shawn.Puzen@meadhunt.com	920-593-6865

TO

NAME	COMPANY	EMAIL	PHONE
Cheryl Laatsch 107 Sutliff Ave Rhinelander WI 54501 United States	Wisconsin Department of Natural Resources	cheryl.laatsch@wisconsin.gov	920-387-7869
nick_utrup@fws.gov		nick_utrup@fws.gov	

REMARKS:

Good Afternoon Cheryl and Nick,

Enclosed for your review and comment is a draft of the Invasive Species Monitoring and Control Plan for the Weed Dam and Upper Red Lake Hydroelectric Project. It was prepared in accordance with the license issued on February 7, 2017.

Please provide your comments by no later than end of day Friday February 2, 2018.

If GMU or I do not receive any comments by that date, we will assume you do not have any comments and will file the file plan with FERC accordingly.

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

Thanks!

Shawn Puzen | FERC Licensing & Compliance Senior Project Manager
Mead & Hunt | 1345B North Road | Green Bay, WI 54313
Direct: 920-593-6865 | Mobile: 920-639-2480
shawn.puzen@meadhunt.com | meadhunt.com
https://www.linkedin.com/in/shawnpuzen

Transmittal

DATE: 1/2/2018
TRANSMITTAL ID: 00004

DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	1/2/2018	20181227 GMU Invasive Species Plan sent to Agencies.pdf	

COPIES:

Brian Carroll (Gresham Municipal Utilities)

Wisconsin Department of Natural Resources Comments and Responses.

Shawn Puzen

From: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Sent: Monday, January 22, 2018 8:58 AM
To: Shawn Puzen
Subject: Weed/Greshem AIS:
Attachments: Weed.docx

Hi - See the attachment. Lets discuss.

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

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


dnr.wi.gov

From: Hudak, Andrew J - DNR
Sent: Monday, January 22, 2018 8:47 AM
To: Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>
Subject:

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

Andrew Hudak
Water Resources Management Specialist – Bureau of Water Quality
Wisconsin Department of Natural Resources
2984 Shawano Ave
Green Bay, WI 54313
Phone: (920) 662-5117
Fax: (920) 662-5498
Andrew.hudak@wisconsin.gov


dnr.wi.gov

Weed/Gresham

-PI Plant survey to be completed every 5-years- Should discuss alternative to funding if Lake District does not conduct PI survey. Section 6 needs an additional paragraph to address future surveys.

-Section 8 Add official DNR language for disinfection.

-Annual surveys for rapid response species should occur at 4 access locations and trash rack cleanings. Protocol excerpt below is from Early Detection SOP v2017. The included table 4-1 as the species to look for. Discuss Zebra mussel veliger and spiny water flea protocols. EDRR protocol is for net tows. Should discuss

- Survey all public boat landings (public and commercial). Do not include small, backyard boat ramps. Record the location of each boat landing from the shoreline in decimal degrees using a GPS (datum WGS84) whether or not any AIS are found.
- Each landing is searched for 30 minutes using snorkeling, D-nets, rakes, and surveying shoreline. Snorkel for 15 minutes covering an area of shoreline 200' long out to the maximum depth of plant growth or 100' from shore. See Appendix A for snorkeling guidance. For distance reference, baseball bases are 90' apart and a football field is 300' long. Spend 15 minutes using the D-net and rake in the shallow water and also examining the shoreline for 200'.
- For QAQC purposes, collect specimens of all AIS recorded.
- If there is poor visibility or safety is a concern (e.g. blue-green algae bloom), do not snorkel. Instead, analyze rake tows and D-net samples for about 30 minutes within the defined area (200' shoreline and 100' from shore).
- Record data on Early Detection form.

-Response framework for new discoveries. See below

How

1. New populations of invasive species in Wisconsin should be reported by:
   - Visiting the Invasive Species webpage and filling out the appropriate form

   OR
   - Contacting the Invasive Species Program Specialist at invasive.species@wisconsin.gov.

2. Suspected new discoveries of invasive should be documented with photographs when possible, to assist with initial identification and verification and provide to the invasive species program specialist.

-Funding for AIS work $3000 annually plus up to $3000 for EDRR if needed.

Responses to WDNR Comments

WDNR Comment
PI Plant survey to be completed every 5-years- Should discuss alternative to funding if Lake District does not conduct PI survey. Section 6 needs an additional paragraph to address future surveys.

GMU Response
The plan has been amended accordingly.

WDNR Comment
Section 8 Add official DNR language for disinfection.

GMU Response
The plan has been updated to reference the DNR Best Management Practices and provides a link to the current location of the information on the WDNR website. Since Online on public website look for language. GMU has chosen not to include the best management practices verbatim in the plan because the best management practices themselves indicate they should be reviewed and updated at least every five years. Including the current version would diminish the incentive to search out the current version.

WDNR Comment
Annual surveys for rapid response species should occur at 4 access locations and trash rack cleanings.

GMU Response
The WDNR clarified on January 25, 2018. The four access locations are the same access locations named in the draft plan. The plan has been updated in consultation with the WDNR to include annual rapid response surveys, with a notification to the WDNR and Commission the annual survey has been completed. A summary report of monitoring activities will be submitted to the WDNR for comment and filed with the Commission (after WDNR comments have been addressed) every five years (beginning in 2023).

WDNR Comment
The included table 4-1 are the species to look for.

GMU Response
Comment noted.

WDNR Comment
Protocol excerpt below is from Early Detection SOP v2017. Used revised protocol use 4-5 main bullet points.

Discuss Zebra mussel veliger and spiny water flea protocols EDRR protocol is for net tows. Should discuss

- *Survey all public boat landings (public and commercial). Do not include small, backyard boat ramps. Record the location of each boat landing from the shoreline in decimal degrees using a GPS (datum WGS84) whether or not any AIS are found.*
- *Each landing is searched for 30 minutes using snorkeling, D-nets, rakes, and surveying shoreline. Snorkel for 15 minutes covering an area of shoreline 200' long out to the maximum depth of plant growth or 100' from shore. See Appendix A for snorkeling guidance. For distance reference, baseball bases are 90' apart and a football field is 300' long. Spend 15 minutes using the D-net and rake in the shallow water and also examining the shoreline for 200'.*
- *For QAQC purposes, collect specimens of all AIS recorded.*

- *If there is poor visibility or safety is a concern (e.g. blue-green algae bloom), do not snorkel. Instead, analyze rake tows and D-net samples for about 30 minutes within the defined area (200' shoreline and 100' from shore).*

GMU Response
For zebra mussel veligers and spiny water fleas, GMU will collect a water sample at each of the four access points using a 54 µm net with two 2-meter tows in 5-10 feet of water. The samples will be sent to the WDNR invasive species coordinator for analysis.

The other aquatic search methods will approximate the WDNR protocols guidelines such that the intent is met. Each of the four access sites will use rake tows within an area of 200' of shoreline and 100' from the shore. Each area will be searched for 30 minutes and will also, within that time-frame involve over-turning of rocks in shallow waters to attempt to identify invasive macro-invertebrates.

WDNR Comment
Response framework for new discoveries. See below

1. New populations of invasive species in Wisconsin should be reported by:
• Visiting the Invasive Species webpage and filling out the appropriate form
OR
• Contacting the Invasive Species Program Specialist at invasive.species@wisconsin.gov.

2. Suspected new discoveries of invasive should be documented with photographs when possible, to assist with initial identification and verification and provide to the invasive species program specialist.

GMU Response
GMU has included the appropriate form in the plan and indicated it will use updated forms when notified by the WDNR. GMU has added the email address for reporting purposes and instructions to attach photos.

WDNR Comment
Funding for AIS work $3000 annually plus up to $3000 for EDRR if needed.

GMU Response
GMU clarified on January 25, 2018 to the WDNR that the $3000 for EDRR would be in addition to the $3,000 provided annually.

The U.S. Fish and Wildlife Service did not respond with comments.

A

APPENDIX A

Public Participation Materials

Red Lake's District News Letter

This Picture highlights a Lone Ice Fisherman on the Upper Red after a Febuary Snow Fall.

It has been a long winter, but the Ice fishermen have had a great time on our Red Lake's. The fishing has been very good and we have made the sport section highlights in the Green Bay Press Gazette and Appleton Post Crescent. Our lakes are truely a popular ice fishing destination in Northeastern Wisconsin, and for good reason they have an above average fishery for all of us to enjoy.

Lake Planning Grant Update

We are very pleased to announce that we have been awarded two State Lake Study Grants, one each for the Upper and Lower Red Lake's. These Grants will provide the scientific data on our lake's ecology that we will need to develop a technically sound improvement plan that gives us a high degree of probability for success. When this study is completed we will also have the required foundation neccessary to qualify for other State Grant money for lake improvement projects. This will be the first important step in improving our beautiful Red Lake's.

We will kick-off the Red Lakes Comprehensive Management Planning Project at our Spring meeting.

This meeting will be held June 3, from 10:00 AM - 12:00PM at the Herman Town Hall.

Please try to make the meeting. We will have the project leader, Aquatic Ecologist Tim Hoyman there to share the projects goals and what will happen this year. Tim will also be able to answer any question you may have about the project and our lakes.

At this meeting we will also be gathering your input to this summers weed cutting plan for both the Upper and Lower Red Lakes.

Wanted Part-time Weed Cutters

Pay is $10.00 and hour, work hours are flexable. The person must have a valid drivers license, and be able to operate large equipment and perform light maintenance. To apply call Dave LeMere at 787-3717

WEEDs , WEEDS, WEEDS

Lake weeds make excellent mulch. Nothing beats adequaltely mulching for your garden plot.. A 6 inch layer of lake weeds will provide excellent weed control, they decompose quickly and they are high in nutrients. They also have high moisture retention and best of all they are free to all District members. We will deliver lake weeds to District members on a first come first serve basis from mid-June through mid-September free of cost. Non-District members can have weeds delivered at the cost of transportation to their site. To take advantage of this great deal call Dave LeMere at 715-787-3717

We Need Your Help

We plan on publishing a news letter twice a year and would like to have a variety of stories related to our Lakes.

If you have any stories, or pictures relating to our Red Lakes please let us know. Do you have any old stories relating to the history of the Red Lakes!. Pictures of that big fish or a nice catch of fish. Do you want to introduce a new district member who has moved into the area. Everything and anything that you think would be of interest to the community would be greatly appreciated. I will be willing to take interviews and write the articles. So don't hesitate to contact Dave LeMere at 787-3717

Mark your Calendars
Our District Meeting Schedules

Spring District Meeting
June 3, 10:00AM-12:00PM at the Herman Town Hall
- Weed Cutting Plan for summer
- Kick off the Lake Study

Fall District Meeting
August 26, 10:00AM - 12:00PM at the Red Springs Town Hall.
- Election of Commissioners
- Review and approve our annual budget for 2007

Your District Commissioners

David LeMere - Chairperson 787-3717
Art Krause - Treasurer 787-4302
Wayne Buettner - Secretary 787-3682
Dan Boucher 787-3785
Bert Grover 787-3323

Apointed Commissioners

Marshall Giese 787-3217
Richard Giese 787-3480

Red Lakes Management District
P.O. Box 140
Gresham Wis. 54128

Red Lakes Comprehensive Lake Management Plan
Project Kick-Off Meeting
June 3, 2006 10:00 am – Herman Town Hall

Aquatic ecologist, Tim Hoyman, speaks to a lake group in Waushara County about their lake management plan. Public participation will be integral part of the Red Lakes project.

The Red Lakes Management District has received two grants from the Wisconsin Department of Natural Resources to partially fund the completion of a comprehensive management plan for Upper and Lower Red Lakes. The project has two primary objectives, the first being the completion of an in-depth studies including multiple plant surveys, water quality sampling, and watershed investigations; the second being the completion of a realistic management plan covering both lakes and their watershed. Most of the studies will be completed during this spring, summer and fall. The tasks associated with the analysis of the data will be completed during the fall and winter. The project will also incorporate opportunities for stakeholder education and input, which are both very important components of all lake management planning efforts. The first opportunity for your participation in the process will be at the Project Kick-off Meeting to be held on Saturday, June 3rd at 10:00 am at the Herman Town Hall.

Onterra, LLC, a lake management planning firm out of De Pere, has been hired to lead the project. During the meeting, aquatic ecologists from Onterra will describe the project and its importance. Their presentation will include a description of the project's components, a quick course on lake ecology, and breakdown of how the District's Planning Committee will be involved in the plan's completion. The preliminary harvest plan used to gain our harvesting permit from the Wisconsin Department of Natural Resources will also be on display and discussed during the meeting. So, please plan on attending the meeting and do not hesitate to ask questions or make comments.

Red Lakes Comprehensive Management Planning

Project Update – September 2006

Submitted By: Eddie Heath, Aquatic Ecologist, Onterra

The end of August signals that another field season on the lakes will be ending soon. Because of the large number of hot, sunny days, this summer was much an exceptional year for aquatic plant growth. Although this may have been a slight inconvenience for some riparians, it was a good summer to perform our necessary studies.

The first goal of the Red Lakes Comprehensive Management Planning Project is to collect the necessary data and analyze this data in order to learn fact-based information about the lake. The majority of the data needed for this goal has already been collected and will soon be analyzed to help us reach the second goal – assisting the district in creating an implementable management plan.

The curly-leaf pondweed (CLP) study was completed on June 6-8. The findings of this survey show that CLP is scattered across most areas of both lakes. Extensive mapping was completed to identify the densities of this invasive plant and will result in the creation of a map depicting CLP densities through color gradients.

The comprehensive aquatic plant study was completed on Upper and Lower Red Lakes during July. We spent nearly 45 hours over 8 days assessing the lake's plant communities. A portion of this study used the point-intercept method where we sampled aquatic plants at predetermined points on each lake (see map). 307 points were sampled on Lower Red Lake and 314 points were sampled on Upper Red Lake. Not all of the points were visited because some areas of the lakes are too deep for plant growth and some areas were too shallow for boating. At each point that was sampled, we identified all of the plants and their densities as well as recorded depth and bottom type. These results will be the bulk of the aquatic plant data used in the lake management plan.

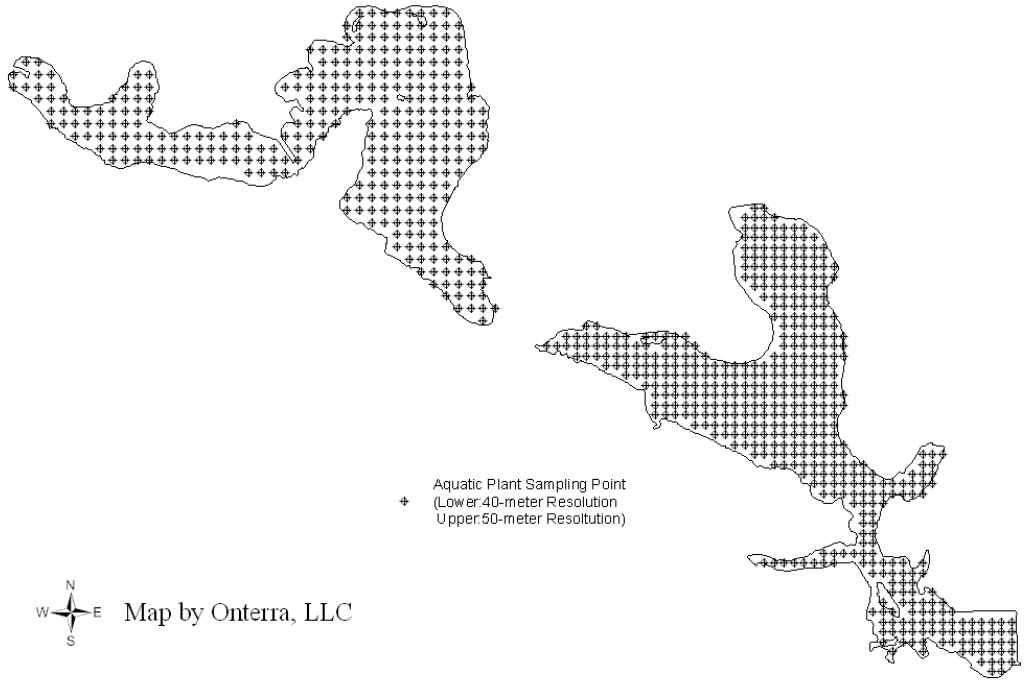
A second portion of the study included mapping of aquatic plant communities throughout the lake. A mapped community can consist of submergent, floating-leaf, or emergent plants, or a combination of these plant types. Examples of submergent plants include wild celery and pondweeds; while emergents include cattails, bulrushes, and arrowheads; and floating-leaf species include white and yellow pond lilies. Emergents and floating-leaf species lend themselves well to mapping, while submergents are much more difficult because they are often not visible from the surface and most species are often mixed throughout much of the lake. Emergent and floating leaf communities are generally the first to react to changes in lakes and baseline information relating to these communities will be helpful in determining changes in the lakes due to future conditions and management actions.

During the point-intercept portion of the study, preliminary analysis shows that Eurasian water milfoil (EWM) occurs across both lakes and in many areas was shown to be quite dense. Although the data has not been fully analyzed, it seems that chemical treatment of EWM is likely not a practical option on a lake-wide basis. Chemical treatments in

localized areas can be quite effective but whole lake treatments are far too costly and pose serious permitting road blocks. Other management actions may be needed to reduce the density of EWM in the lakes. It is important to note that it is impossible to eradicate EWM from the Red Lakes and reducing the densities of this invasive serve as a more realistic goal. Most importantly, many interesting native plants were observed in these lakes and it is important to create an environment in the lake for these natives to flourish and continue to provide the foundations of the ecosystems that support the excellent fishing conditions your lakes have.

In addition to studying the lakes' plant communities, we have also been monitoring various physical and chemical conditions in the lakes. Much of the chemical data analysis has yet to arrive from the Wisconsin State Laboratory of Hygiene. A delineation of the Red Lakes watershed and an evaluation of the land-use types within the watershed will soon be completed. Understanding the impacts that land-use types have on a system may provide options for limiting the amount of nutrients entering the lakes. However, flowages tend to have much larger watersheds than other lakes and therefore larger inputs of nutrients.

Taking into consideration the plant community data and the size of the watershed, it is safe to say that the Red Lakes are a highly productive system and can support a large amount of plants. Plant densities will always be quite large in these lakes. There is no silver bullet for combating the detriment of the non-native plants in this system and all management actions will need careful consideration.



Agenda
Red Lakes Management Planning Meeting

February 21, 2007 9:00am
Shawano County Courthouse Board Room

Meeting Premise: The Red Lakes are currently infested with Eurasian water milfoil and curly-leaf pondweed. Considering both lakes are flowages, with their water levels controlled by dams, drawdown for control of exotics is a potential management option. While drawdown itself is not a difficult concept, the completion of such an alternative may be. The intent of this meeting is to explore the feasibility and potential requirements of completing this action on the Red Lakes system.

Meeting Topics

1. Applicability of drawdown for controlling exotics in the Red Lakes
    a. Red Lakes exotics
    b. Depth
    c. Natives
    d. Fishery
2. WDNR Permitting
    a. Requirements
    b. Timeline
3. WDNR Lake Protection Grants
    a. What can the funds be used for?
    b. Plan requirements
4. Village of Gresham
    a. Hydroelectric dams
    b. Participation in planning and implementation
5. Miscellaneous
    a. Obtaining stakeholder buy-in
    b. Realistic timeline for drawdown

B

APPENDIX B

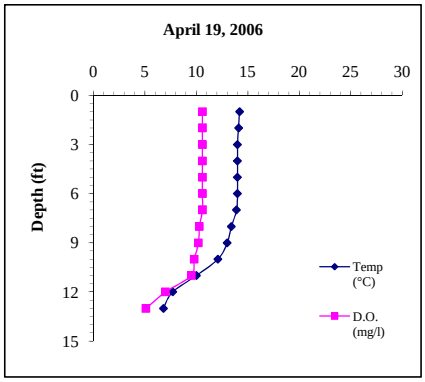
Water Quality Data

Upper Red Lake

Date: 04-19-06
Time: 13:45
Weather: 90% Clouds, Windy, 12°C
Ent: EJH **Verf:**

Max Depth (ft): 14.2
URLS Depth (ft): 1.5
URLB Depth (ft): 12.0
Secchi Depth (ft): 7.2

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	14.2	10.6	8.6	310
2.0	14.1	10.6	8.6	311
3.0	14.0	10.6	8.6	312
4.0	14.0	10.6	8.6	312
5.0	14.0	10.6	8.7	312
6.0	14.0	10.6	8.7	312
7.0	13.9	10.6	8.7	312
8.0	13.4	10.3	8.7	314
9.0	13.0	10.2	8.7	314
10.0	12.1	9.8	8.5	317
11.0	10.0	9.5	8.3	334
12.0	7.7	7.0	7.9	381
13.0	6.8	5.1	7.8	389



Parameter	URLS	URLB
Total P (µg/L)	26.0	33.0
Dissolved P (µg/L)	ND	ND
Chl a (µg/L)	7.05	
TKN (µg/L	610.0	610.0
NO3+NO2-N (µg/L)	437.0	368.0
NH3-N (µg/L)	23.0	ND
Total N (µg/L)	1047.0	978.0
Lab Cond. (µS/cm)	319	375
Lab pH	8.46	8.16
Alkal (mg/l CaCO3)	147.0	171.0
Total Susp Sol (mg/l)	2.0	3.0
Calcium (mg/l)	38.0	

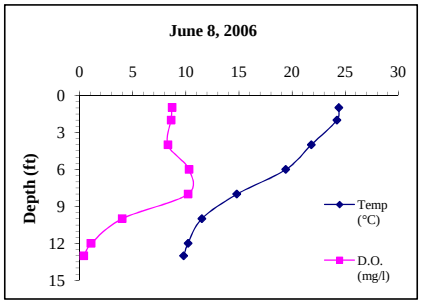
Sample Collected by EJH

Upper Red Lake

Date: 06-08-06
Time: Noon
Weather: Full Sun, 85°F
Ent: EJH **Verf:**

Max Depth (ft): 13.6
URLS Depth (ft): 1.5
URLB Depth (ft): 11.0
Secchi Depth (ft): 7.6

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	24.4	8.7	8.8	332
2.0	24.2	8.6	8.8	332
4.0	21.8	8.3	8.6	344
6.0	19.4	10.3	8.6	344
8.0	14.8	10.2	8.3	276
10.0	11.5	4.0	7.9	283
12.0	10.2	1.1	7.8	290
13.0	9.8	0.4	7.9	303



Parameter	URLS	URLB
Total P (µg/L)	56.0	30.0
Dissolved P (µg/L)		
Chl a (µg/L)	5.82	
TKN (µg/L	690.0	640.0
NO3+NO2-N (µg/L)	195.0	341.0
NH3-N (µg/L)	58.0	29.0
Total N (µg/L)	885.0	981.0
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

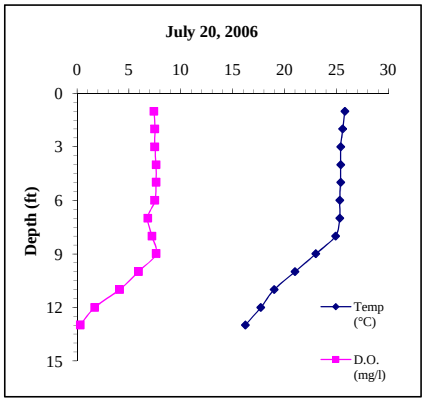
Samples collected by EJH, CS

Upper Red Lake

Date: 07-20-06
Time: 10:30
Weather: Full sun and Windy, 80°F
Ent: EJH **Verf:**

Max Depth (ft): 13.8
URLS Depth (ft): 1.5
URLB Depth (ft): 12.0
Secchi Depth (ft): 11.5

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	25.8	7.4	9.0	326
2.0	25.6	7.5	9.1	327
3.0	25.4	7.5	9.1	326
4.0	25.4	7.6	9.0	326
5.0	25.4	7.6	9.0	326
6.0	25.3	7.5	9.1	326
7.0	25.3	6.8	8.9	329
8.0	24.9	7.2	9.0	328
9.0	23.0	7.6	8.8	320
10.0	21.0	5.9	8.4	316
11.0	19.0	4.1	8.2	316
12.0	17.7	1.7	8.0	319
13.0	16.2	0.3	7.9	324



Parameter	URLS	URLB
Total P (µg/L)	34.0	69.0
Dissolved P (µg/L)	4.0	22.0
Chl a (µg/L)	4.80	
TKN (µg/L	570.0	970.0
NO3+NO2-N (µg/L)	ND	ND
NH3-N (µg/L)	36.0	113.0
Total N (µg/L)	570.0	970.0
Lab Cond. (µS/cm)	324	321
Lab pH	8.50	7.94
Alkal (mg/l CaCO3)	152.0	152.0
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

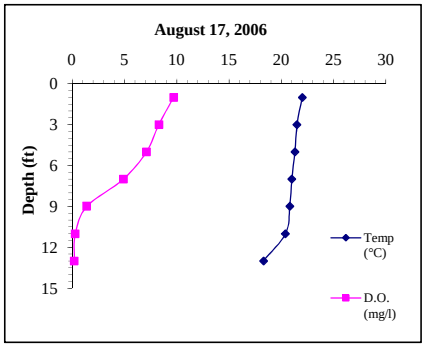
Samples Collected by EJH, CS. SLOH received sample with ice melted

Upper Red Lake

Date: 08-17-06
Time: 15:30
Weather: Full Sun, No Wind, 68°F
Ent: EJH **Verf:**

Max Depth (ft): 13.7
URLS Depth (ft): 1.5
URLB Depth (ft): 12.0
Secchi Depth (ft): 6.8

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	22.0	9.7	8.9	324
3.0	21.5	8.3	8.6	327
5.0	21.3	7.1	8.4	331
7.0	21.0	4.9	8.2	334
9.0	20.8	1.4	7.8	331
11.0	20.4	0.3	7.6	318
13.0	18.3	0.2	7.6	370



Parameter	URLS	URLB
Total P (µg/L)	41.0	279.0
Dissolved P (µg/L)		
Chl a (µg/L)	22.50	
TKN (µg/L	760.0	1820.0
NO3+NO2-N (µg/L)	221.0	ND
NH3-N (µg/L)	ND	767.0
Total N (µg/L)	782.5	1820.0
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	10.0
Calcium (mg/l)		

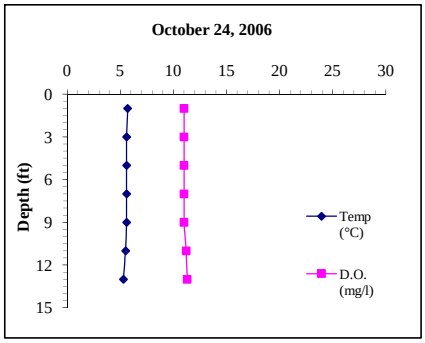
Samples Collected by TAH, MJH.

Upper Red Lake

Date: 10-24-06
Time: 13:00
Weather: 80% Sun, 40°F
Ent: EJH **Verf:**

Max Depth (ft): 14.0
URLS Depth (ft): 1.5
URLB Depth (ft): 12.0
Secchi Depth (ft): 9.2

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	5.7	11.0	8.3	327
3.0	5.6	11.0	8.3	327
5.0	5.6	11.0	8.4	327
7.0	5.6	11.0	8.4	326
9.0	5.6	11.0	8.5	325
11.0	5.5	11.2	8.5	324
13.0	5.3	11.3	8.5	324



Parameter	URLS	URLB
Total P (µg/L)	16.0	15.0
Dissolved P (µg/L)		
Chl a (µg/L)	1.38	
TKN (µg/L		
NO3+NO2-N (µg/L)		
NH3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

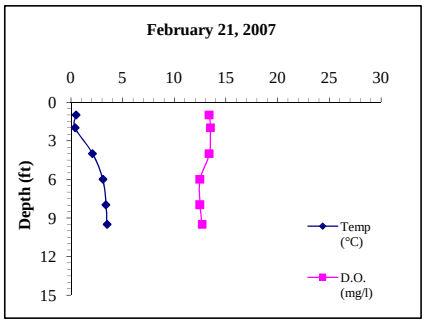
Samples Collected by EJH

Upper Red Lake

Date: 02-21-07
Time: Noon
Weather: 60% Sun, 36°F
Ent: EJH **Verf:**

Max Depth (ft): 10.8
URLS Depth (ft): 3.0
URLB Depth (ft): 9.5
Secchi Depth (ft): 10.8 Hit bottom

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	0.5	13.4	7.5	447
2.0	0.4	13.5	7.5	445
4.0	2.1	13.4	7.7	462
6.0	3.1	12.5	7.7	487
8.0	3.4	12.5	7.8	456
9.5	3.5	12.7	7.9	455



Parameter	URLS	URLB
Total P (µg/L)	11.0	20.0
Dissolved P (µg/L)	ND	ND
Chl a (µg/L)		
TKN (µg/L	ND	250.0
NO3+NO2-N (µg/L)	1940.0	1850.0
NH3-N (µg/L)	17.0	8.0
Total N (µg/L)	1940.0	2100.0
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	0.0
Calcium (mg/l)		

Samples Collected by EJH, TAH, MG. Ice: 2.9 ft.

Water Quality Data

2006-07	Surface		Bottom	
Parameter	Count	Mean	Count	Mean
Secchi Depth (feet)	6	8.9		
Total P (µg/L)	6	30.667	6	74.333
Dissolved P (µg/L)	3	1.333	3	7.333
Chl a (µg/L)	5	8.310	0	
TKN (µg/L	5	526.000	5	858.000
NO4+NO3-N (µg/L)	5	558.600	5	511.800
NH3-N (µg/L)	5	26.800	5	183.400
Total N (µg/L)	5	1044.900	5	1369.800
Lab Cond. (µS/cm)	2	321.500	2	348.000
Lab pH	2	8.480	2	8.050
Alkal (mg/l CaCO3)	2	149.500	2	161.500
Total Susp Sol (mg/l)	6	0.333	6	2.167
Calcium (µg/L)	1	38	0	

Wisconsin Trophic State Index (WTSI)			
Year	TP	Chla	SD
1991	55.42	52.03	46.56
2006	57.53	52.77	46.05
All Years (weighted)	56.55	52.29	46.30
WI Impoundments	60.51	58.05	56.10
Central Region	51.45	49.88	47.33

Morphological / Geographical Data

Parameter	Value
Acreage	188
Volume (acre-feet)	1096
Perimeter (miles)	4.75
Shoreland Development	2.47
Maximum Depth (feet)	15
County	Shawano County
WBIC	329900
Lillie Mason Region(1983)	Central Region
Nichols Ecoregion(1999)	NCSE

Watershed Data

WiLMS Class	Acreage	kg/yr	lbs/yr
Row Crops	2594	1050	2310
Pasture/Grass	24473	2971	6536
HD Urban	23	14	31
MD Urban	68	14	31
Wetlands	16060	650	1430
Forest	41737	1520	3344
Open Water	206	25	55

Watershed to Lake Area 499 :1

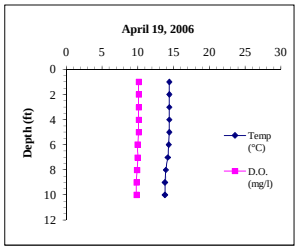
	Secchi (feet)				Chlorophyll a (µg/L)				Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1991	3	8.3	3	8.3	6	10.0	6	10.0	3	33.3	3	33.3
2006	5	8.5	3	8.6	5	8.3	3	11.0	5	34.6	3	43.7
All Years (weighted)		8.4		8.5		9.2		10.3		34.1		38.5
WI Impoundments				4.3				22.3				64.0
Central Region				7.9				7.5				20.0

Lower Red Lake

Date: 04-19-06
Time: 14:50
Weather: 90% Clouds, Windy, 12°C
Ent: EJH **Verf:**

Max Depth (ft): 11.1
LRLS Depth (ft): 1.5
LRLB Depth (ft): 9.0
Secchi Depth (ft): 6.0

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	14.4	10.1	8.5	303
2.0	14.4	10.1	8.5	302
3.0	14.4	10.1	8.5	303
4.0	14.4	10.1	8.5	307
5.0	14.4	10.1	8.5	309
6.0	14.3	10.0	8.6	310
7.0	14.2	10.0	8.6	315
8.0	13.9	9.9	8.6	315
9.0	13.8	9.8	8.6	315
10.0	13.8	9.8	8.6	315



Parameter	LRLS	LRLB
Total P (µg/L)	37.0	28.0
Dissolved P (µg/L)	ND	ND
Chl a (µg/L)	10.30	
TKN (µg/L	720.0	620.0
NO3+NO2-N (µg/L)	425.0	492.0
NH3-N (µg/L)	22.0	29.0
Total N (µg/L)	1145.0	1112.0
Lab Cond. (µS/cm)	307	321
Lab pH	8.39	8.38
Alkal (mg/l CaCO3)	140.0	147.0
Total Susp Sol (mg/l)	3.0	3.0
Calcium (mg/l)	37.8	

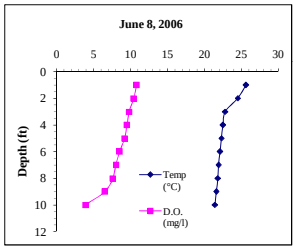
Samples Collected by EJH.

Lower Red Lake

Date: 06-08-06
Time: Noon
Weather: Full Sun, 85°F
Ent: EJH **Verf:**

Max Depth (ft): 11.2
LRLS Depth (ft): 1.5
LRLB Depth (ft): 9.0
Secchi Depth (ft): 5.6

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	25.6	10.8	9.3	270
2.0	24.5	10.4	9.2	311
3.0	22.8	9.8	9.1	323
4.0	22.5	9.5	9.1	330
5.0	22.3	9.2	9.0	333
6.0	22.1	8.5	9.0	335
7.0	21.9	8.0	9.0	340
8.0	21.8	7.6	9.0	340
9.0	21.6	6.5	8.9	337
10.0	21.4	3.9	8.5	327



Parameter	LRLS	LRLB
Total P (µg/L)	70.0	42.0
Dissolved P (µg/L)		
Chl a (µg/L)	5.90	
TKN (µg/L	700.0	640.0
NO3+NO2-N (µg/L)	132.0	223.0
NH3-N (µg/L)	18.0	108.0
Total N (µg/L)	832.0	863.0
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	2.0	3.0
Calcium (mg/l)		

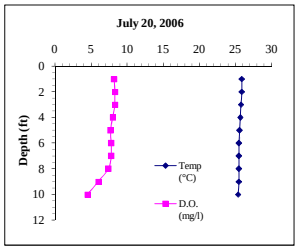
Samples collected by EJH, CS

Lower Red Lake

Date: 07-20-06
Time: 9:56
Weather: Full sun and Windy, 80°F
Ent: EJH **Verf:**

Max Depth (ft): 11.2
LRLS Depth (ft): 1.5
LRLB Depth (ft): 9.0
Secchi Depth (ft): 8.9

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	25.9	8.2	9.2	324
2.0	25.9	8.3	9.2	324
3.0	25.8	8.3	9.2	321
4.0	25.7	8.0	9.3	309
5.0	25.6	7.7	9.2	312
6.0	25.5	7.8	9.2	327
7.0	25.5	7.8	9.1	330
8.0	25.5	7.4	9.1	331
9.0	25.5	6.0	9.0	334
10.0	25.4	4.5	8.8	331



Parameter	LRLS	LRLB
Total P (µg/L)	39.0	36.0
Dissolved P (µg/L)	4.0	4.0
Chl a (µg/L)	6.22	
TKN (µg/L	450.0	540.0
NO3+NO2-N (µg/L)	ND	38.0
NH3-N (µg/L)	17.0	36.0
Total N (µg/L)	450.0	578.0
Lab Cond. (µS/cm)	320	330
Lab pH	8.53	8.31
Alkal (mg/l CaCO3)	151.0	156.0
Total Susp Sol (mg/l)	ND	2.0
Calcium (mg/l)		

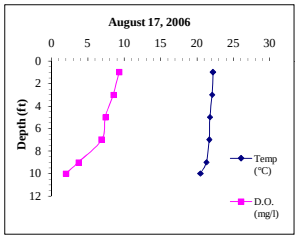
Samples Collected by EJH, CS. SLOH received sample with ice melted

Lower Red Lake

Date: 08-17-06
Time: 14:00
Weather: Full Sun, No Wind, 68°F
Ent: EJH **Verf:**

Max Depth (ft): 11.2
LRLS Depth (ft): 1.5
LRLB Depth (ft): 9.5
Secchi Depth (ft): 5.3

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	22.2	9.3	8.9	320
3.0	22.1	8.5	8.8	323
5.0	21.8	7.4	8.7	327
7.0	21.7	6.9	8.6	326
9.0	21.3	3.7	8.1	303
10.0	20.5	2.0	7.7	273



Parameter	LRLS	LRLB
Total P (µg/L)	59.0	33.0
Dissolved P (µg/L)		
Chl a (µg/L)	30.70	
TKN (µg/L	1020.0	770.0
NO3+NO2-N (µg/L)	232.0	240.0
NH3-N (µg/L)	17.0	92.0
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	2.0	2.0
Calcium (mg/l)		

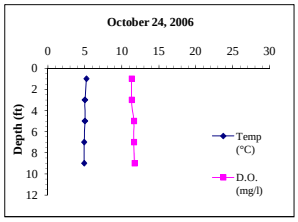
Samples Collected by TAH, MJH.

Lower Red Lake

Date: 10-24-06
Time: Noon
Weather: 80% Sun, 40°F
Ent: EJH **Verf:**

Max Depth (ft): 11.0
LRLS Depth (ft): 1.5
LRLB Depth (ft): 9.5
Secchi Depth (ft): 8.0

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	5.2	11.3	8.2	241
3.0	5.0	11.3	8.4	307
5.0	5.0	11.6	8.6	308
7.0	4.9	11.6	8.7	313
9.0	4.9	11.7	8.7	314



Parameter	LRLS	LRLB
Total P (µg/L)	19.0	12.0
Dissolved P (µg/L)		
Chl a (µg/L)	1.22	
TKN (µg/L		
NO3+NO2-N (µg/L)		
NH3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

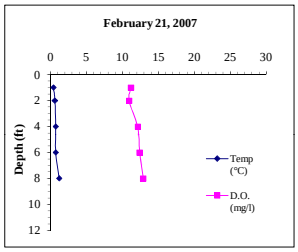
Samples Collected by EJH

Lower Red Lake

Date: 02-21-07
Time: 13:30
Weather: 60% Sun, 36°F
Ent: EJH **Verf:**

Max Depth (ft): 9.0
LRLS Depth (ft): 3.0
LRLB Depth (ft): 6.5
Secchi Depth (ft): 9.0 Hit bottom

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	0.4	11.2	7.4	409
2.0	0.6	10.9	7.4	399
4.0	0.7	12.1	7.6	438
6.0	0.7	12.4	7.6	444
8.0	1.2	12.9	7.8	435



Parameter	LRLS	LRLB
Total P (µg/L)	14.0	12.0
Dissolved P (µg/L)	5.0	3.0
Chl a (µg/L)		
TKN (µg/L	ND	23.0
NO3+NO2-N (µg/L)	2003.0	1980.0
NH3-N (µg/L)	49.0	28.0
Total N (µg/L)	2003.0	2003.0
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

Samples Collected by EJH, TAH, MG. Ice: 1.8 ft.

Water Quality Data

2006-07	Surface		Bottom	
Parameter	Count	Mean	Count	Mean
Secchi Depth (feet)	6	7.1		
Total P (µg/L)	6	39.667	6	27.167
Dissolved P (µg/L)	2	4.500	2	3.500
Chl a (µg/L)	5	10.868	0	
TKN (µg/L	4	722.500	5	518.600
NO4+NO3-N (µg/L)	4	698.000	5	594.600
NH3-N (µg/L)	5	24.600	5	58.600
Total N (µg/L)	4	1107.500	4	1139.000
Lab Cond. (µS/cm)	2	313.500	2	325.500
Lab pH	2	8.460	2	8.345
Alkal (mg/l CaCO3)	2	145.500	2	151.500
Total Susp Sol (mg/l)	3	2.333	4	2.500
Calcium (µg/L)	1	37.8	0	

Wisconsin Trophic State Index (WTSI)			
Year	TP	Chla	SD
1991	54.52	48.61	50.94
1993			40.15
1994			41.92
1995			53.34
1996			49.92
2006	59.47	54.70	49.37
All Years (weighted)	57.38	51.23	49.37
WI Impoundments	60.51	58.05	56.10
Central Region	51.45	49.88	47.33

Morphological / Geographical Data

Parameter	Value
Acreage	240
Volume (acre-feet)	1601
Perimeter (miles)	6.27
Shoreland Development	2.89
Maximum Depth (feet)	28
County	Shawano County
WBIC	327800
Lillie Mason Region(1983)	Central Region
Nichols Ecoregion(1999)	NCSE

Watershed Data

WiLMS Class	Acreage	kg/yr	lbs/yr
Row Crops	0.0	0	0
Pasture/Grass	0.0	0	0.0
HD Urban	0.0	0	0.0
MD Urban	0.0	0	0.0
Wetlands	1060.0	650	1430.0
Forest	68895.0	2509	5519.8
Open Water	206	25	55.0

Watershed to Lake Area 413 :1

	Secchi (feet)				Chlorophyll a (µg/L)				Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1975									1	30.0		
1977									1	40.0		
1991	3	8.0	3	8.0	6	6.3	6	6.3	3	29.7	3	29.7
1993	5	6.2	5	6.2								
1994	1	13.0	1	13.0								
1995	3	11.3	1	11.5								
1996	10	5.6	6	5.2								
2006	5	6.8	3	6.6	5	10.87	3	14.27	5	44.80	3	56.0
All Years (weighted)		7.1		6.9		8.4		9.0		47.9		42.8
WI Impoundments				4.3				22.3				64.0
Central Region				7.9				7.5				20.0

C

APPENDIX C

Watershed Analysis WiLMS Results

Date: 5/25/2007 Scenario: Upper Red Current

Lake Id: Upper Red
Watershed Id: Red River

Hydrologic and Morphometric Data

Tributary Drainage Area: 84955.0 acre
Total Unit Runoff: 10.8 in.
Annual Runoff Volume: 76459.5 acre-ft
Lake Surface Area <As>: 206 acre
Lake Volume <V>: 1096 acre-ft
Lake Mean Depth <z>: 5.3 ft
Precipitation - Evaporation: 4.6 in.
Hydraulic Loading: 76538.5 acre-ft/year
Areal Water Load <qs>: 371.5 ft/year
Lake Flushing Rate <p>: 69.83 1/year
Water Residence Time: 0.01 year
Observed spring overturn total phosphorus (SPO): 26 mg/m^3
Observed growing season mean phosphorus (GSM): 34.6 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	2594	0.50	1.00	3.00	16.8	525	1050	3149
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	24473	0.10	0.30	0.50	47.6	990	2971	4952
HD Urban (1/8 Ac)	23	1.00	1.50	2.00	0.2	9	14	19
MD Urban (1/4 Ac)	68	0.30	0.50	0.80	0.2	8	14	22
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	16060	0.10	0.10	0.10	10.4	650	650	650
Forest	41737	0.05	0.09	0.18	24.3	845	1520	3040
Lake Surface	206.0	0.10	0.30	1.00	0.4	8	25	83

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.3	0.5	0.8	
# capita-years	0.0				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	6692.5	13765.4	26269.6	100.0
Total Loading (kg)	3035.7	6243.9	11915.8	100.0
Areal Loading (lb/ac-year)	32.49	66.82	127.52	0.0
Areal Loading (mg/m^2-year)	3641.46	7489.84	14293.50	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	6674.2	13710.2	26085.8	100.0
Total NPS Loading (kg)	3027.4	6218.9	11832.4	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/25/2007 Scenario: Upper Red Current
Observed spring overturn total phosphorus (SPO): 26.0 mg/m^3
Observed growing season mean phosphorus (GSM): 34.6 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m^3)	Most Likely Total P (mg/m^3)	High Total P (mg/m^3)	Predicted -Observed (mg/m^3)	% Dif.
Walker, 1987 Reservoir	29	59	112	24	69
Canfield-Bachmann, 1981 Natural Lake	30	60	110	25	72
Canfield-Bachmann, 1981 Artificial Lake	28	54	94	19	55
Rechow, 1979 General	25	51	97	16	46
Rechow, 1977 Anoxic	28	58	111	23	66
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	26	54	103	19	55
Walker, 1977 General	29	59	113	33	127
Vollenweider, 1982 Combined OECD	24	44	75	14	46
Dillon-Rigler-Kirchner	26	53	101	27	104
Vollenweider, 1982 Shallow Lake/Res.	20	37	65	7	23
Larsen-Mercier, 1976	29	59	113	33	127
Nurnberg, 1984 Oxic	28	59	112	24	69

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	34	98	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	19	173	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	17	156	FIT	1	GSM
Rechow, 1979 General	29	86	FIT	0	GSM
Rechow, 1977 Anoxic	34	96	FIT	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	37	84	FIT	0	GSM
Walker, 1977 General	29	107	FIT	0	SPO
Vollenweider, 1982 Combined OECD	21	79	Tw	0	ANN
Dillon-Rigler-Kirchner	31	87	P L p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	18	66	Tw	0	ANN
Larsen-Mercier, 1976	36	96	P Pin p	0	SPO
Nurnberg, 1984 Oxic	30	104	L	0	ANN

Date: 5/25/2007 Scenario: Upper Red Row Crop to Forest

Lake Id: Upper Red
Watershed Id: Red River

Hydrologic and Morphometric Data

Tributary Drainage Area: 84955.0 acre
Total Unit Runoff: 10.80 in.
Annual Runoff Volume: 76459.5 acre-ft
Lake Surface Area <As>: 206.0 acre
Lake Volume <V>: 1096.0 acre-ft
Lake Mean Depth <z>: 5.3 ft
Precipitation - Evaporation: 4.6 in.
Hydraulic Loading: 76538.5 acre-ft/year
Areal Water Load <qs>: 371.5 ft/year
Lake Flushing Rate <p>: 69.83 1/year
Water Residence Time: 0.01 year
Observed spring overturn total phosphorus (SPO): 26.0 mg/m^3
Observed growing season mean phosphorus (GSM): 34.6 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	0	0.50	1.00	3.00	0.0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	0	0.10	0.30	0.50	0.0	0	0	0
HD Urban (1/8 Ac)	0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	0	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	16060.0	0.10	0.10	0.10	20.4	650	650	650
Forest	68895	0.05	0.09	0.18	78.8	1394	2509	5019
Lake Surface	206.0	0.10	0.30	1.00	0.8	8	25	83

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.30	0.50	0.80	
# capita-years	0.0			
% Phosphorus Retained by Soil	98.0	90.0	80.0	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	4524.7	7020.2	12681.0	100.0
Total Loading (kg)	2052.4	3184.3	5752.0	100.0
Areal Loading (lb/ac-year)	21.96	34.08	61.56	
Areal Loading (mg/m^2-year)	2461.91	3819.72	6899.81	
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	4506.3	6965.0	12497.2	100.0
Total NPS Loading (kg)	2044.0	3159.3	5668.7	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/25/2007 Scenario: 16
Observed spring overturn total phosphorus (SPO): 26.0 mg/m^3
Observed growing season mean phosphorus (GSM): 34.6 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m^3)	Most Likely Total P (mg/m^3)	High Total P (mg/m^3)	Predicted -Observed (mg/m^3)	% Dif.
Walker, 1987 Reservoir	20	32	57	-3	-9
Canfield-Bachmann, 1981 Natural Lake	20	31	55	-4	-12
Canfield-Bachmann, 1981 Artificial Lake	19	29	50	-6	-17
Rechow, 1979 General	17	26	47	-9	-26
Rechow, 1977 Anoxic	19	30	54	-5	-14
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	18	27	50	-8	-23
Walker, 1977 General	19	30	54	4	15
Vollenweider, 1982 Combined OECD	18	25	41	-5	-17
Dillon-Rigler-Kirchner	17	27	49	1	4
Vollenweider, 1982 Shallow Lake/Res.	14	20	34	-10	-33
Larsen-Mercier, 1976	19	30	54	4	15
Nurnberg, 1984 Oxic	19	30	54	-5	-14

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	20	51	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	10	89	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	9	84	FIT	1	GSM
Rechow, 1979 General	16	43	FIT	0	GSM
Rechow, 1977 Anoxic	20	48	FIT	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	21	41	FIT	0	GSM
Walker, 1977 General	16	53	FIT	0	SPO
Vollenweider, 1982 Combined OECD	13	45	Tw	0	ANN
Dillon-Rigler-Kirchner	18	43	P L p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	11	35	Tw	0	ANN
Larsen-Mercier, 1976	20	47	P Pin p	0	SPO
Nurnberg, 1984 Oxic	17	51	L	0	ANN

Date: 5/25/2007 Scenario: Lower Red Current (URL Surface Outfall)

Lake Id: Lower Red
Watershed Id: Full

Hydrologic and Morphometric Data

Tributary Drainage Area: 19955.0 acre
Total Unit Runoff: 10.80 in.
Annual Runoff Volume: 17959.5 acre-ft
Lake Surface Area <As>: 211.0 acre
Lake Volume <V>: 1601.0 acre-ft
Lake Mean Depth <z>: 7.6 ft
Precipitation - Evaporation: 4.6 in.
Hydraulic Loading: 94571.7 acre-ft/year
Areal Water Load <qs>: 448.2 ft/year
Lake Flushing Rate <p>: 59.07 1/year
Water Residence Time: 0.02 year
Observed spring overturn total phosphorus (SPO): 37.0 mg/m^3
Observed growing season mean phosphorus (GSM): 44.8 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	851.0	0.50	1.00	3.00	8.6	172	344	1033
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	1969.0	0.10	0.30	0.50	5.9	80	239	398
HD Urban (1/8 Ac)	7.0	1.00	1.50	2.00	0.1	3	4	6
MD Urban (1/4 Ac)	29.0	0.30	0.50	0.80	0.1	4	6	9
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	3880.0	0.10	0.10	0.10	3.9	157	157	157
Forest	13219.0	0.05	0.09	0.18	12.0	267	481	963
Lake Surface	211.0	0.10	0.30	1.00	0.6	9	26	85

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Red Lake Outlet	94400000.0	0.0	2770.0	0.0	68.8

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.30	0.50	0.80	
# capita-years	0.0			
% Phosphorus Retained by Soil	98.0	90.0	80.0	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	1524.0	8879.4	5846.7	100.0
Total Loading (kg)	691.3	4027.7	2652.0	100.0
Areal Loading (lb/ac-year)	7.22	42.08	27.71	
Areal Loading (mg/m^2-year)	809.58	4716.89	3105.85	
Total PS Loading (lb)	0.0	6106.7	0.0	68.8
Total PS Loading (kg)	0.0	2770.0	0.0	68.8
Total NPS Loading (lb)	1505.2	2716.2	5658.4	31.2
Total NPS Loading (kg)	682.7	1232.1	2566.7	31.2

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/25/2007
Observed spring overturn total phosphorus (SPO): 37.0 mg/m^3
Observed growing season mean phosphorus (GSM): 44.8 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m^3)	Most Likely Total P (mg/m^3)	High Total P (mg/m^3)	Predicted -Observed (mg/m^3)	% Dif.
Walker, 1987 Reservoir	5	32	21	-13	-29
Canfield-Bachmann, 1981 Natural Lake	6	32	21	-13	-29
Canfield-Bachmann, 1981 Artificial Lake	6	29	20	-16	-36
Rechow, 1979 General	5	27	18	-18	-40
Rechow, 1977 Anoxic	5	30	20	-15	-33
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	5	27	18	-18	-40
Walker, 1977 General	5	31	20	-6	-16
Vollenweider, 1982 Combined OECD	6	26	18	-15	-37
Dillon-Rigler-Kirchner	5	29	19	-8	-22
Vollenweider, 1982 Shallow Lake/Res.	4	21	14	-20	-49
Larsen-Mercier, 1976	5	31	20	-6	-16
Nurnberg, 1984 Oxic	5	31	21	-14	-31

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	13	45	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	10	92	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	9	84	FIT	1	GSM
Rechow, 1979 General	11	40	FIT	0	GSM
Rechow, 1977 Anoxic	13	42	FIT	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	14	33	FIT	0	GSM
Walker, 1977 General	11	50	FIT	0	SPO
Vollenweider, 1982 Combined OECD	9	44	FIT	0	ANN
Dillon-Rigler-Kirchner	12	41	P L	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	7	35	FIT	0	ANN
Larsen-Mercier, 1976	14	42	P Pin p	0	SPO
Nurnberg, 1984 Oxic	12	48	L	0	ANN

Date: 4/6/2008 Scenario: Lower Red Lake w/ Red Lake Hypolimnetic Outfall (Ave of surf and hypol.)

Lake Id: Lower Red
Watershed Id: Full

Hydrologic and Morphometric Data

Tributary Drainage Area: 19955.0 acre
Total Unit Runoff: 10.80 in.
Annual Runoff Volume: 17959.5 acre-ft
Lake Surface Area <As>: 211.0 acre
Lake Volume <V>: 1601.0 acre-ft
Lake Mean Depth <z>: 7.6 ft
Precipitation - Evaporation: 4.6 in.
Hydraulic Loading: 94247.4 acre-ft/year
Areal Water Load <qs>: 446.7 ft/year
Lake Flushing Rate <p>: 58.87 1/year
Water Residence Time: 0.02 year
Observed spring overturn total phosphorus (SPO): 37.0 mg/m^3
Observed growing season mean phosphorus (GSM): 44.8 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	851.0	0.50	1.00	3.00	5.7	172	344	1033
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	1969.0	0.10	0.30	0.50	4.0	80	239	398
HD Urban (1/8 Ac)	7.0	1.00	1.50	2.00	0.1	3	4	6
MD Urban (1/4 Ac)	29.0	0.30	0.50	0.80	0.1	4	6	9
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	3880.0	0.10	0.10	0.10	2.6	157	157	157
Forest	13219.0	0.05	0.09	0.18	8.0	267	481	963
Lake Surface	211.0	0.10	0.30	1.00	0.4	9	26	85

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Red Lake Outlet	9.4E+007	0.0	4738	0.0	79.0

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.30	0.50	0.80	
# capita-years	0.0			
% Phosphorus Retained by Soil	98.0	90.0	80.0	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	1524.0	13218.1	5846.7	100.0
Total Loading (kg)	691.3	5995.7	2652.0	100.0
Areal Loading (lb/ac-year)	7.22	62.65	27.71	
Areal Loading (mg/m^2-year)	809.58	7021.65	3105.85	
Total PS Loading (lb)	0.0	10445.4	0.0	79.0
Total PS Loading (kg)	0.0	4738.0	0.0	79.0
Total NPS Loading (lb)	1505.2	2716.2	5658.4	21.0
Total NPS Loading (kg)	682.7	1232.1	2566.7	21.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 4/6/2008
Observed spring overturn total phosphorus (SPO): 37.0 mg/m^3
Observed growing season mean phosphorus (GSM): 44.8 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m^3)	Most Likely Total P (mg/m^3)	High Total P (mg/m^3)	Predicted -Observed (mg/m^3)	% Dif.
Walker, 1987 Reservoir	5	46	20	1	2
Canfield-Bachmann, 1981 Natural Lake	6	47	21	2	4
Canfield-Bachmann, 1981 Artificial Lake	6	42	20	-3	-7
Rechow, 1979 General	5	40	18	-5	-11
Rechow, 1977 Anoxic	5	46	20	1	2
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	5	41	18	-4	-9
Walker, 1977 General	5	46	20	9	24
Vollenweider, 1982 Combined OECD	6	36	18	-5	-12
Dillon-Rigler-Kirchner	5	43	19	6	16
Vollenweider, 1982 Shallow Lake/Res.	4	29	14	-12	-29
Larsen-Mercier, 1976	5	46	20	9	24
Nurnberg, 1984 Oxic	5	47	21	2	4

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	18	69	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	15	135	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	13	121	FIT	1	GSM
Rechow, 1979 General	15	61	FIT	0	GSM
Rechow, 1977 Anoxic	18	68	FIT	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	19	55	FIT	0	GSM
Walker, 1977 General	15	77	FIT	0	SPO
Vollenweider, 1982 Combined OECD	12	63	FIT	0	ANN
Dillon-Rigler-Kirchner	17	64	P L	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	9	50	FIT	0	ANN
Larsen-Mercier, 1976	19	67	P Pin p	0	SPO
Nurnberg, 1984 Oxic	16	76	L	0	ANN

D

APPENDIX D

2006 Aquatic Plant Survey Data

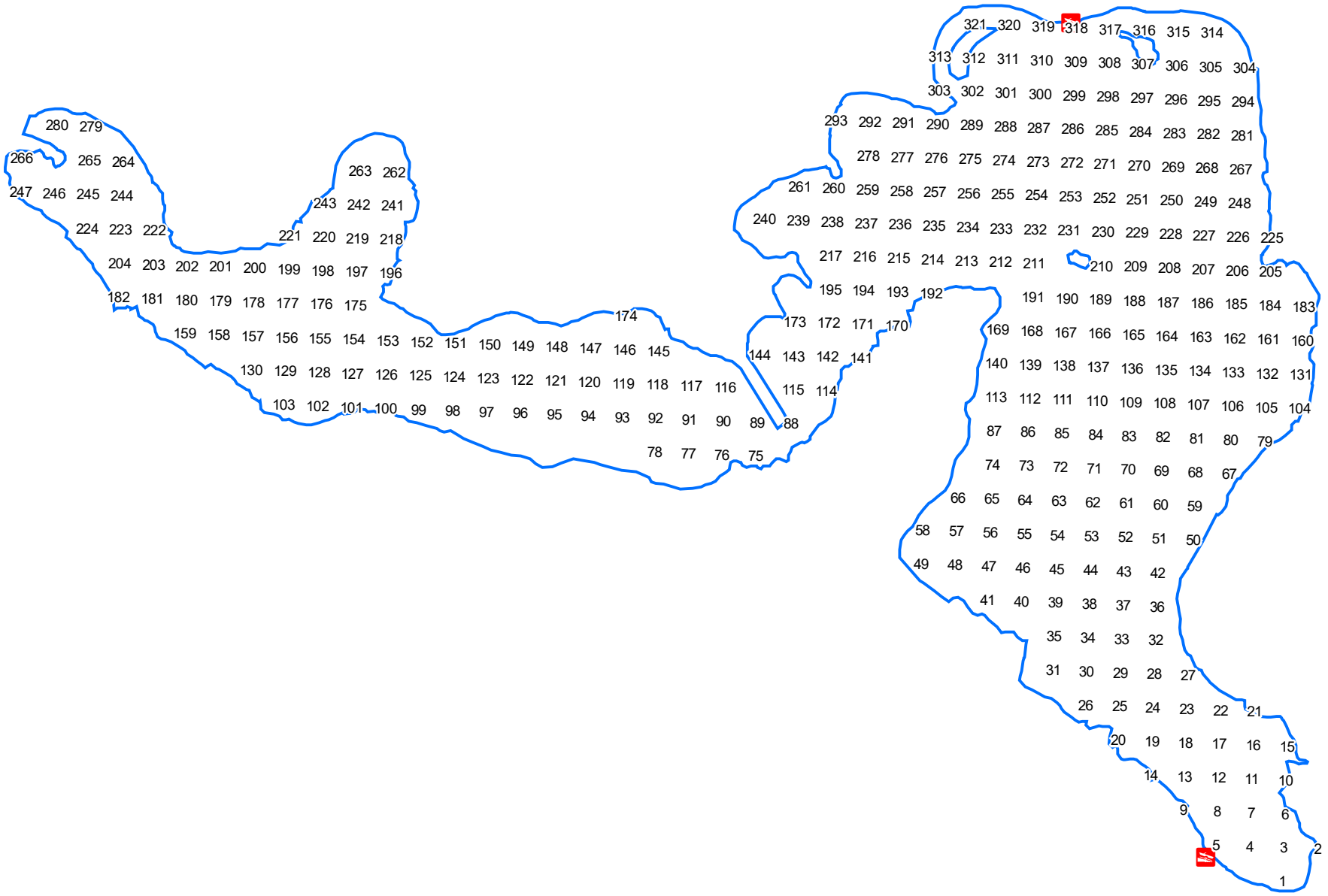
Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Heteranthera dubia*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Sagittaria latifolia*	*Eleocharis acicularis*	*Lemna trisulca*	*All Free-Floating Species*	*Potamogeton natans*
1	-88.7887274	44.85462253	4		m	p	1				1	1	3							1						1	
2	-88.7880853	44.85506582																									
3	-88.788718	44.85507254	14	Too Deep																							
4	-88.7893507	44.85507925	14	Too Deep																							
5	-88.7899833	44.85508595	7		m	p					1	2	3													1	
6	-88.7887086	44.85552254	4		m	p	3				2	2				1										1	
7	-88.7893412	44.85552925	6		m	p	3				1																
8	-88.7899739	44.85553596	10		m	p						2	1														
9	-88.7906066	44.85554266																									
10	-88.7886991	44.85597255																									
11	-88.7893318	44.85597926	5		m	p	3				3	1															
12	-88.7899645	44.85598597	4		m	p	2	1				2														1	
13	-88.7905971	44.85599267	7		m	p	3				1	3	1														
14	-88.7912298	44.85599937																									
15	-88.7886897	44.85642256		Ureachable																							
16	-88.7893224	44.85642927	3		m	p	3				3	1			1	1										1	
17	-88.789955	44.85643597	6		m	p	3				1	1															
18	-88.7905877	44.85644268	8		m	p	3					1															
19	-88.7912204	44.85644938	6		m	p	3				1	3	1														
20	-88.7918531	44.85645607																									
21	-88.7893129	44.85687928																									
22	-88.7899456	44.85688598	2		m	p			2		1	3														1	
23	-88.7905783	44.85689268	5		m	p	3			1	3	2														1	
24	-88.791211	44.85689938	9		m	p	3				1	2															
25	-88.7918437	44.85690608	6		m	p	3					1														1	
26	-88.7924763	44.85691277	2		m	p	2		1	2	2	3														1	
27	-88.7905689	44.85734269	2		m	p			2			3	3													1	
28	-88.7912016	44.85734939	7		m	p	3				2	3														1	
29	-88.7918342	44.85735609	9		m	p	3				1	3															
30	-88.7924669	44.85736278	5		m	p	3				1	1														1	
31	-88.7930996	44.85736947	3		m	p	3	1			1	3														1	
32	-88.7911921	44.8577994	3		m	p	1				1	3	1			2					1					1	1
33	-88.7918248	44.85780609	10		m	p	2					2	2														
34	-88.7924575	44.85781279	7		m	p	3					3	1			1										1	
35	-88.7930902	44.85781948	7		m	p	3		1		1	1								1						1	
36	-88.7911827	44.85824941	3		m	p	1				2	1				3										1	
37	-88.7918154	44.8582561	9		m	p	3					3	1														
38	-88.7924481	44.85826279	9		m	p	3				1	3															
39	-88.7930808	44.85826948	6		m	p	3				1	3														1	
40	-88.7937135	44.85827617	9		m	p	3					3														1	
41	-88.7943462	44.85828285	6		m	p	3					3				1										1	
42	-88.7911733	44.85869941	2		m	p	1			3	2	1	2													1	
43	-88.791806	44.85870611	5		m	p	2				3	3	2													1	
44	-88.7924387	44.8587128	7		m	p	3				1	1														1	
45	-88.7930714	44.85871949	6		m	p	3					1															
46	-88.7937041	44.85872618	6		m	p	3					2														1	
47	-88.7943368	44.85873286	8		m	p	3					3														1	
48	-88.7949695	44.85873954	8		m	p	3					3														1	
49	-88.7956022	44.85874621	3		m	p	1	1			1	1				1										1	
50	-88.7905312	44.85914272	1		m	p		1		2		1	1	3						2						1	
51	-88.7911639	44.85914942	4		m	p	2				2	2	1							1	1					1	
52	-88.7917966	44.85915612	4		m	p	2				2	3														1	
53	-88.7924293	44.85916281	4		m	p	3				2	2														1	
54	-88.793062	44.8591695	4		m	p					1	1														1	
55	-88.7936947	44.85917618	9		m	p	3			1	1	3														1	
56	-88.7943274	44.85918287	6		m	p	3					2														1	
57	-88.7949601	44.85918954	7		m	p	3					3														1	
58	-88.7955928	44.85919622	5		m	p	1				1	1														1	
59	-88.7905218	44.85959273	2		m	p	1		2		1	1		3								2				1	
60	-88.7911545	44.85959943	4		m	p	3				3	2														1	
61	-88.7917872	44.85960612	4		m	p	3				2	2														1	
62	-88.7924199	44.85961282	3		m	p	2				1															1	1
63	-88.7930526	44.85961951	7		m	p	3				1	3														1	
64	-88.7936853	44.85962619	9		m	p	1					1	1														
65	-88.794318	44.85963287	6		m	p	3					3														1	
66	-88.7949507	44.85963955	3		m	p	2					2				1										1	
67	-88.7898796	44.86003603	2		m	p	1			1	2	2				1										1	
68	-88.7905123	44.86004273	3		m	p	2				1	3														1	
69	-88.7911451	44.86004943	3		m	p	3				1	3														1	
70	-88.7917778	44.86005613	5		m	p	3				1	3														1	
71	-88.7924105	44.86006282	10		m	p	1					1														1	

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Heteranthera dubia*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Sagittaria latifolia*	*Eleocharis acicularis*	*Lemna trisulca*	*All Free-Floating Species*	*Potamogeton natans*
72	-88.7930432	44.86006951	5		m	p	3				1	1														1	
73	-88.7936759	44.8600762	6		m	p	3					2														1	
74	-88.7943086	44.86008288	4		m	p	3				1	3														1	
75	-88.7987376	44.86012956	8		m	p					1	1													1		
76	-88.7993704	44.86013621	7		m	p					1	3															
77	-88.8000031	44.86014287	5		m	p	3					3														1	
78	-88.8006358	44.86014951	2		m	p	3									1										1	
79	-88.7892375	44.86047933																									
80	-88.7898702	44.86048604	3		m	p	1				1	3				1										1	
81	-88.7905029	44.86049274	3		m	p	3				2	2		2		1										1	
82	-88.7911356	44.86049944	3		m	p	3				1	2	1													1	
83	-88.7917684	44.86050614	8		m	p	1				1	3														1	
84	-88.7924011	44.86051283	9		m	p	1					3														1	
85	-88.7930338	44.86051952	4		m	p	3				1	3														1	
86	-88.7936665	44.86052621	5		m	p	3				1	3														1	
87	-88.7942992	44.86053289	2		m	p	1		1		2	3				1										1	
88	-88.7980956	44.86057291																									
89	-88.7987283	44.86057957	6		m	p					1	2															
90	-88.799361	44.86058622	7		m	p	1	1			1	3								1							
91	-88.7999937	44.86059287	3		m	p	3					3														1	
92	-88.8006265	44.86059952	3		m	v	2	1			3	3														1	
93	-88.8012592	44.86060617	2		m	v	1	1			3	2														1	
94	-88.8018919	44.86061281	4		m	v	2				1	3				1										1	
95	-88.8025246	44.86061944	4		m	v	1				1	2				1				1							
96	-88.8031573	44.86062608	2		m	v	2				1	2														1	
97	-88.8037901	44.86063271	2		m	p	1	1	1		2	2					1									1	
98	-88.8044228	44.86063933																									
99	-88.8050555	44.86064596	2		m	v	1					1								2						1	
100	-88.8056882	44.86065257	4		m	p		1	1			1				1				1						1	
101	-88.806321	44.86065919	4		m	p					2	1				2						1				1	
102	-88.8069537	44.8606658																									
103	-88.8075864	44.86067241																									
104	-88.7885953	44.86092263																									
105	-88.789228	44.86092934	2		m	p	2				2	1			1	2					2					1	
106	-88.7898608	44.86093604	3		m	p	3				1	3				2										1	
107	-88.7904935	44.86094275	4		m	p	2					3														1	
108	-88.7911262	44.86094945	4		m	p	3				2	2								2						1	
109	-88.7917589	44.86095614	7		m	p	2					2															
110	-88.7923917	44.86096284	7		m	p						3															
111	-88.7930244	44.86096953	4		m	p	3				1	1														1	
112	-88.7936571	44.86097621	5		m	p	3					1														1	
113	-88.7942898	44.8609829	2		m	p			3		2	3										3				1	
114	-88.7974535	44.86101626	1		s	p	1					1								1							
115	-88.7980862	44.86102292	4		m	p	3					3				1										1	
116	-88.7993517	44.86103623	6		m	p					1	1														1	
117	-88.7999844	44.86104288	3		m	p	2					3				1											
118	-88.8006171	44.86104953	3		m	v	1	1			3	3														1	
119	-88.8012498	44.86105617	3		m	p	1	1				3								1						1	
120	-88.8018826	44.86106281																									
121	-88.8025153	44.86106945	3		m	v	1	1			3	3														1	
122	-88.803148	44.86107609	2		m	v					3	1								1						1	
123	-88.8037808	44.86108272	2		m	v	2	1			3	2								2							
124	-88.8044135	44.86108934	6		m	p					1	1															
125	-88.8050462	44.86109596	3		m	v	2				1	1															
126	-88.8056789	44.86110258	3		m	v	1	1			1	1								2							
127	-88.8063117	44.8611092	2		m	p	1	1			2	3														1	
128	-88.8069444	44.86111581																									
129	-88.8075771	44.86112242		Ureachable																							
130	-88.8082099	44.86112903		Ureachable																							
131	-88.7885859	44.86137263	2		m	p	2				1	1				2						1				1	
132	-88.7892186	44.86137934	3		m	p	3				1	3				1										1	
133	-88.7898513	44.86138605	3		m	p	3					3				1										1	
134	-88.7904841	44.86139275	4		m	p	2				2	2														1	
135	-88.7911168	44.86139946	4		m	p	3				1	1									1						
136	-88.7917495	44.86140615	4		m	p	2				1	1															
137	-88.7923823	44.86141285	4		m	p	3				1	1	1													1	
138	-88.793015	44.86141953	4		m	p	3				1	3														1	
139	-88.7936477	44.86142622	5		m	p	3				1	3														1	
140	-88.7942804	44.8614329	2		m	p	1		3		1	3										1				1	
141	-88.7968114	44.8614596	1		m	p	1				1	1														1	
142	-88.7974441	44.86146626	3		m	v	1	1				2				1										1	

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Heteranthera dubia*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Sagittaria latifolia*	*Eleocharis acicularis*	*Lemna trisulca*	*All Free-Floating Species*	*Potamogeton natans*
143	-88.7980768	44.86147293	4		m	p	1					3														1	
144	-88.7987096	44.86147958	4		m	p	1	1			1	3														1	
145	-88.8006078	44.86149954	3		m	p	1	1			3	3								1						1	
146	-88.8012405	44.86150618	4		m	p	3																			1	
147	-88.8018732	44.86151282	3		m	p		1			1	1								3						1	
148	-88.802506	44.86151946	14	Too Deep																							
149	-88.8031387	44.86152609	5		m	p	1				3	2								1						1	
150	-88.8037714	44.86153272	6		m	p					1	1								1						1	
151	-88.8044042	44.86153935	4		m	v			2		1	1								1						1	
152	-88.8050369	44.86154597	2		m	v	1	2	2		2	1								1						1	
153	-88.8056696	44.86155259	2		m	v		2	2		2	2								1						1	
154	-88.8063024	44.86155921	1		m	v	1	1	1		2	1								1						1	
155	-88.8069351	44.86156582	1		m	v					1	1						1		1						1	
156	-88.8075678	44.86157243		Ureachable																							
157	-88.8082006	44.86157904		Ureachable																							
158	-88.8088333	44.86158564		Ureachable																							
159	-88.809466	44.86159224		Ureachable																							
160	-88.7885764	44.86182264	3		m	p	1				1	1														1	
161	-88.7892092	44.86182935	4		m	p	1			1		3									1					1	
162	-88.7898419	44.86183606	3		m	p	3				3	3														1	
163	-88.7904746	44.86184276	4		m	p	3					3														1	
164	-88.7911074	44.86184946	5		m	p	3					3															
165	-88.7917401	44.86185616	5		m	p	1				1	1	1													1	
166	-88.7923728	44.86186285	5		m	p	3				1	3														1	
167	-88.7930056	44.86186954	6		m	p	2				2	2	1													1	
168	-88.7936383	44.86187623	4		m	p	1				1	3														1	
169	-88.7942711	44.86188291	2		m	p	1		3			3										1				1	
170	-88.7961693	44.86190294	2		m	p				1	1	3														1	
171	-88.796802	44.86190961	8		m	p					1	2														1	
172	-88.7974347	44.86191627	5		m	p	3					3														1	
173	-88.7980675	44.86192293																									
174	-88.8012312	44.86195619	4		m	p						1														1	
175	-88.8062931	44.86200922	2		m	v	1	1	1		1	1				1										1	
176	-88.8069258	44.86201583	3		m	v		1			3	3															
177	-88.8075586	44.86202244	2		m	v		1			3	1				1										1	
178	-88.8081913	44.86202905		Ureachable																							
179	-88.808824	44.86203565		Ureachable																							
180	-88.8094568	44.86204225		Ureachable																							
181	-88.8100895	44.86204884		Ureachable																							
182	-88.8107223	44.86205543		Ureachable																							
183	-88.788567	44.86227265	4		m	p	3				3	3				1										1	
184	-88.7891997	44.86227936	4		m	p	3				3	3				1										1	
185	-88.7898325	44.86228606	4		m	p	3				3	3														1	
186	-88.7904652	44.86229277	5		m	p	3				1	1				1										1	
187	-88.791098	44.86229947	5		m	p	1				1	3														1	
188	-88.7917307	44.86230617																									
189	-88.7923634	44.86231286	5		m	p	2				1															1	
190	-88.7929962	44.86231955	9		m	p					3	3															
191	-88.7936289	44.86232624	3		m	p	1				1	3														1	
192	-88.7955271	44.86234627	1		m	p	1			1	1	1				1										1	
193	-88.7961599	44.86235295	7		m	p					3	1														1	
194	-88.7967926	44.86235962	4		m	p	3																			1	
195	-88.7974254	44.86236628	3		m	p	2		1		2	2														1	
196	-88.805651	44.86245261	1		m	v			2			3				1						2				1	
197	-88.8062838	44.86245923	2		m	v	1	1			1	2				2										1	
198	-88.8069165	44.86246584	4		m	p	1	1	1		2	2														1	
199	-88.8075493	44.86247245	1		m	p			1		1	3				1										1	
200	-88.808182	44.86247906		Ureachable																							
201	-88.8088148	44.86248566		Ureachable																							
202	-88.8094475	44.86249226		Ureachable																							
203	-88.8100802	44.86249885		Ureachable																							
204	-88.810713	44.86250544		Ureachable																							
205	-88.7891903	44.86272936	3		m	p	1			1	3	3														1	
206	-88.7898231	44.86273607	2		m	p					1			1		2	1				2					1	
207	-88.7904558	44.86274278	3		m	p	3				3	3								1						1	
208	-88.7910885	44.86274948	4		m	p	1			3	3	3				1										1	
209	-88.7917213	44.86275617	4		m	p	2		1		3	3														1	
210	-88.792354	44.86276287	3		m	p	1	1	1		3	3														1	
211	-88.7936195	44.86277624	4		m	p	2				1	2	1													1	
212	-88.7942523	44.86278293	3		m	p	1			3	1	1				1										1	
213	-88.794885	44.86278961	7		m	p	2				1	2	1													1	

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Heteranthera dubia*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Sagittaria latifolia*	*Eleocharis acicularis*	*Lemna trisulca*	*All Free-Floating Species*	*Potamogeton natans*
214	-88.7955178	44.86279628	4		m	p	2	1			1	3				1										1	
215	-88.7961505	44.86280295	4		m	p	3				1	1														1	
216	-88.7967833	44.86280962	5		m	p	3					3														1	
217	-88.797416	44.86281629	4		m	p	1				1	3														1	
218	-88.8056417	44.86290262	3		m	p	1	1			1	3				1		1								1	
219	-88.8062745	44.86290924	2		m	p	2		1			1		1		3					1					1	
220	-88.8069072	44.86291585	3		m	v	1	2	1		1	3				2										1	
221	-88.80754	44.86292246		Ureachable																							
222	-88.810071	44.86294886		Ureachable																							
223	-88.8107037	44.86295546		Ureachable																							
224	-88.8113365	44.86296204		Ureachable																							
225	-88.7891809	44.86317937	1		m	p				1	3	3										2				1	
226	-88.7898136	44.86318608	2		m	p				3	1			3	1						2					1	
227	-88.7904464	44.86319278	2		m	p			2	2	1	1			2					2						1	
228	-88.7910791	44.86319948	3		m	p	1		2	2		2			1											1	
229	-88.7917119	44.86320618	4		m	p	3		1		3	3				1	1									1	
230	-88.7923446	44.86321287	4		m	p	2		1		2	2				1										1	
231	-88.7929774	44.86321956	5		m	p	2				3	3														1	
232	-88.7936101	44.86322625	5		m	p	2				1	2														1	
233	-88.7942429	44.86323293	4		m	p	3					3														1	
234	-88.7948756	44.86323961	5		m	p	3					3														1	
235	-88.7955084	44.86324629	7		m	p	2					3														1	
236	-88.7961411	44.86325296	2		m	p	3				1	3														1	
237	-88.7967739	44.86325963	2		m	p	3		1		1	3														1	
238	-88.7974066	44.8632663	4		m	p	3		2		2	2				2										1	
239	-88.7980394	44.86327296	3		m	p	3					3														1	
240	-88.7986721	44.86327962																									
241	-88.8056324	44.86335263																									
242	-88.8062652	44.86335925	2		m	p	1		2		1	3				3										1	
243	-88.8068979	44.86336586	1		m	p	1		2			3				2										1	
244	-88.8106945	44.86340547		Ureachable																							
245	-88.8113272	44.86341205		Ureachable																							
246	-88.81196	44.86341864		Ureachable																							
247	-88.8125927	44.86342522		Ureachable																							
248	-88.7898042	44.86363608	2		m	p	1		2	2	1		3	1					1		1					1	
249	-88.7904369	44.86364279	2		m	p	2	2	2			3				2										1	
250	-88.7910697	44.86364949	2		m	p			1	3					2	1					2					1	
251	-88.7917025	44.86365619	3		m	p			1	2	1									2						1	
252	-88.7923352	44.86366288	3		m	p	1		2		1	1				2										1	
253	-88.792968	44.86366957	4		m	p	1				3	3														1	
254	-88.7936007	44.86367626	3		m	p					3	3														1	
255	-88.7942335	44.86368294	5		m	p	3				1	3														1	
256	-88.7948662	44.86368962	4		m	p	3		1			3														1	
257	-88.795499	44.8636963	4		m	p	3				1	3														1	
258	-88.7961317	44.86370297	3		m	p	3				1	3														1	
259	-88.7967645	44.86370964	4		m	p	3					3				1										1	
260	-88.7973973	44.8637163	4		m	p	3				1	3				1										1	
261	-88.79803	44.86372297	3		m	p	3				1	3				1										1	
262	-88.8056231	44.86380264	2		m	p	2	1	1			1		2		3										1	
263	-88.8062559	44.86380926	2		m	p	1		2			2				3		1			1					1	3
264	-88.8106852	44.86385548		Ureachable																							
265	-88.811318	44.86386206		Ureachable																							
266	-88.8125835	44.86387523		Ureachable																							
267	-88.7897948	44.86408609	2		m	p				3	1	1	2	3	2	1					1						
268	-88.7904275	44.8640928	2		m	p			1	3		1		1	1		1				1						
269	-88.7910603	44.8640995	2		m	p				2	1	1		2	2						1					1	
270	-88.791693	44.86410619	2		m	p	1		2	2	1	1				1										1	
271	-88.7923258	44.86411289	2		m	p	2		2		3	2				2										1	
272	-88.7929586	44.86411958	4		m	p	3				3	2				1										1	
273	-88.7935913	44.86412626	3		m	p	1		1		3					3										1	
274	-88.7942241	44.86413295	4		m	p	3		1		1	3														1	
275	-88.7948568	44.86413963	2		m	p	3		1	1		3														1	
276	-88.7954896	44.8641463	4		m	p	2		1		2	1	1													1	
277	-88.7961224	44.86415298	4		m	p	3					2														1	
278	-88.7967551	44.86415965	3		m	p	3				1	1														1	
279	-88.8113087	44.86431207		Ureachable																							
280	-88.8119415	44.86431866		Ureachable																							
281	-88.7897853	44.8645361	1		m	p				3	1			3			1		1							1	
282	-88.7904181	44.8645428	1		m	p				3	1			3	1						1					1	
283	-88.7910509	44.8645495	2		m	p			2	3	2				2						1					1	
284	-88.7916836	44.8645562	2		m	p	1		2	3	3	2			3	2			1							1	

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Heteranthera dubia*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Sagittaria latifolia*	*Eleocharis acicularis*	*Lemna trisulca*	*All Free-Floating Species*	*Potamogeton natans*
285	-88.7923164	44.86456289	10		m	p	1				1	1														1	
286	-88.7929492	44.86456958	14	Too Deep																							
287	-88.7935819	44.86457627	10		m	p					1	1				1											
288	-88.7942147	44.86458296	6		m	p	1				1	2				1										1	
289	-88.7948475	44.86458964	3		m	p	1					3														1	
290	-88.7954802	44.86459631	14	Too Deep																							
291	-88.796113	44.86460298	4		m	p	1				1	1				1										1	
292	-88.7967457	44.86460965	3		m	p	1		1		1	1				1										1	
293	-88.7973785	44.86461632																									
294	-88.7897759	44.8649861	1		m	p	1			1	2	2	1								1					1	
295	-88.7904087	44.86499281	1		m	p	1			1	2	2		1	2	1			1		1					1	
296	-88.7910414	44.86499951	3		m	p	1		1	1	3	3		1		1	1									1	
297	-88.7916742	44.86500621	2		m	p	1		1	1	3	3		1		1										1	
298	-88.792307	44.8650129	12	Too Deep																							
299	-88.7929398	44.86501959	14	Too Deep																							
300	-88.7935725	44.86502628	14	Too Deep																							
301	-88.7942053	44.86503296	13		m	p						2														1	
302	-88.7948381	44.86503964	3		m	v	2																			1	
303	-88.7954708	44.86504632																									
304	-88.7897665	44.86543611	3		m	p	1			1	2	2									1					1	
305	-88.7903993	44.86544282	3		m	p	1		1	3	1	1		3	1	1	1				1					1	
306	-88.791032	44.86544952	3		m	p	3		1	2	3	3		3		1					1					1	
307	-88.7916648	44.86545621	1		m	p	1				1	1										1	1	2		1	2
308	-88.7922976	44.86546291	12	Too Deep																							
309	-88.7929303	44.8654696	13	Too Deep																							
310	-88.7935631	44.86547629	6		m	p	1				1	3															
311	-88.7941959	44.86548297	11		m	p						3														1	
312	-88.7948287	44.86548965																									
313	-88.7954614	44.86549633	2		m	p	3				3	3										2	2			1	
314	-88.7903898	44.86589282	4		m	p	1			1	2	2		2		1										1	
315	-88.7910226	44.86589952	4		m	p	2			3	2	2		2		1										1	
316	-88.7916554	44.86590622	4		m	p	2		1		2	2				1										1	
317	-88.7922882	44.86591292	4		m	p	2				2	1									1					1	
318	-88.7929209	44.86591961	2		m	p				2	2			3		1										1	
319	-88.7935537	44.86592629	1		m	p				2	1			3	2	1										1	
320	-88.7941865	44.86593298	3		m	p	3				3	3														1	
321	-88.7948193	44.86593966	3		m	p	1				1	3														1	



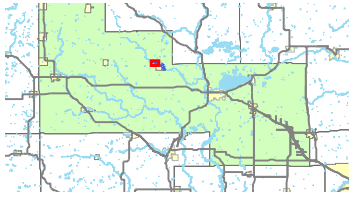
N W E S

700

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Sample Locations: Onterra
Map date: March 20, 2008



Extent of large map shown in red.

Legend

\# Point-intercept Sample Location

Public Boat Landing

Appendix D

Upper Red Lake

Shawaon County, WI

Point-intercept Sample Locations

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
1	-88.7624528	44.84154533	8		m	p	2					1				1																
2	-88.7629588	44.84155081	14	Too Deep																												
3	-88.761939	44.84189985	11		m	r																										
4	-88.762445	44.84190533	18	Too Deep																												
5	-88.7629511	44.84191081	15	Too Deep																												
6	-88.7634571	44.84191629	25	Too Deep																												
7	-88.7619313	44.84225985	10		m	r																										
8	-88.7624373	44.84226533	12	Too Deep																												
9	-88.7629433	44.84227082	17	Too Deep																												
10	-88.7634494	44.8422763	24	Too Deep																												
11	-88.7639554	44.84228178	15	Too Deep																												
12	-88.7644614	44.84228725	1		s	v	1			2	1			2		1						1										
13	-88.7664854	44.84230914	1		m	v				2	1			2	1					1		1										
14	-88.7680035	44.84232552	1		m	v				1		2		2	1																	1
15	-88.7619236	44.84261985	8		m	p	3					1																				
16	-88.7624296	44.84262534		Too Deep																												
17	-88.7629356	44.84263082	12		m	r																										
18	-88.7634417	44.8426363	14	Too Deep																												
19	-88.7639477	44.84264178	21	Too Deep																												
20	-88.7644537	44.84264726	15	Too Deep																												
21	-88.7649597	44.84265273	16	Too Deep																												
22	-88.7654657	44.8426582	10		m	p	1																									
23	-88.7664777	44.84266914	1		m	v				2				2	1					1		1										
24	-88.7669838	44.8426746	1		m	v				1	1			2	2	1				1												
25	-88.7674898	44.84268007	1		m	v	1							2	1							1										
26	-88.7685018	44.84269099	1		m	v					2		2			1											1				1	1
27	-88.7619159	44.84297985	3		m	p	3																								1	
28	-88.7624219	44.84298534	4		m	p	3																								1	
29	-88.7629279	44.84299082	11		m	r																										
30	-88.763434	44.8429963	12	Too Deep																												
31	-88.76394	44.84300178	14	Too Deep																												
32	-88.764446	44.84300726	23	Too Deep																												
33	-88.764952	44.84301273	23	Too Deep																												
34	-88.765458	44.84301821	18	Too Deep																												
35	-88.765964	44.84302367	5		m	p	3					1				1																
36	-88.7664701	44.84302914	2		m	v	3			1	2	1				1																
37	-88.7669761	44.84303461	4		m	v	3				1	1																				
38	-88.7674821	44.84304007	4		m	v	3					1																				
39	-88.7679881	44.84304553	2		m	v	3				2		1																		1	1
40	-88.7684941	44.84305099	1		m	v				2	1		1		1					1	1									1	1
41	-88.7619082	44.84333986	2		m	p	2			2	1			1																	1	
42	-88.7624142	44.84334534	6		m	p	3					1																			1	
43	-88.7629202	44.84335083	5		m	p	3																								1	
44	-88.7634263	44.84335631	4		m	p	3					1																			1	
45	-88.7639323	44.84336179	5		m	p	3																									
46	-88.7644383	44.84336726	6		m	p	3					2				2																
47	-88.7649443	44.84337274	21	Too Deep																												
48	-88.7654503	44.84337821	17	Too Deep																												
49	-88.7659564	44.84338368	8		m	p	3					1																				
50	-88.7664624	44.84338915	9		m	r	1					1	1																			
51	-88.7669684	44.84339461	5		m	p	3					2																				
52	-88.7674744	44.84340007	2		m	v	2				2				1	2																
53	-88.7679804	44.84340553	2		m	v	2	2		1	2									1	1										1	
54	-88.7684865	44.84341099	2		m	v	1			1	2				1	1				1											1	1
55	-88.7649366	44.84373274	2		m	v	1			2	1											1										
56	-88.7654426	44.84373821	4		m	p	3																									
57	-88.7659487	44.84374368	6		m	p	3					1																				
58	-88.7664547	44.84374915	12		m	r																										
59	-88.7669607	44.84375461	6		m	p	3																									
60	-88.7679728	44.84376554		Unreachable																												
61	-88.7684788	44.843771	1		m	v	1				3				1	1			1	1	1	1					1				1	1
62	-88.7689848	44.84377645		Unreachable																												
63	-88.765435	44.84409821	2		m	v	3				1	1				1																
64	-88.765941	44.84410368	4		m	p	3																								1	
65	-88.766447	44.84410915	4		m	p	3																									
66	-88.766953	44.84411462	13		m	r																										
67	-88.7674591	44.84412008	5		m	p	3					1																				
68	-88.7684711	44.844131		Unreachable																												
69	-88.7659333	44.84446369		Unreachable																												
70	-88.7669454	44.84447462	5		m	p	3					1																				
71	-88.7674514	44.84448008	13		m	r																										
72	-88.7679574	44.84448555	4		m	p	3					2																				
73	-88.7669377	44.84483462	1		m	v	2			1	1	1		2		1															1	
74	-88.7674437	44.84484009	6		m	p	3					1																				
75	-88.7679497	44.84484555	13		m	r																										
76	-88.766424	44.84518916		Unreachable																												
77	-88.76693	44.84519463	1		m	v	2				2	1				1															1	
78	-88.767436	44.84520009	2		m	v	3				1	1				1																
79	-88.7679421	44.84520555	6		m	p	3					1																				

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
80	-88.7684481	44.84521101	6		m	p	3					1																				
81	-88.7689541	44.84521647	12		m	r																										
82	-88.7664163	44.84554917		Unreachable																												
83	-88.7674284	44.84556009	1		m	v	1				2																				1	
84	-88.7679344	44.84556556	4		m	v	3				1					1																
85	-88.7684404	44.84557101	6		m	p	3																									
86	-88.7689465	44.84557647	7		m	p	3																									
87	-88.7694525	44.84558193	11		m	r						1																				
88	-88.7709706	44.84559828	2		m	v	2			1	1	1		2								1										
89	-88.7714767	44.84560372	4		m	p	2			1	2	1																				
90	-88.7719827	44.84560916	6		m	p	1				1	3																				
91	-88.7724888	44.84561461	5		m	p	2					2							1													
92	-88.7729948	44.84562004	5		m	p	2					1				1			2													
93	-88.7735008	44.84562548	2		m	v	1					2			1	2		1	1													
94	-88.7740069	44.84563092	3		m	v	2					2				1			2													
95	-88.7745129	44.84563635	1		m	v	1					1				1									1	1					1	
96	-88.7689388	44.84593648	7		m	p	3					1																				
97	-88.7694449	44.84594193	11		m	r																										
98	-88.7699509	44.84594738	6		m	p	3					2																				
99	-88.7704569	44.84595283	4		m	v	3																									
100	-88.770963	44.84595828	4		m	v	3				1	1				1															1	
101	-88.771469	44.84596373	3		m	v	3									1															1	
102	-88.7689311	44.84629648	5		m	v	3				2																					
103	-88.7694372	44.84630193	11		m	r	1					1																				
104	-88.7689235	44.84665648	2		m	r	1				2	1																				
105	-88.7694295	44.84666194	10		m	r						2																				
106	-88.7689158	44.84701649	11		m	r																										
107	-88.7694219	44.84702194	9		m	p	2					1																				
108	-88.7689081	44.84737649	12		m	r																										
109	-88.7694142	44.84738194	6		m	p	3					1																				
110	-88.7683944	44.84773104		Unreachable																												
111	-88.7689005	44.84773649	12		m	r																										
112	-88.7694065	44.84774195	6		m	p	3					2				1																
113	-88.7699126	44.8477474	5		m	p	3					2																				
114	-88.7663625	44.84806919		Unreachable																												
115	-88.7668685	44.84807465	1		m	v	1	1			2	2		2	2																	
116	-88.7673746	44.84808012	1		m	v	1				3			1	1	1																
117	-88.7678807	44.84808558	2		m	v	2			1	2	1			1	1																
118	-88.7683867	44.84809104	2		m	v	3			1	1	1			1	1																
119	-88.7688928	44.8480965	9		m	r						2	1																			
120	-88.7693989	44.84810195	6		m	p	3					2																				
121	-88.7699049	44.8481074	6		m	p	3																								1	
122	-88.770411	44.84811285	1		m	r	1			1	1	1			1	3																
123	-88.770917	44.8481183	1		m	v				1						1																3
124	-88.7714231	44.84812375	2		m	v				1	1	1																			1	3
125	-88.7658487	44.84842372		Unreachable																												
126	-88.7663548	44.84842919		Unreachable																												
127	-88.7668609	44.84843466	1		m	v	1			1			1	1	2	1				1	1										
128	-88.7673669	44.84844012	1		m	v				1	1	1	2	1		1					1										
129	-88.767873	44.84844558	1		m	v	1			1	2				1	1					1										
130	-88.7683791	44.84845104	1		m	v	3									2															
131	-88.7688851	44.8484565	9		m	r						1																				
132	-88.7693912	44.84846195	10		m	r	1					2																				
133	-88.7698973	44.84846741	7		m	p	3																								1	
134	-88.7704033	44.84847286	6		m	p	3																									
135	-88.7709094	44.84847831	6		m	p	3																									
136	-88.7714155	44.84848375	3		m	p	3				1	1																				
137	-88.7719215	44.8484892	2		m	p	1			2	1			2	1	1			1												1	
138	-88.765841	44.84878373		Unreachable																												
139	-88.7663471	44.84878919		Unreachable																												
140	-88.7668532	44.84879466		Unreachable																												
141	-88.7688775	44.8488165	1		m	v	1									1															1	
142	-88.7693835	44.84882196	11		m	r																										
143	-88.7698896	44.84882741	10		m	r																										
144	-88.7703957	44.84883286	11		m	r																										
145	-88.7709017	44.84883831	11		m	r	1					1																				
146	-88.7714078	44.84884376	5		m	p	3																									
147	-88.7719139	44.8488492	6		m	p	3																								1	
148	-88.7724199	44.84885464	4		m	p	3	1		1		1				1																
149	-88.7658334	44.84914373		Unreachable																												
150	-88.7663394	44.8491492		Unreachable																												
151	-88.7693759	44.84918196	1		m	v	3									1															1	
152	-88.7698819	44.84918741	3		m	p	3					1																				
153	-88.770388	44.84919287	5		m	p	3					1																			1	
154	-88.7708941	44.84919831	8		m	p	2					2																				
155	-88.7714001	44.84920376	6		m	p	3					1																			1	
156	-88.7719062	44.8492092	7		m	p	3																								1	
157	-88.7724123	44.84921465	11		m	r	1																									
158	-88.7729184	44.84922008	2		m	p	3	1		1					1	1																

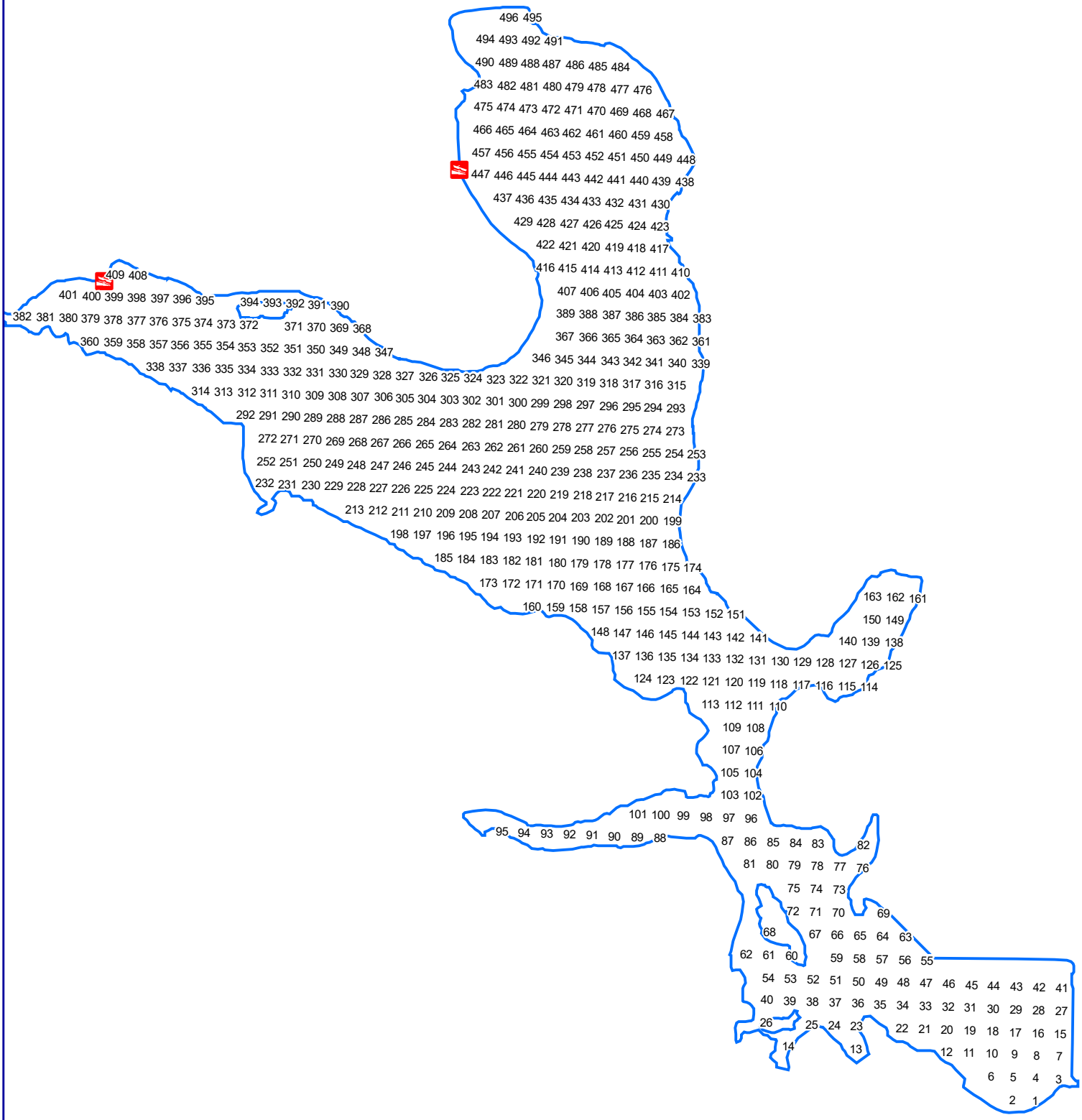
Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
159	-88.7734244	44.84922552	2		m	p	2			1	1	1			1	2																
160	-88.7739305	44.84923096	1		r	p	1			3	1								1													
161	-88.7653196	44.84949826		Unreachable																												
162	-88.7658257	44.84950373		Unreachable																												
163	-88.7663317	44.8495092		Unreachable																												
164	-88.7703803	44.84955287		Unreachable																												
165	-88.7708864	44.84955832	8		m	p	2					1																				
166	-88.7713925	44.84956376	6		m	p	3				1	1																			1	
167	-88.7718986	44.84956921	7		m	p	3																								1	
168	-88.7724046	44.84957465	11		m	r																										
169	-88.7729107	44.84958009	11		m	r																										
170	-88.7734168	44.84958553	10		m	r	1														1										1	
171	-88.7739229	44.84959096	3		m	p	3																									
172	-88.774429	44.84959639	3		m	p	3																							1		
173	-88.774935	44.84960182	3		m	p	3								1																	
174	-88.7703727	44.84991287	1		m	v	3			1	1											1									1	
175	-88.7708788	44.84991832	2		m	v	3			1	1	1				1															1	
176	-88.7713848	44.84992377	5		m	p	3					1																			1	
177	-88.7718909	44.84992921	8		m	p	3																									
178	-88.772397	44.84993465	9		m	p	3										2															
179	-88.7729031	44.84994009	8		m	p	3					1																				
180	-88.7734092	44.84994553	5		m	p	3																								1	
181	-88.7739152	44.84995096	5		m	p	3																									
182	-88.7744213	44.8499564	5		m	p	3																							1		
183	-88.7749274	44.84996183	4		m	p	3																									
184	-88.7754335	44.84996726	3		m	p	3																									
185	-88.7759396	44.84997268	2		m	p	2			3	1				1	1			1													
186	-88.7708711	44.85027832	2		m	v	2			2	1					1															1	
187	-88.7713772	44.85028377	2		m	p	2			2	1	1	1																		1	
188	-88.7718833	44.85028921	10		m	r						1	1																			
189	-88.7723893	44.85029466	9		m	p	3																									
190	-88.7728954	44.8503001	8		m	p	3					1																			1	
191	-88.7734015	44.85030553	6		m	p	3																									
192	-88.7739076	44.85031097	5		m	p	3																								1	
193	-88.7744137	44.8503164	6		m	p	3					1																				
194	-88.7749198	44.85032183	6		m	p	2					1																				
195	-88.7754258	44.85032726	5		m	p	3					1																				
196	-88.7759319	44.85033269	4		m	p	2			1	1						1														1	
197	-88.776438	44.85033811	3		m	p	3			1	1				1		1															
198	-88.7769441	44.85034353	2		m	p	1			2	1				1	1			1		1											
199	-88.7708634	44.85063833	2		m	v	2			1	1				1	2				1											1	
200	-88.7713695	44.85064377	3		m	p	3				1	1				1															1	
201	-88.7718756	44.85064922	10		m	r							1																			
202	-88.7723817	44.85065466	8		m	p	3					1																				
203	-88.7728878	44.8506601	7		m	p	3					1																			1	
204	-88.7733939	44.85066554	9		m	p	1																									
205	-88.7739	44.85067097	5		m	p	3																								1	
206	-88.774406	44.85067641	6		m	p	3																									
207	-88.7749121	44.85068184	6		m	p	3					1																			1	
208	-88.7754182	44.85068727	6		m	p	3																									
209	-88.7759243	44.85069269	8		m	p	2					2																				
210	-88.7764304	44.85069812	6		m	p	3				1	1																			1	
211	-88.7769365	44.85070354	5		m	p	3					1																			1	
212	-88.7774426	44.85070896	3		m	p	1			3	1	1				1			1												1	
213	-88.7779487	44.85071437	2		m	p	1			2	1	1				1			1		1										1	
214	-88.7708558	44.85099833	2		m	v	3			2	1	1			1																1	
215	-88.7713619	44.85100378	5		m	p	2					1																			1	
216	-88.771868	44.85100922	8		m	p	2										2															
217	-88.7723741	44.85101466	9		m	r	1					3																				
218	-88.7728801	44.8510201	7		m	p	3																								1	
219	-88.7733862	44.85102554	6		m	p	3					1																				
220	-88.7738923	44.85103098	10		m	r						3					1															
221	-88.7743984	44.85103641	6		m	p	3																									
222	-88.7749045	44.85104184	6		m	p	3					1																				1	
223	-88.7754106	44.85104727	6		m	p	3					1																			1	
224	-88.7759167	44.8510527	6		m	p	1				1	1					3															1	
225	-88.7764228	44.85105812	7		m	p	3																									
226	-88.7769289	44.85106354	4		m	p	3																								1	
227	-88.7774349	44.85106896	4		m	p	3				1																					
228	-88.777941	44.85107438	4		m	p	3			2																					1	
229	-88.7784471	44.85107979	3		m	p	2			1		1			1	1													1		1	
230	-88.7789532	44.85108521	2		m	p	2			1	1	1			1	1			1		1										1	
231	-88.7794593	44.85109062	2		m	p	2			2	1					1													1		1	
232	-88.7799654	44.85109603	2		m	p	2	1			1	1																	1		1	
233	-88.770342	44.85135289		Unreachable																												
234	-88.7708481	44.85135833	2		m	v	3				1					2															1	
235	-88.7713542	44.85136378	5		m	p	3					1																			1	
236	-88.7718603	44.85136923	9		m	r	2					1					2															
237	-88.7723664	44.85137467	8		m	p	1					2																				

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
238	-88.7728725	44.85138011	7		m	p	3																									
239	-88.7733786	44.85138555	6		m	p	3																									
240	-88.7738847	44.85139098	8		m	p	3																									
241	-88.7743908	44.85139641	7		m	p	3																									
242	-88.7748969	44.85140184	6		m	p	3					1																				
243	-88.775403	44.85140727	7		m	p	3																							1		
244	-88.7759091	44.8514127	7		m	p	3					1																		1		
245	-88.7764151	44.85141812	7		m	p	3					1																		1		
246	-88.7769212	44.85142355	6		m	p	3					1																				
247	-88.7774273	44.85142897	7		m	p	3					1																			1	
248	-88.7779334	44.85143438	6		m	p	3					1																			1	
249	-88.7784395	44.8514398	6		m	p	3																								1	
250	-88.7789456	44.85144521	4		m	p	3					1																			1	
251	-88.7794517	44.85145062	4		m	p	3																								1	
252	-88.7799578	44.85145603	3		m	p	3	1			1	2																			1	
253	-88.7703344	44.85171289	1		m	v	2			2	3																					1
254	-88.7708405	44.85171834	4		m	p	3				2		1																			
255	-88.7713466	44.85172379	5		m	p	3					2																			1	
256	-88.7718527	44.85172923	6		m	p	3																									
257	-88.7723588	44.85173467	8		m	p	1					1																				
258	-88.7728648	44.85174011	9		m	p	3																									
259	-88.7733709	44.85174555	6		m	p	3																							1		
260	-88.773877	44.85175098	8		m	p	3																									
261	-88.7743831	44.85175642	7		m	p	3																									
262	-88.7748892	44.85176185	8		m	p	3					1																				
263	-88.7753953	44.85176728	7		m	p	3					1																				
264	-88.7759014	44.8517727	7		m	p	3																									
265	-88.7764075	44.85177813	6		m	p	3																									
266	-88.7769136	44.85178355	7		m	p	3																								1	
267	-88.7774197	44.85178897	6		m	p	3					1																			1	
268	-88.7779258	44.85179439	5		m	p	3					1																			1	
269	-88.7784319	44.8517998	6		m	p	3																								1	
270	-88.778938	44.85180522	6		m	p	3																								1	
271	-88.7794441	44.85181063	4		m	p	3					1																			1	
272	-88.7799502	44.85181603	4		m	p	3	1				2																			1	
273	-88.7708328	44.85207834	3		m	v	3				2																				1	
274	-88.7713389	44.85208379	5		m	p	3					1																			1	
275	-88.771845	44.85208923	6		m	p	3																									
276	-88.7723511	44.85209468		Too Deep																												
277	-88.7728572	44.85210012	9		m	p	1					2																				
278	-88.7733633	44.85210555	11		m	r							2																			
279	-88.7738694	44.85211099	12		m	r																										
280	-88.7743755	44.85211642	11		m	r							2																			
281	-88.7748816	44.85212185	9		m	p	1																									
282	-88.7753877	44.85212728	7		m	p	3																									
283	-88.7758938	44.85213271	6		m	p	2																							1		
284	-88.7763999	44.85213813	12		m	p	1																									
285	-88.776906	44.85214355	8		m	p	1																									
286	-88.7774121	44.85214897	12		m	r	1					2																				
287	-88.7779182	44.85215439	6		m	p	3																									
288	-88.7784243	44.85215981	8		m	p	3																									
289	-88.7789304	44.85216522	8		m	p	3																								1	
290	-88.7794365	44.85217063	8		m	p	2					1																				
291	-88.7799426	44.85217604	6		m	p	3					1																			1	
292	-88.7804487	44.85218145	4		m	p	2	2		1	1	1		1		1															1	
293	-88.7708251	44.85243835	2		s	v	2			1	3				1	2																
294	-88.7713313	44.85244379	4		m	p	3					1	3																			
295	-88.7718374	44.85244924	6		m	p	3																									
296	-88.7723435	44.85245468	9		m	p	3																									
297	-88.7728496	44.85246012	7		m	p	3																									
298	-88.7733557	44.85246556	7		m	p	3																									
299	-88.7738618	44.85247099	7		m	p	2																									
300	-88.7743679	44.85247643	6		m	p	2					1																				
301	-88.774874	44.85248186	6		m	p	2																									
302	-88.7753801	44.85248729	6		m	p	2										2															
303	-88.7758862	44.85249271	6		m	p	2																									
304	-88.7763923	44.85249814	7		m	p	2																									
305	-88.7768984	44.85250356	6		m	p	2																									
306	-88.7774045	44.85250898	8		m	p	2																									
307	-88.7779106	44.8525144	7		m	p	2					1																				
308	-88.7784167	44.85251981	6		m	p	3					1																				
309	-88.7789228	44.85252522	7		m	p	3					1																				
310	-88.7794289	44.85253064	8		m	p	3																								1	
311	-88.779935	44.85253604	10		m	r																										
312	-88.7804411	44.85254145	6		m	p	3					1																			1	
313	-88.7809472	44.85254685	3		m	p	3	1				1																				
314	-88.7814533	44.85255226	2		m	p	3	1				1																			1	
315	-88.7708175	44.85279835	2		s	v	1			2	1		1		1	3																
316	-88.7713236	44.8528038	2		m	p	3			2	1	1					1															

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
317	-88.7718297	44.85280924	5		m	p	2					2				1	1															
318	-88.7723358	44.85281468	9		m	p	3																									
319	-88.7728419	44.85282012	7		m	p	3					1																				
320	-88.773348	44.85282556	6		m	p	2				1						1															
321	-88.7738541	44.852831	7		m	p	2																							1		
322	-88.7743602	44.85283643	6		m	p	2																									
323	-88.7748663	44.85284186	4		m	p	2																									
324	-88.7753724	44.85284729	2		m	p	2			1	1	1																			1	
325	-88.7758785	44.85285272	2		m	p	2			1	1	1					1														1	
326	-88.7763846	44.85285814	2		m	p	1			1		1				1																
327	-88.7768908	44.85286356	2		m	p	2																1							1		
328	-88.7773969	44.85286898	2		m	p	3					1																		1		
329	-88.777903	44.8528744	2		m	p	3					1																			1	
330	-88.7784091	44.85287982	2		m	p	3					1																			1	
331	-88.7789152	44.85288523	3		m	p	3				1	1			1	1															1	
332	-88.7794213	44.85289064	4		m	p	3																								1	
333	-88.7799274	44.85289605	4		m	p	3															1									1	
334	-88.7804335	44.85290146	4		m	p	3									1															1	
335	-88.7809396	44.85290686	1		m	p	1			2		1																		1		
336	-88.7814457	44.85291226	10		m	p				2																						
337	-88.7819518	44.85291766	6		m	p	3					1																			1	
338	-88.7824579	44.85292306	4		m	p	3																								1	
339	-88.7703037	44.8531529		Unreachablenre																												
340	-88.7708098	44.85315835	1		s	v	2			2	1				1			1		1												
341	-88.7713159	44.8531638	3		m	p	3					1					1															
342	-88.771822	44.85316924	5		m	p	2					2																				
343	-88.7723282	44.85317469	9		m	p	3										1															
344	-88.7728343	44.85318013	8		m	p	3																									
345	-88.7733404	44.85318556	6		m	p	2										1															
346	-88.7738465	44.853191	7		m	p	2																									
347	-88.7773892	44.85322899	1		m	p	1					2										1									1	
348	-88.7778954	44.8532344	3		m	p	1				1	2				2															1	
349	-88.7784015	44.85323982	2		m	p	3				1	1																				
350	-88.7789076	44.85324523	4		m	p	3				1	1																			1	
351	-88.7794137	44.85325064		Unreachablenre																												
352	-88.7799198	44.85325605		Unreachablenre																												
353	-88.7804259	44.85326146		Unreachablenre																												
354	-88.780932	44.85326686	3		m	p	3					1																			1	
355	-88.7814381	44.85327227	6		m	p	3					1																			1	
356	-88.7819442	44.85327767	12		m	p																										
357	-88.7824503	44.85328306	6		m	p	3																								1	
358	-88.7829565	44.85328846	4		m	p	3																								1	
359	-88.7834626	44.85329385	4		m	p	3					1																			1	
360	-88.7839687	44.85329924		Unreachablenre																												
361	-88.7702961	44.85351291		Unreachablenre																												
362	-88.7708022	44.85351836	1		s	v	1			1					1	1		1	1	1												
363	-88.7713083	44.8535238	3		m	p	2			1						1	1															
364	-88.7718144	44.85352925	5		m	p	2																									
365	-88.7723205	44.85353469	9		m	p	2					2																				
366	-88.7728266	44.85354013	8		m	p	1					1					1															
367	-88.7733327	44.85354557	6		m	p	2																									
368	-88.7778877	44.85359441	1		m	p						2										1					1				1	
369	-88.7783939	44.85359982	5		m	p	1				1	3																				
370	-88.7789	44.85360524	1		m	p	2				2	1			1	1					1											
371	-88.7794061	44.85361065		Unreachablenre																												
372	-88.7804183	44.85362146		Unreachablenre																												
373	-88.7809244	44.85362687	2		m	p	3	1		1	1																				1	
374	-88.7814305	44.85363227	3		m	p	2				1	2				1															1	
375	-88.7819366	44.85363767	2		m	p	3	1				1																			1	
376	-88.7824428	44.85364307	11		m	r	1					1																				
377	-88.7829489	44.85364846	10		m	p	1			2																				1		
378	-88.783455	44.85365386	8		m	p	1			1	1	1																		1		
379	-88.7839611	44.85365925	8		m	p	3					2																			1	
380	-88.7844672	44.85366464	8		m	p	2			1		1	1																	1		
381	-88.7849733	44.85367002	6		r	p	3																									
382	-88.7854794	44.85367541	6		r	p				1																						
383	-88.7702884	44.85387291		Unreachablenre																												
384	-88.7707945	44.85387836	1		s	v	1			1	1				1	1		1	1	1												
385	-88.7713006	44.85388381	2		m	v	2						1		1		1															
386	-88.7718067	44.85388925	4		m	p	3																									
387	-88.7723129	44.85389469	8		m	p	1					1					2															
388	-88.772819	44.85390013	8		m	p	3					2																				
389	-88.7733251	44.85390557	6		m	p	2																									
390	-88.7783862	44.85395983		Unreachablenre																												
391	-88.7788924	44.85396524	2		m	p	3				1																				1	
392	-88.7793985	44.85397065	1		m	p	2			1	1	1				1												1			1	
393	-88.7799046	44.85397606	2		m	p	2	1			1	1																	1		1	
394	-88.7804107	44.85398147	2		m	p	2																						1		1	
395	-88.7814229	44.85399228	2		r	v	3				1	1										1		1							1	

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
396	-88.7819291	44.85399768	2		m	p	3				1	1																				
397	-88.7824352	44.85400307	3		m	p	1			1		1																			1	
398	-88.7829413	44.85400847	4		m	p	3					1																			1	
399	-88.7834474	44.85401386	8		m	p	1			2		1																				
400	-88.7839535	44.85401925	8		m	p	3	1		1	1	1				1																
401	-88.7844596	44.85402464	12		m	r																										
402	-88.7707869	44.85423836	1		s	v	1	1		1					1	1		1	1	1		1										
403	-88.771293	44.85424381	2		m	p	3					1				1	1															
404	-88.7717991	44.85424925	2		m	p	1					2																				
405	-88.7723052	44.8542547	7		m	p	1					1																				
406	-88.7728113	44.85426014	7		m	p	3																									
407	-88.7733174	44.85426558	6		m	p	3																									
408	-88.7829337	44.85436847	2		m	p	2				1	1										2									1	
409	-88.7834398	44.85437387	4		m	p	3			1		1				1															1	
410	-88.7707792	44.85459837	1		m	v	1				1				2	2						1										
411	-88.7712853	44.85460381	2		m	p	2			1	1	1			1	1	1															
412	-88.7717914	44.85460926	3		m	p	1									2																
413	-88.7722976	44.8546147	8		m	p	1				1	2					1															
414	-88.7728037	44.85462014	7		m	p	2																									
415	-88.7733098	44.85462558	6		m	p	2																									
416	-88.7738159	44.85463101	5		m	p	1				2	2																				
417	-88.7712777	44.85496382	2		m	v	2			2	1	1			1	1																
418	-88.7717838	44.85496926	3		m	p	1				1	1				2	1															
419	-88.7722899	44.8549747	7		m	p	2					1					1															
420	-88.772796	44.85498014	6		m	p	2					2					1															
421	-88.7733022	44.85498558																														
422	-88.7738083	44.85499102	5		m	p	1					3				1																
423	-88.77127	44.85532382	2		m	v	1			2	1	1			1	1																
424	-88.7717761	44.85532926	2		m	v	2				2	1					1															
425	-88.7722823	44.85533471	7		m	p	1					2																				
426	-88.7727884	44.85534015	6		m	p	3																									
427	-88.7732945	44.85534559	7		m	p	2																									
428	-88.7738006	44.85535102	9		m	p	1					1																				
429	-88.7743068	44.85535646	4		m	p	2					2																				
430	-88.7712623	44.85568382	2		m	v	2			1	1					1															1	
431	-88.7717685	44.85568927	3		m	p	1				3	1				1																
432	-88.7722746	44.85569471	7		m	p	2					3																				
433	-88.7727807	44.85570015	6		m	p	3					1																				
434	-88.7732869	44.85570559	8		m	p						1																				
435	-88.773793	44.85571103	6		m	p	2				1																					
436	-88.7742991	44.85571646	4		m	p	2																									
437	-88.7748053	44.85572189	2		m	p	2				1																					
438	-88.7707486	44.85603838	1		m	v	1	1		1	2	1				1						1					1				1	
439	-88.7712547	44.85604383	1		m	v	2				2	1																				
440	-88.7717608	44.85604927	2		m	p	1				2	1					1															
441	-88.772267	44.85605471	5		m	p	2					1					1															
442	-88.7727731	44.85606015	6		m	p	1					1					2															
443	-88.7732792	44.85606559	5		m	p	2					1																				
444	-88.7737854	44.85607103	6		m	p	3																									
445	-88.7742915	44.85607646	2		m	p	2																									
446	-88.7747976	44.8560819	3		m	p	2				1						1															
447	-88.7753038	44.85608732	2		m	p	1					1																			1	
448	-88.7707409	44.85639838	1		m	v	1				3	1				1						1					1				1	2
449	-88.771247	44.85640383	2		m	v	1	1		1	2	2				1															1	
450	-88.7717532	44.85640927	2		m	v	2				2	1			1	2	1														1	
451	-88.7722593	44.85641472	7		m	p	2										1															
452	-88.7727654	44.85642016	5		m	p	3					1					1														1	
453	-88.7732716	44.8564256	3		m	p	3	2				1																				
454	-88.7737777	44.85643103	4		m	p	3					2																			1	
455	-88.7742839	44.85643647	4		m	p	3																								1	
456	-88.77479	44.8564419	3		m	p	2				1	1					1															
457	-88.7752961	44.85644733	2		m	p	1		1	2	1	2				1	1														1	
458	-88.7712394	44.85676383	2		m	v	2	1		1	2	1			1	2															1	
459	-88.7717455	44.85676928	2		m	v	3			1						2															1	
460	-88.7722517	44.85677472	3		m	p	1	1			2	1				2	1															
461	-88.7727578	44.85678016	5		m	p	2					2					1														1	
462	-88.7732639	44.8567856	3		m	p	3				1	2					1															
463	-88.7737701	44.85679104	4		m	p	2					2																			1	
464	-88.7742762	44.85679647	4		m	p	2				1	2																			1	
465	-88.7747824	44.8568019	3		m	p	2				1	1																				
466	-88.7752885	44.85680733	3		m	p	1			2						1															1	
467	-88.7712317	44.85712384	1		m	v	1	1		1	2	1										1									1	
468	-88.7717379	44.85712928	2		m	p	3				2	1				1	1														1	
469	-88.772244	44.85713472	3		m	p	1				1	1				2	1														1	
470	-88.7727501	44.85714017	4		m	p	3				1	1				1	1															
471	-88.7732563	44.8571456	3		m	p	3																								1	
472	-88.7737624	44.85715104	3		m	p	1					2																			1	
473	-88.7742686	44.85715647	4		m	p	1					2				1																
474	-88.7747747	44.85716191	4		m	p	1					3																				

Sampling Point	Latitiude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft)	Comments	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Vallisneria americana*	*Elodea canadensis*	*Ceratophyllum demersum*	*Najas flexilis*	*Chara sp.*	*Stuckenia pectinata*	*Potamogeton zosteriformis*	*Potamogeton praelongus*	*Potamogeton amplifolius*	*Potamogeton pusillus*	*Potamogeton richardsonii*	*Myriophyllum sibiricum*	*Sparganium eurycarpum*	*Schoenoplectus pungens*	*Sagittaria latifolia*	*Sagittaria graminea*	*Schoenoplectus tabernaemontani*	*Typha latifolia*	*Ranunculus aquatilis*	*Typha angustifolia*	*Lemna trisulca*	*FFs*	*Potamogeton natans*
475	-88.7752809	44.85716734	2		m	p	1			2		2			1																1	1
476	-88.7717302	44.85748928	2		m	p	1			1	3	1			1	2															1	
477	-88.7722363	44.85749473	2		m	p	2				2	1			1	1															1	
478	-88.7727425	44.85750017	2		m	p	3					1				1															1	
479	-88.7732486	44.85750561	2		m	p	2					1					1														1	
480	-88.7737548	44.85751104	2		m	p	1					3																			1	
481	-88.7742609	44.85751648	2		m	p	1				1	2				1	1														1	
482	-88.7747671	44.85752191	3		m	p	1					2				1															1	
483	-88.7752732	44.85752734	1		m	v	1			2	1		1	3	1												1				1	
484	-88.7722287	44.85785473	2		m	p	1				2	1			1	1															1	1
485	-88.7727348	44.85786017	2		m	p	1			1	2	2				2															1	
486	-88.773241	44.85786561	2		m	p	1			1	1	1			1	2															1	
487	-88.7737471	44.85787105	2		m	p	1		1		1	2				2															1	
488	-88.7742533	44.85787648	2		m	p	1				2					2															1	
489	-88.7747594	44.85788191	2		m	p	1				2					2															1	
490	-88.7752656	44.85788734	2		m	p	2				3					1															1	
491	-88.7737395	44.85823105	1		m	v				1	2	2				1						1									1	1
492	-88.7742457	44.85823649	1		m	v	1			1	2	2				2															1	
493	-88.7747518	44.85824192	1		m	v	1			1	1	2				2															1	



N
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Feet

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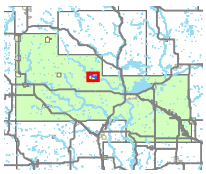
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Sample Locations: Onterra
Map date: March 20, 2008



Extent of large map shown in red.

Legend

\# Point-intercept Sample Location

Public Boat Landing

Appendix D

Lower Red Lake

Shawaon County, WI

Point-intercept Sample Locations

E

APPENDIX E

Red Lake Fish Survey Summary Reports

Upper Red Lake Fish Survey
Summary Report – 2007

In 2007, the Department of Natural Resources conducted a comprehensive fish survey of Upper Red Lake in order to provide direction for the future fisheries management of this lake. The following report is a brief summary of all activities conducted, general fisheries information and future management options for Upper Red Lake. A more comprehensive report will be completed later this spring. In the meantime, if you have any questions, please contact: Al Niebur, DNR Fisheries Biologist , 647 Lakeland Road, Shawano, Wisconsin, 54166. Phone: 715-526-4227

Comprehensive Fish Survey – What is it?

A comprehensive fish survey is an assessment of the entire fish community in a lake. Different survey methods are used to sample all the different fish species that inhabit a lake (including the smaller forage fish). Fyke-netting and boomshocking are the primary fish capture methods; however, seines and other gear are also utilized. Once fish are captured, information can be collected as it relates to species composition, abundance, size structure, age classes, growth, survival, and reproductive success.

DNR fisheries crew removing fish from fyke-net.

The following surveys were conducted on Upper Red Lake:

Fyke Netting after ice-out: This survey is conducted to target spawning northern pike, walleye and yellow perch.

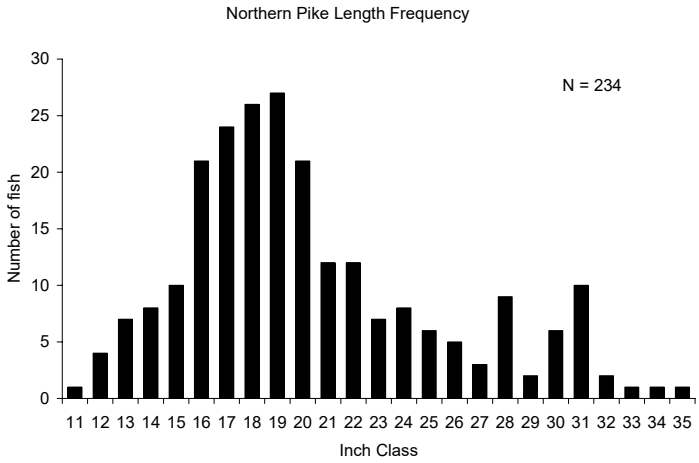
Boomshocking: This survey is conducted at night and is used to target largemouth bass and recapture fish that were marked during fyke netting. Other species are also collected. We also use this gear in the fall to check for newly hatched young of year (YOY) gamefish.

Late Spring Fyke Netting: This survey is conducted to target pre-spawn centrarchids (e.g. bluegills, pumpkinseed) and other panfish.

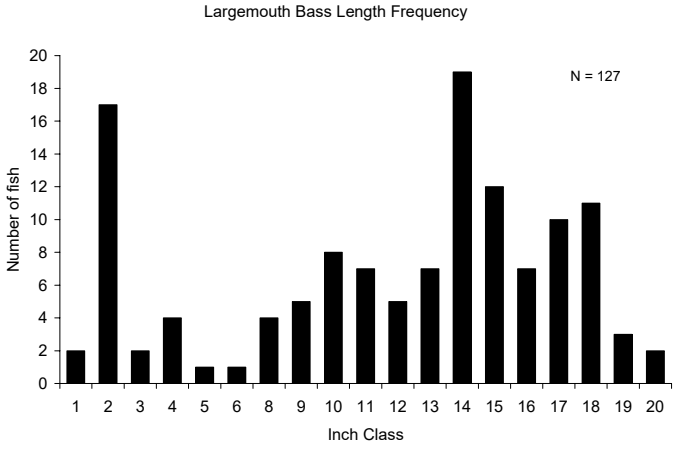
Summer Mini Fyke-Netting: Smaller version of fyke-net used to capture newly hatched YOY gamefish, panfish and minnow species.

Gamefish Summary

Northern pike was the dominant gamefish sampled in Upper Red Lake. A total of 232 pike were captured during our surveys with length ranges of 13.4 – 35.0 inches and a mean length of 23.5 inches. Abundance was above average when compared to other impoundments in the area and has remained similar to past surveys. A population estimate of 1689 (9.0 pike/acre) was calculated from mark/recapture surveys. Size structure was above average with over 38% of catch greater than 21 inches in length and 14% over 28 inches. Only two trophy sized (≥34.0 inches) were captured. Size structure indexes have remained relatively similar to past surveys.



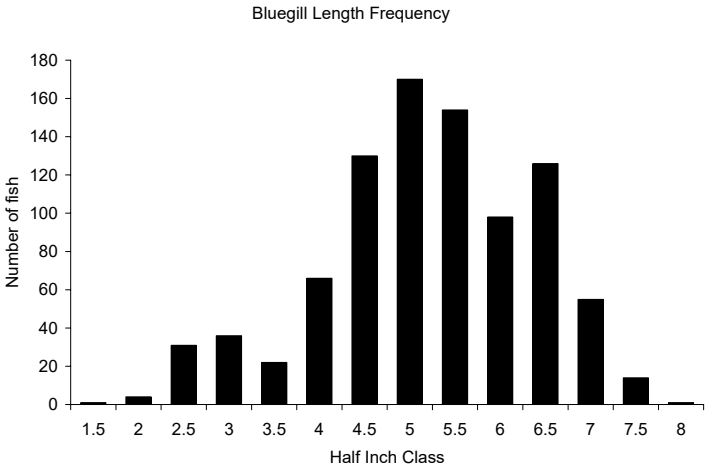
Largemouth bass were found in slightly below average abundance and comprised a small portion of the predator (gamefish) population. Size structure was above average with length ranges of 1.9- 20.5 inches and a mean length of 12.0 inches. Approximately 45% of stock size bass sampled were greater than the legal size of 14.0 inches. Trophy sized (> 18.0 inches) comprised 16% of the catch. Growth was slightly below average with bass attaining legal size by the end of their 6th summer. Bass size structure and abundance have remained relatively constant when compared to past surveys and are above average when compared to other area lakes.



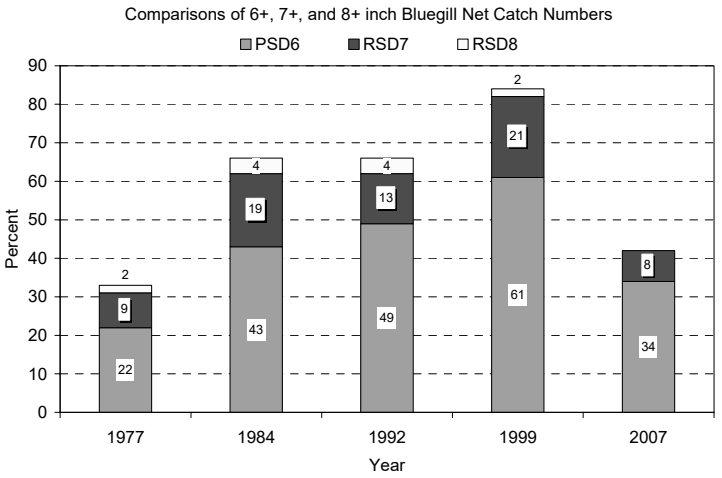
Musky were sampled in low numbers. Our survey captured 6 in total with length ranges of 21.3 – 42.0 inches and mean length of 37.8 inches.

Panfish Summary

Bluegill was the dominant panfish sampled in Upper Red Lake. A total of 6992 were captured during spring surveys. Abundance appeared to be above average when compared to other water bodies in the area. Size structure was average with 34% greater than harvestable size (6.0 inches) and with less than 1% over 8.0 inches in length. Size structure indexes appear to have declined since the last survey conducted in 1999. Growth was below average with most bluegills reaching catchable size (6.0 inches) by their 5th year.



Black crappie was found in above average abundance and comprised a significant portion of the prey (panfish) catch. A total of 861 were captured during spring surveys. Size structure was below average with length ranges of 4- 11.1 inches and a mean length of 5.3 inches. Most of crappies captured were the result of strong year classes produced in 2004 and 2005. In the next few years these fish should produce a decent fishery.

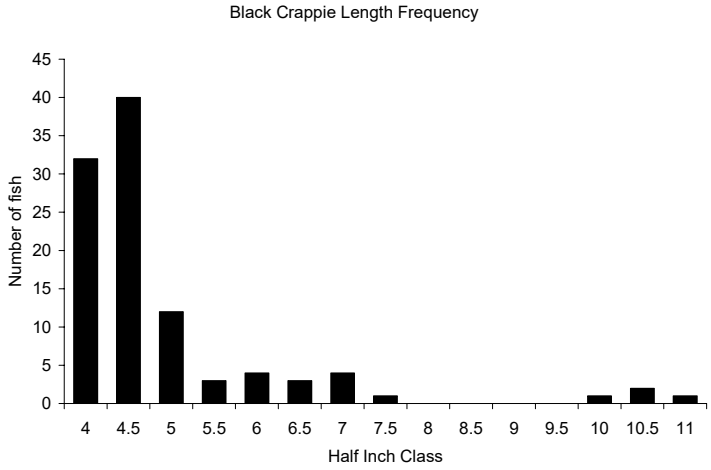


Yellow perch were found in low abundance and comprised a very small portion of the prey (panfish) catch. Only 32 were captured during spring surveys. Yellow perch numbers have declined significantly when compared to past surveys.

Other prey species sampled in lesser numbers included: rockbass, pumpkinseed, brown bullhead, yellow bullhead, white sucker, warmouth, golden shiner, shorthead redhorse and common shiner.

Management Recommendations

Overall, the fishery in Upper Red Lake could be considered above average when compared to other lakes in the area. It supports a diverse fishery that can produce both quantity and quality gamefish. The northern pike and largemouth bass population could be considered one of the highest quality fisheries in the area. Perhaps, the only concern is the declining size structure of bluegill and other panfish since the last survey and the loss of recreational use during mid-summer months.



Management Options:

- Maintain northern pike abundance and size structure. The current northern pike fishery could be considered one of the best fisheries in the area. Population abundance is adequate and size structure was phenomenal. Upper Red Lake appears to receive a fair amount of fishing pressure and I believe the fish refuge area above the railroad trestle maintains the fishery as well as the decline in fishing pressure/harvest while the lake is inundated with vegetation over the summer months.
- Maintain largemouth bass abundance and size structure. Largemouth bass populations were in good condition and appear to be providing a high quality fishery. The high abundance of bluegill and dense growths of aquatic vegetation benefits this particular gamefish.
- Bluegill size structure appears to have declined from past surveys but is still within acceptable levels. Abundance is still at very high levels. This may be a product of the dense growths of aquatic vegetation, especially Eurasian Milfoil, which may be interfering with predator/prey interaction. Management options may include actions to increase open spaces for predation of overabundant bluegills.
- Musky abundance was low and periodic stocking should be continued to maintain this population
- Conduct spring netting and electrofishing surveys on a routine basis (5-6 year rotation) to monitor fish populations.
- Periodic drawdown to reduce aquatic plant densities. This option would require cooperation/coordination with local affected public and dam owners. Drawdown may be beneficial in opening up more space and habitat for predation of overabundant bluegill population. It may also improve recreational fishing opportunities during the mid-summer months (June-September) that are typically choked with aquatic vegetation.

Lower Red Lake Fish Survey
Summary Report – 2007

In 2007, the Department of Natural Resources conducted a comprehensive fish survey of Lower Red Lake in order to provide direction for the future fisheries management of this lake. The following report is a brief summary of all activities conducted, general fisheries information and future management options for Lower Red Lake. A more comprehensive report will be completed later this spring. In the meantime, if you have any questions, please contact: Al Niebur, DNR Fisheries Biologist , 647 Lakeland Road, Shawano, Wisconsin, 54166. Phone: 715-526-4227

Comprehensive Fish Survey – What is it?

A comprehensive fish survey is an assessment of the entire fish community in a lake. Different survey methods are used to sample all the different fish species that inhabit a lake (including the smaller forage fish). Fyke-netting and boomshocking are the primary fish capture methods, however, seines and other gear are also utilized. Once fish are captured, information can be collected as it relates to species composition, abundance, size structure, age classes, growth, survival, and reproductive success.

The following surveys were conducted on Lower Red Lake:

Fyke Netting after ice-out: This survey is conducted to target spawning northern pike, walleye and yellow perch.

Boomshocking: This survey is conducted at night and is used to target largemouth bass and recapture fish that were marked during fyke netting. Other species are also collected. We also use this gear in the fall to check for newly hatched young of year (YOY) gamefish.

Late Spring Fyke Netting: This survey is conducted to target pre-spawn centrarchids (e.g. bluegills, pumpkinseed) and other panfish.

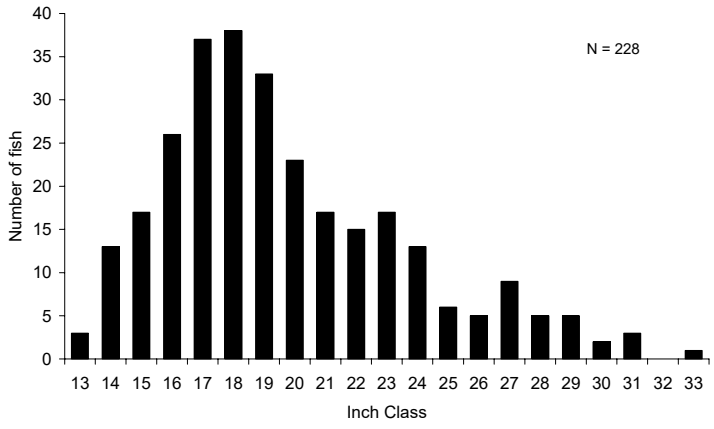
Summer Mini Fyke-Netting: Smaller version of fyke-net used to capture newly hatched YOY gamefish, panfish and minnow species.

DNR fisheries crew removing fish from fyke-net.

Gamefish Summary

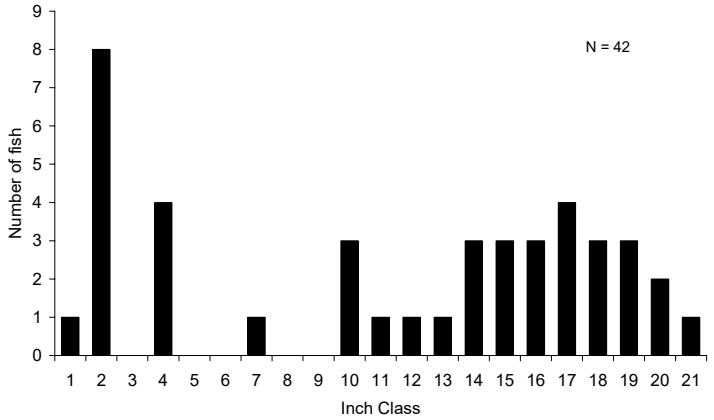
Northern pike was the dominant gamefish sampled in Lower Red Lake. A total of 288 pike were captured during our surveys with length ranges of 13.7 – 33.4 inches and a mean length of 19.1 inches. Abundance was below average when compared to other impoundments in the area. A population estimate of 974 (4.1 pike/acre) was calculated from mark/recapture surveys. Relative abundance has increased significantly from the last survey. Size structure was average with over 34% of catch greater than 21 inches in length and 11% over 26 inches. No trophy size (≥ 34.0 inches) pike were captured. Size structure indexes for quality size (21 inches) pike have declined over the past two surveys.

Northern Pike Length Frequency



Largemouth bass were found in low abundance and comprised a small portion of the predator (gamefish) population. Size structure was above average with length ranges of 7.5- 21.5 inches and a mean length of 15.9 inches. Approximately 68% of stock size bass sampled were greater than the legal size of 14.0 inches. Trophy sized (> 18.0 inches) comprised 30% of the catch. Growth was slightly below average with bass attaining legal size by the end of their 6th summer.

Largemouth Bass Length Frequency



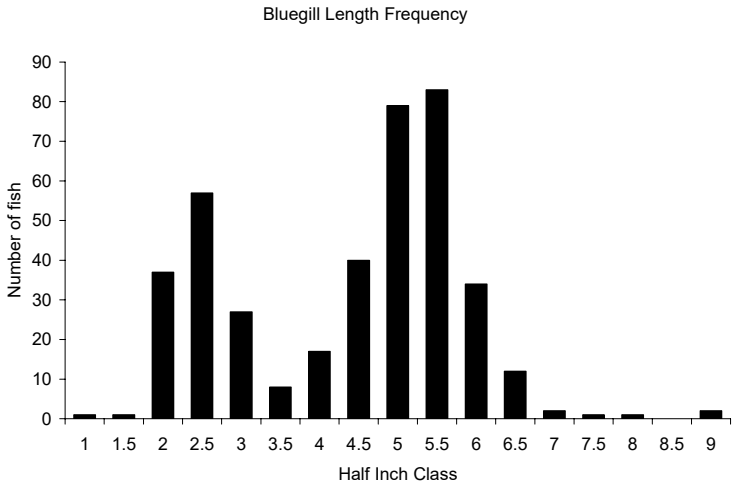
Panfish Summary

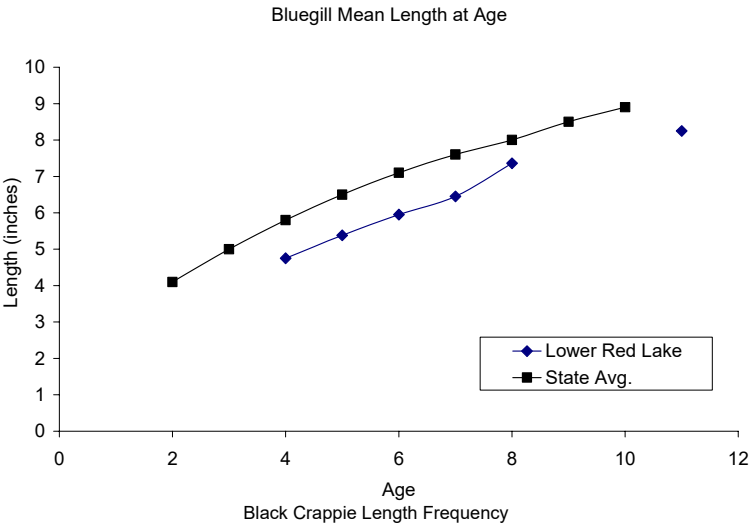
Bluegill was the dominant panfish sampled in Lower Red Lake. A total of 1464 were captured during spring surveys. Abundance appeared to be above average when compared to other water bodies in the area. Size structure was below average with only 20% greater than harvestable size (6.0 inches) and with less than 2% over 7.0 inches in length. Size structure indexes have not changed significantly since the last survey conducted in 1999. In addition, growth was below average with most bluegills reaching catchable size (6.0 inches) by their 6th year. Condition (measure of weight vs. length standard) was very poor.

Black crappie was found in average and comprised a small portion of the prey (panfish) catch. A total of 186 were captured during spring surveys. Size structure was above average with length ranges of 4.1- 13.3 inches and a mean length of 8.2 inches. Growth was extremely poor with most crappies reaching catchable size (>8.0 inches) after 7 summers of growth.

Bullhead species were found in high abundance and comprised a large portion of the net catch. A total of 816 bullheads (predominantly brown bullhead) were captured during spring surveys. Brown bullhead size structure was above average with length ranges of 10.2- 14.1 inches and a mean length of 12.5 inches.

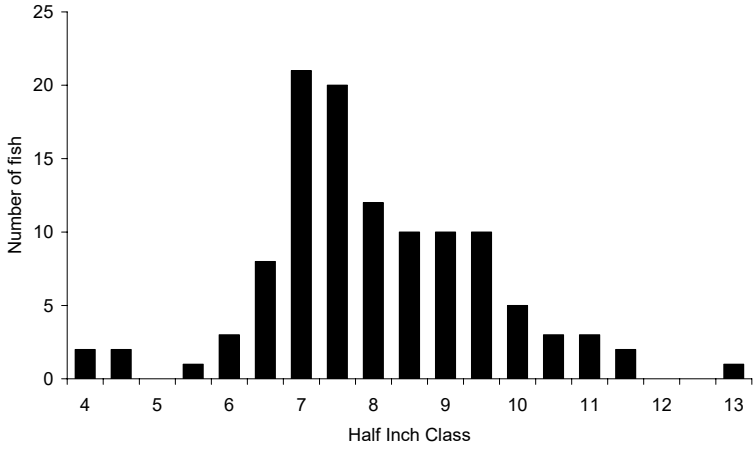
Other species sampled in lesser numbers included: rockbass, pumpkinseed, yellow perch, white sucker, green sunfish, golden shiner, and walleye.





Management Recommendations

The fishery in Lower Red Lake could be considered average when compared to other lakes in the area. It supports quality largemouth bass and northern pike populations. Of concern is the chronic poor size structure and growth of bluegill, crappie and other panfish. As with Upper Red Lake, the dense growths of aquatic vegetation are most likely inhibiting predator/prey interactions, however it appears that this problem is more extensive in Lower Red Lake. Also, plant choked conditions are affecting recreational use of the impoundment during mid-summer months.



Management Options:

- Maintain northern pike and largemouth bass abundance and size structure. Northern pike abundance has declined over recent years but is still at acceptable levels.

- Bluegill size structure and growth have been in a chronically poor condition for several years. Abundance is at high levels and is most likely causing severe competition for limited food resources. Management options may include actions to increase open spaces for predation of overabundant bluegills and bring this population back into balance. This may also have a positive impact on other species that are experiencing similar problems.

- Conduct spring netting and electrofishing surveys on a routine basis (5-6 year rotation) to monitor fish populations.

- Periodic drawdown to reduce aquatic plant densities. This option would require cooperation/coordination with local affected public and dam owners. Drawdown may be beneficial in opening up more space and habitat for predation of overabundant bluegill population. It may also improve recreational fishing opportunities during the mid-summer months (June-September) that are typically choked with aquatic vegetation.