

# ORIGINAL MEAD HUNT

*Designing the future*

January 26, 2007

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FEDERAL ENERGY REGULATORY COMMISSION  
SECRETARY'S OFFICE

Ms. Magalie Salas, Secretary  
Federal Energy Regulatory Commission  
Mail Code: DHAC, PJ-12.3  
888 First Street, NE  
Washington, DC 20426

Subject: *Invasive Plant Monitoring Report*  
Sturgeon Falls Hydroelectric Project; FERC Project No. 2720 - *dm*

Dear Secretary Salas:

On May 18, 2006, the Federal Energy Regulatory Commission (Commission) issued an *Order Modifying and Approving Invasive Plant Monitoring Plan Pursuant to Article 406* of the City of Norway's (City) license to operate the Sturgeon Falls Hydroelectric Project (FERC No. 2720). The Commission's *Order* requires the City to file a report of invasive plant monitoring efforts, together with copies of agency comments and recommendations on the report and a description of how the agencies' comments are accommodated. The Commission granted the City an extension of time until January 31, 2007, to file its first monitoring report.

Enclosed are an original and seven copies of the report entitled *Monitoring the Sturgeon Falls Hydroelectric Project for Eurasian Water Milfoil and Purple Loosestrife*, which was prepared by White Water Associates of Amasa, Michigan. Draft copies of the report were submitted to the U.S. Fish & Wildlife Service (USFWS) and to the Michigan Department of Natural Resources (MDNR) by Dr. Dean Premo, Senior Ecologist for White Water Associates. Consultation between Dr. Premo and resource agencies is summarized in the attached document entitled *Consultation Summary*.

Copies of the final monitoring report and consultation summary have been transmitted to the USFWS (Green Bay Field Office) and to the MDNR (Marquette Fisheries Station) by copy of this letter. If additional information is required, please contact me by telephone or e-mail at [linda.mitchell@meadhunt.com](mailto:linda.mitchell@meadhunt.com). Your attention to this matter is appreciated.

Sincerely,

MEAD & HUNT, Inc.



Linda D. Mitchell

Enclosures

cc: Louise Clemency – USFWS, Green Bay Field Office  
Jessica Mistak – MDNR, Marquette Fisheries Station  
Joe Pickart, Utilities Superintendent – City of Norway  
Dean Premo, Ph.D., Sr. Ecologist – White Water Associates

**Consultation Summary**  
**Monitoring of Eurasian Water Milfoil and**  
**Purple Loosestrife**  
**Sturgeon Falls Hydroelectric Project**  
**FERC No. 2720**

On behalf of the City of Norway (City), draft copies of the *Eurasian Water Milfoil and Purple Loosestrife Monitoring Report* for field investigations conducted in 2006 were sent to the Michigan Department of Natural Resources (MDNR) Marquette Fisheries Station and to the U.S. Fish & Wildlife Service (USFWS) Green Bay Field Office in New Franken, Wisconsin, on December 13, 2006. Comments were submitted by the MDNR on January 4, 2007. As of January 24, 2007, no comments had been received from the USFWS.

Comments from the MDNR were provided by Jessica Mistak, Fisheries Biologist at the MDNR Marquette Fisheries Station. Ms. Mistak concurred with the draft report, but also recommended an additional action objective to accomplish interim control of the stand of Eurasian water milfoil near the MDNR-owned boat launch in 2007. In light of the fact that effective measures for eradication and control of Eurasian water milfoil have not been well-established in lotic (riverine) ecosystems, a further inquiry was made to determine specific measures recommended for interim control. In response to this inquiry, Ms. Mistak recommended aquatic application of the chemical 2-4-D in the spring before the water reaches 60 degrees Fahrenheit.

In response to this MDNR recommendation, preliminary research was conducted on permitting and usage issues associated with application of 2,4 D in public waterways (this research is one of the Action Objectives listed in the 2006 Monitoring Report). It was determined that the Michigan Department of Environmental Quality (MDEQ) is the permitting authority for such application. On the City's behalf, an environmental scientist from White Water Associates (Dean Premo) spoke with Matt Preisser, an MDEQ staff person involved with review of permit applications for use of aquatic plant herbicides such as 2,4 D.

Based on this discussion, it was determined that at this point in time, the MDEQ has granted very few permits for application of 2,4 D in rivers. The only acceptable form of 2,4 D for such application is granular pellets. Retention time at the site of the Eurasian water milfoil occurrence is likely to be an issue with pellet application. Under some conditions, water flow can carry the herbicide downstream before the target plant (Eurasian water milfoil) has experienced a lethal exposure.

A review of the permit application process revealed that bathymetric and flow data may be required to allow for evaluation of retention time characteristics. MDEQ staff attempts to review and act upon applications submitted during the winter months prior to May 1. For other permits, a 30-day turnaround time is typical. The fee for permits varies from less than \$100 up to \$800 for applications of less than 100 acres. The application fee is due at the time of application filing and is payable whether or not the application is approved.

Due to the fact that the Menominee River forms the border between the states of Michigan and Wisconsin, White Water Associates staff also spoke to the Wisconsin Department of Natural Resources (WDNR) nuisance aquatic species specialist in Peshtigo, Wisconsin (Gregory Sevenser). Mr. Sevenser said that his agency had recently met with WE Energies and MDNR regarding Eurasian water milfoil management on WE Energies' impoundments, most of which are located on the Menominee River upstream of the Sturgeon Falls Project. Mr. Sevenser stated that chemical treatment does not eradicate Eurasian water milfoil and that even in whole lake chemical treatments, Eurasian water milfoil always comes back. He expressed a concern regarding river system treatments and the limited time for exposure to the herbicide because of current.

White Water Associates staff (Dean Premo) also spoke with Ms. Mistak by phone to discuss her recommendation of a spring 2007 application of herbicide to the area of Eurasian water milfoil in the vicinity of the MDNR boat landing on the Sturgeon River. Dr. Premo expressed a concern for treatment of this area with herbicide prior to having more information about depth and current (streamflow). In fact, it is likely that measurements or estimates of depth and flow would likely be required in a permit application (for herbicide use) to the MDEQ. Dr. Premo further expressed that although the boat landing is in a relatively wide spot on the Sturgeon River, the main stream does flow by this area and some influence of the river current may exist in the area of the boat landing. Another possible component of flow is a stream/drainage that enters the boat launch bay from the north. Ms. Mistak suggested that Dr. Premo contact WE Energies ecologist (Mike Grisar) to discuss common observations and management options for Eurasian water milfoil in the Menominee River. Ms. Mistak acknowledged that water current in the vicinity of the boat landing is a consideration.

In light of this consultation, the City believes it is not appropriate to propose the application of the chemical 2,4 D in the Menominee River at the time recommended by the MDNR (spring 2007). The City does not currently have the depth and streamflow data necessary to evaluate appropriate residency (exposure) time for the herbicide and therefore believes that a permit application might be viewed as incomplete by the MDEQ. Since WE Energies and others in the watershed are beginning to address Eurasian water milfoil control, the City believes it is prudent to evaluate what approaches to Eurasian water milfoil control seem to have the anticipated results. Communication and perhaps coordination with these other entities is important for optimizing successful management of this invasive species. The City also notes that the application site proposed by the MDNR is in fact owned and operated by the MDNR. The City is willing to participate in a joint effort with the MDNR to fund the cost of application of 2,4 D at its Sturgeon River boat launch should the MDNR elect to implement this initiative. Such participation would be contingent upon the MDNR obtaining all necessary permits and initiating coordination among the MDNR, the WDNR (if necessary), and the MDEQ. The City is willing to refund the cost of the application permit fee if the MDNR applies to the MDEQ for 2,4 D application and the permit is granted.



**INITIAL E-MAIL TRANSMITTAL MESSAGE TO USEWIS**

FROM: Dean Premo, White Water Associates

TO: U.S. Fish & Wildlife Service Green Bay Office (Louise Clemency, Field Supervisor)

At: 1:28 PM Wed 12/13/2006

Ms. Clemency,

We have completed a report for Monitoring The Surgeon Falls Hydroelectric Project For Eurasian Water Milloll and Purple Loosetite (FERC Hydro Project No. 2720, Menominee River in Dickinson County, Michigan and Marinette County, Wisconsin) and would like to send it to you for review and comment. To expedite the process I could send the report to you as an email attachment (PDF format). Would that be acceptable or do you prefer me to send a hard copy? Thanks.

Dean Premo, Ph.D., President  
White Water Associates, Inc.  
429 River Lane, P.O. Box 27  
Ames, Michigan 49808  
Phone: (908) 822-7888  
Fax: (908) 822-7977  
E-mail: dean.premo@white-water-associates.com  
<http://www.white-water-associates.com>

**E-MAIL CONSULTATION MESSAGE REPLY**

FROM: U.S. Fish & Wildlife Service Green Bay Office (Louise Clemency, Field Supervisor)

TO: Dean Premo, White Water Associates

At: 12:55 PM 12/14/06

>Mr. Premo,

>A pdf copy of the report would be fine.

>

>Louise Clemency

>Field Supervisor

>U.S. Fish and Wildlife Service

>Green Bay Ecological Services Office

>2061 Scott Tower Drive

>New Franken, Wisconsin 54229-8686

>820-886-1725

>820-886-1710 Fax

Surgeon Falls Hydroelectric Project - FERC No. 2720  
E-mail Consultation - Sheet 3 of 8

**REPORT TRANSMITTAL E-MAIL CONSULTATION MESSAGE**

TO: U.S. Fish & Wildlife Service Green Bay Office (Louise Clemency, Field Supervisor)

FROM: Dean Premo, White Water Associates

At: 1:02 PM 12/14/2006

Ms. Clemency,

Thank you for your prompt response. Please find attached the Surgeon Falls Report. I look forward to your comments.

-Dean Premo

Surgeon Falls Hydroelectric Project - FERC No. 2720  
E-mail Consultation - Sheet 4 of 8

**E-MAIL COMMENTS FROM MICHIGAN DNR ON MONITORING REPORT**

From: "Jessica Mistak" [mistakj@michigan.gov](mailto:mistakj@michigan.gov)

To: "Dean Pramo" [dean.pramo@white-water-associates.com](mailto:dean.pramo@white-water-associates.com)

At 11:19 AM 1/4/07:

Subject: Re: Sturgeon Falls Eurasian Watermilfoil and Purple Loosestrife

Hi Dean,

The Michigan DNR has reviewed the City of Norway's Sturgeon Falls Eurasian Watermilfoil and Purple Loosestrife Monitoring Report.

Approximately 64 acres of Eurasian watermilfoil were documented at the project in 2006, with the most extensive and dense coverage near the public boat launch. Given this information and the reasons for concern listed on page 5 of the report, we agree that a plan of action is needed to control Eurasian watermilfoil at the Sturgeon Falls project.

We concur with the proposed Action Objectives for control of Eurasian watermilfoil; however, we recommend an additional action objective to accomplish interim control of the stand of Eurasian watermilfoil near the boat launch in 2007. A quick control response of Eurasian watermilfoil in the project's most heavily used boating areas will reduce its spread in both this project and other water bodies.

Please let me know if you have any questions.

Jessica

**E-MAIL FOLLOW-UP INQUIRY BY WHITE WATER ASSOCIATES**

FROM: Dean Pramo, Ph.D., President  
E-mail: [dean.pramo@white-water-associates.com](mailto:dean.pramo@white-water-associates.com)

TO: Michigan Department of Natural Resources - Jessica Mistak

At: 01/04/2007 12:34 PM >>>

Jessica,

Thanks for your prompt review of the monitoring report. Can you elaborate on your recommendation of a "quick control response" for interim control of the boat launch stand?

-Dean

**E-MAIL REPLY FROM MICHIGAN DNR**

FROM: Michigan Department of Natural Resources - Jessica Mistak

TO: Dean Pramo, Ph.D., President, White Water Associates

Date: Thu, 04 Jan 2007 14:29:14 -0500

No problem- we recommend that this stand be controlled using the chemical 2,4-D in the spring (before water reaches 60 degrees F).

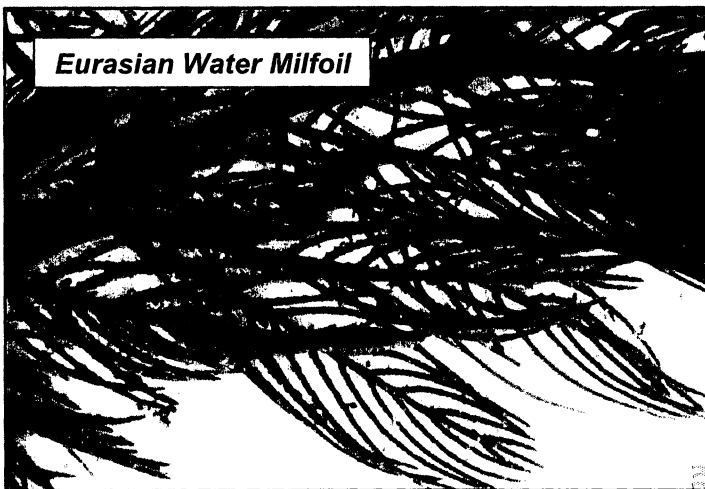
Jessica

SUBSEQUENT TELEPHONE CONSULTATION IS PRESENTED IN  
CONSULTATION SUMMARY DOCUMENT

ORIGINAL

MONITORING REPORT

**Monitoring The Sturgeon Falls Hydroelectric Project  
For Eurasian Water Milfoil and Purple Loosestrife  
FERC Hydro Project No. 2720, Menominee River  
(Dickinson County, Michigan and Marinette County, Wisconsin)**



**Prepared for:**  
City of Norway  
Norway, Michigan  
and  
Mead & Hunt

**Prepared by:**

Contact: Dean B. Premo, Ph.D., Senior Ecologist  
429 River Lane, P.O. Box 27  
Amasa, Michigan 49903

Date: November 2006

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**MONITORING REPORT**

**Monitoring The Sturgeon Falls Hydroelectric Project  
For Eurasian Water Milfoil and Purple Loosestrife  
FERC Hydro Project No. 2720, Menominee River  
(Dickinson County, Michigan and Marinette County, Wisconsin)**

Fieldwork: David Tiller, B.S., Field Biologist  
Jim Butler, Field Technician

Data Analysis And Report Dean Premo, Senior Ecologist  
Kent Premo, Technical Support Scientist  
David Tiller, B.S. Field Biologist

Cite as:  
Premo, Dean, David Tiller, and Kent Premo. 2006.  
Monitoring The Sturgeon Falls Hydroelectric  
Project For Eurasian Water Milfoil and Purple  
Loosestrife - FERC Hydro Project No. 2720,  
Menominee River. Report to the City of Norway,  
Michigan. White Water Associates, Inc.

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## **List of Figures and Table in Appendix A**

Figure 1. Locations of Eurasian water milfoil (*Myriophyllum spicatum* L.) and Purple Loosestrife (*Lythrum salicaria*) in the Sturgeon Falls Hydroelectric Project.

Figure 2. Locations of Eurasian water milfoil (*Myriophyllum spicatum* L.) in the Sturgeon Falls Hydroelectric Project.

Figure 3. Locations of Eurasian water milfoil (*Myriophyllum spicatum* L.) in the Sturgeon Falls Hydroelectric Project.

Table 1. Eurasian water milfoil (*Myriophyllum spicatum* L.) in the Sturgeon Falls Hydroelectric Project in 2006 (FERC #2720).

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## SUMMARY

On January 6, 2005, the Federal Energy Regulatory Commission granted an Order Issuing New License to the City of Norway (City) for its Sturgeon Falls Hydroelectric Project (FERC Project No. 2720, located on the Menominee River in Dickinson County, Michigan, and Marinette County, Wisconsin. Among other actions, the Order required the development of an "Invasive Plants Monitoring Plan." The plan calls for periodic monitoring of two non-native and aggressive plant species: Eurasian water milfoil (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*). This document reports on the 2006 annual monitoring survey.

During an aquatic plant survey conducted in 2000, Eurasian water milfoil was found at several locations, but in limited numbers and typically in association with other water species. A single purple loosestrife plant was observed in 2000.

The Sturgeon Falls Dam impounds a reservoir comprising approximately 440 acres. The impounded areas include a reach of the Menominee River extending 4 miles upstream from the dam, and a reach of the Sturgeon River extending approximately 2 miles upstream from its confluence with the Menominee River. We conducted the fieldwork during four days in late summer and early fall. We used a 14-foot boat for the survey. We carried maps of the aquatic plant communities that were documented in 2000 and visited all of these locations to inspect for Eurasian water milfoil and purple loosestrife. We marked on map and with GPS coordinates the locations of Eurasian water milfoil finds. For each area where Eurasian water milfoil was observed, we estimated the number of plants, recorded the length and width of each area of occurrence, and described other features. We examined numerous samples of Eurasian water milfoil for evidence of weevil herbivory.

The project area has a robust diversity of native aquatic plants. In 2006, we documented thirty-three sites in the project area with Eurasian water milfoil. We estimate that there are approximately 64 acres of aquatic plant habitat that have Eurasian water milfoil present to some extent. We did not observe evidence of weevil herbivory. We observed the most extensive and densest coverage Eurasian water milfoil in the vicinity of the public boat launch on the Sturgeon River. In general, it appears that the population of Eurasian water milfoil in the entire project area has increased in distribution and population size since 2000. The only purple loosestrife observed in the entire project area was the same plant that was discovered during the year 2000 survey. We fully excavated the single plant with shovels, being careful to remove all parts of the root structure. We disposed of this plant in a sanitary landfill.

Eurasian water milfoil is unfortunately distributed in many places throughout the Menominee River and continued colonization of the Sturgeon Falls project area is a likely prospect. Some organizations in the watershed have begun various control measures. We propose an adaptive management approach to Eurasian water milfoil in the Sturgeon Falls project area that undertakes seven action objectives in the year 2007 based on the following goal:

*Through an overall "do no harm" policy to native plant communities, reduce the population size and distribution of Eurasian water milfoil in the Sturgeon Falls Hydroelectric Project area and minimize the potential emigration of the species from the project area to other bodies of water.*

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## INTRODUCTION AND BACKGROUND

On January 6, 2005, the Federal Energy Regulatory Commission (FERC) granted an Order Issuing New License to the City of Norway (City) for its Sturgeon Falls Hydroelectric Project (Sturgeon Falls Project), FERC Project No. 2720, located on the Menominee River in Dickinson County, Michigan, and Marinette County, Wisconsin. The Order includes License Articles specifying actions the City must take to comply with terms and conditions of the license. One required action was the development of an "Invasive Plants Monitoring Plan" (specified by License Article 406). The plan calls for periodic monitoring of two non-native and aggressive plant species: Eurasian water milfoil (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*). The Invasive Plant Monitoring Plan calls for annual monitoring through the year 2010 and every two years thereafter (in even numbered years). This document reports on the first annual monitoring survey.

A qualified ecological consultant for the City of Norway conducted a botanical resources assessment in the year 2000. This assessment established a valuable baseline of the aquatic macrophytes in the project area (both native and non-native species). During the survey conducted in 2000, Eurasian water milfoil was found at several locations, but in limited numbers and typically in association with other water species. The localities of Eurasian water milfoil were mapped and provided as part of a report documenting the finds. During the survey conducted in 2000, a single large purple loosestrife plant was found on a small island located approximately one-half mile downstream of the project's western (upstream) boundary. This site was mapped and described and the plant's twenty-one flowering stalks were cut, bagged, and disposed of in a landfill to prevent seed dispersal. It should be noted that the 2000 survey did not specifically target Eurasian water milfoil or purple loosestrife as is the case of the 2006 effort.

There have been reports of both Eurasian water milfoil and purple loosestrife within the Menominee River basin since 1990 although none from the project area prior to 2000. Eurasian water milfoil has been reported since 1995 from the Twin Falls Flowage, several miles upstream of the project area. Eurasian water milfoil has been reported since 2002 from the Little Quinnesec Falls Flowage (the closest upstream flowage to the Sturgeon Falls Project). The population of Eurasian water milfoil in the Little Quinnesec Falls Flowage has generally been small in numbers and locations and has not dominated the plant community at any of its localities. Instead, it tends to be part of a diverse plant community of native species. Weevil damage on Eurasian water milfoil at the Little Quinnesec Falls Project has not been documented.

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Purple loosestrife has not been observed in the Little Quinnesec Falls Project area, although it has been found since 1998 growing along the Wisconsin shoreline of the river below the Little Quinnesec Dam (about 100 feet below the public access site). This area is within the city of Niagara but outside the project area. These few plants have occurred on private land and most have been removed. The locality of these plants is four to five miles upstream of the Sturgeon Falls Project area.

This document reports on the 2006 monitoring survey results and presents information in five sections: (1) Summary, (2) Introduction and Background, (3) Project Area and Methods, (4) Findings, and (5) Conclusions. An appendix contains maps of Eurasian water milfoil and purple loosestrife localities in the project area.

## **PROJECT AREA AND METHODS**

The Sturgeon Falls Project is located on the Menominee River about 3.5 miles southeast of the City of Norway, and about one mile downstream from the confluence of the Menominee and Sturgeon Rivers. At this location the Menominee River forms the boundary between Michigan and Wisconsin. Portions of the project lie in Dickinson County, Michigan, and Marinette County, Wisconsin. Adjacent lands in Dickinson County are located in Norway Township, T39N, R29W, while adjacent lands in Marinette County are located in the town of Niagara, T38N, R21E.

The Sturgeon Falls Dam impounds a reservoir comprising approximately 440 acres. The impounded areas include a reach of the Menominee River extending 4 miles upstream from the dam, and a reach of the Sturgeon River extending approximately 2 miles upstream from its confluence with the Menominee River. Most of the project shoreline is wooded. Project wetlands consist of forested swamps, bogs, and emergent wetlands dominated by grasses, sedges, and other herbaceous vegetation.

We conducted the fieldwork for the 2006 survey during two days in late August (August 21 and 22) and two days in the early fall (September 25 and October 6). The August bout also incorporated a survey for erosion sites in the project area and coincided with the peak flowering season for purple loosestrife. Reconnaissance work on Eurasian water milfoil was conducted during the August survey, but the two early fall survey days focused on Eurasian water milfoil.

We used a 14-foot boat and a 9.9 HP engine to survey the shoreline and other likely areas in the project area, including numerous backwater wetlands. Most of the backwater wetlands are

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shallow and densely vegetated with a diversity of aquatic plants making motor use difficult. Oars were used to row the boat into these areas allowing comprehensive coverage. In the field, we carried maps of the aquatic plant communities that were documented in the 2000 survey of aquatic plants and visited all of these locations to inspect for Eurasian water milfoil and purple loosestrife (unlike the 2000 survey, the 2006 efforts focused on these two non-native plants).

We visually surveyed for Eurasian water milfoil in aquatic plant beds and took samples by hand and metal garden rake. We closely examined the leaves of suspect plants, counting leaflets. The average number of leaflets is the main morphological trait used to separate the native northern water milfoil (*Myriophyllum sibiricum*) from Eurasian water milfoil, although there is considerable variability within each species. Generally, the average number of leaflets for northern water milfoil is 5-11 with a reported maximum of 13. The average number for Eurasian water milfoil is 14-17 with a maximum of 20. Also useful later in the season is the presence of winter buds (turions) on northern water milfoil, structures not found on Eurasian water milfoil. Where Eurasian water milfoil was observed, we also examined for evidence of weevil herbivory.

When flowering, purple loosestrife is showy and easily identifiable. Peak blossoming extends from late July through August in northern Michigan. All backwaters connected to the project area were visually inspected. Binoculars were used to scan the shore and less accessible backwaters. We carefully inspected the site of the purple loosestrife find in the 2000 survey.

Our field approach was to mark on map and with GPS coordinates the locations of Eurasian water milfoil finds. We identified and inspected all sites where Eurasian water milfoil was documented in the 2000 survey. We made observations as to whether the plants existed in mats or as individual plants and described whether they seemed to dominate a given area or were part of a diverse plant community. For each area where Eurasian water milfoil was observed, we estimated the number of plants in one of four categories (<10, 11-100, 101-1000, and >1000). We estimated the length and width of an area of occurrence. We verified plant identification by collection specimens for identification in the laboratory. We examined numerous samples of Eurasian water milfoil for evidence of weevil herbivory.

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## FINDINGS

This report section presents the findings from the 2006 survey and integrates information from the 2000 surveys to provide insight into population dynamics of Eurasian water milfoil and purple loosestrife in the Sturgeon Falls Hydroelectric Project.

### Eurasian Water Milfoil

The project area continues to have a robust diversity of native aquatic plants. The 2000 aquatic plant assessment documented twenty-six species including: *Anacharis Canadensis*, *Ceratophyllum demersum*, *Chara vulgaris*, *Heteranthera dubia*, *Hippuris vulgaris*, *Lemna minor*, *Megalodonta beckii*, *Myriophyllum spicatum*, *M. heterophyllum*, *Najas flexilis*, *Nuphar advena*, *Nymphaea odorata*, *Pontederia cordata*, *Potamogeton amplifolius*, *P. epihydrus*, *P. foliosus*, *P. natans*, *P. richardsonii*, *P. robinsii*, *P. zosteriformis*, *Ranunculus flabellaris*, *Sagittaria graminea*, *S. latifolia*, *Stuckenia filiformis*, *S. pectinata*, and *Vallisneria Americana*.

The 2000 survey documented twelve sites in the project area where Eurasian water milfoil was observed. The 2000 report stated, "Eurasian water milfoil was found in limited numbers, typically in association with other water species."

In 2006, we documented thirty-three sites in the project area with Eurasian water milfoil. These sites are identified and described in Table 1 and shown in Figures 1-3. Although the 2000 report did not specifically map Eurasian water milfoil extent, it is our impression that the 2006 population is more extensive in its area of coverage. Like the 2000 survey, we typically found Eurasian water milfoil to be distributed among native aquatic plants, but we would not characterize the numbers that we observed as "limited." In fact, in many areas Eurasian water milfoil plants were too numerous to count. We estimate that there are approximately 64 acres of aquatic plant habitat that have Eurasian water milfoil present to some extent. We did not observe evidence of weevil herbivory on any specimens that we examined.

We observed the most extensive coverage and most dense areas of Eurasian water milfoil in the vicinity of the public boat launch on the Sturgeon River. Although the 2000 survey reported Eurasian water milfoil about 1,400 feet south of the boat landing, it was found in one relatively small aquatic plant patch. During the 2006 survey, we found it throughout the large bay by the boat landing and in the large bay to the south of the boat landing (see Figure 3). Only the deeper

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water in the main Sturgeon River channel was devoid of the species in this vicinity. Eurasian water milfoil was quite dense in this area, although still among native aquatic macrophytes. The extensive distribution in this close proximity to the boat landing is problematical for two reasons: (1) boats launching at this point motor through Eurasian water milfoil and facilitate its spread within the project area and downstream (by physically carrying plant fragments in the propeller and by breaking up the stems allowing them to float downstream) and (2) boats leaving from this landing have a good probability of carrying away Eurasian water milfoil on the propeller or boat trailer with possible introduction to other bodies of water. Colonization of downstream habitat seems to be in progress as we found areas of Eurasian water milfoil just downstream of County Road 577 (these were not documented in 2000). Upstream distribution on the Sturgeon River has also increased since 2000 when there was only a single occurrence of the species. In 2006 we found more extensive distribution, even in the mouth of Hamilton Creek. The Hamilton Lakes chain (upstream on Hamilton Creek) has Eurasian water milfoil and is a possible source of propagules for the Sturgeon Falls Project.

### **Purple Loosestrife**

The only purple loosestrife observed in the entire project area was the same plant that was discovered during the year 2000 survey. This was a robust multi-stemmed plant, but had not spread. Pulling a purple loosestrife plant is typically not sufficient to eliminate the plant as it can sprout from fragments of roots left in the soil or seeds still present in the seed bank. We fully excavated the single plant with shovels, being careful to remove all parts of the root structure. We disposed of this plant in a sanitary landfill.



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## DISCUSSION AND PROPOSED ACTIONS

Although Eurasian water milfoil was documented in a 2000 aquatic plant survey of the Sturgeon Falls Hydroelectric Project, this 2006 survey was the first to specifically target the plant's population and distribution. Comparing the 2000 and the 2006 surveys, it appears that the population of Eurasian water milfoil in the project area has increased in distribution and population size. At most of the sites where it was observed, however, it was not the dominant plant in this diverse plant community. It was a visually dominant component in eight of the thirty-three sites where it was observed. In contrast, Eurasian water milfoil numbered less than ten individual plants at nine of the thirty-three sites.

This is a dynamic period in the aquatic flora of the Menominee River watershed with respect to the role played by the non-native Eurasian water milfoil. The plant is unfortunately distributed in many places throughout the watershed in several impoundments and lakes. Eurasian water milfoil is upstream of the Sturgeon Falls project on both the Menominee River and the Sturgeon River systems making continued colonization of the Sturgeon Falls project a likely prospect. Some organizations in the watershed have begun various control measures ranging from mechanical (hand-pulling), to introduction of herbivorous weevils, to application of herbicide. It is too early to draw conclusions regarding the success of these control attempts.

We propose an adaptive management<sup>1</sup> approach to the challenges of Eurasian water milfoil in the Sturgeon Falls project area. This is an appropriate model to use in aquatic resource management, especially in those situations where a non-native invasive species is being managed and uncertainty exists about the efficacy of various control actions. In adaptive management, the outcomes of management actions are monitored to ascertain whether they are effective in meeting objectives of the plan. If warranted, the plan is "adapted" in a process of continuous refinement.

Adaptive management acknowledges uncertainty. In complex natural ecosystems, almost all management actions will have some uncertain outcomes and possibly unintended negative results. Monitoring is crucial in adaptive management. Adaptive management uses information from monitoring to continually evaluate and refine management practices. Monitoring measures the success of management actions.

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<sup>1</sup> Walters, C. 1986. *Objectives, constraints, and problem bounding*. In W.M. Getz, ed., *Adaptive Management of Renewable Resources*. Macmillan Publishing Company. New York. p. 13+.

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The City of Norway established the following goal with respect to Eurasian water milfoil in the Sturgeon Falls project:

*Through an overall "do no harm" policy to native plant communities, reduce the population size and distribution of Eurasian water milfoil in the Sturgeon Falls Hydroelectric Project area and minimize the potential emigration of the species from the project area to other bodies of water.*

Using adaptive management, we will address this goal by pursuing several action objectives in the year 2007. These are described in the following paragraphs.

**Action Objective 1.** Investigate opportunities to educate the public through signage at project area boat landings indicating the presence of Eurasian water milfoil and proper boating precautions to prevent its spread.

**Action Objective 2.** Research ongoing control measures being implemented in the Menominee River watershed to determine applicability to the Sturgeon Falls project area. We plan to confer with others who have had experience in attempting to control Eurasian water milfoil on the Menominee River watershed (especially those using weevils and/or herbicides). We hope to glean practical information to apply to the Sturgeon Falls project.

**Action Objective 3.** Conduct a more general investigation of attempts at Eurasian water milfoil control in the Great Lakes States in order to determine most promising approaches.

**Action Objective 4.** Research required permits from resource/regulatory agencies for application of various Eurasian water milfoil control methods.

**Action Objective 5.** Conduct early spring reconnaissance in the project area to determine the period of "green-up" for native aquatic plants and see how this fits into the phenology of Eurasian water milfoil. This will help judge a suitable treatment window in the case that an herbicide is used in future control treatments.

**Action Objective 6.** Conduct the 2007-monitoring program, documenting changes in population size or extent. Since 2006 was the first monitoring year, it is the baseline against which future changes can be measured.

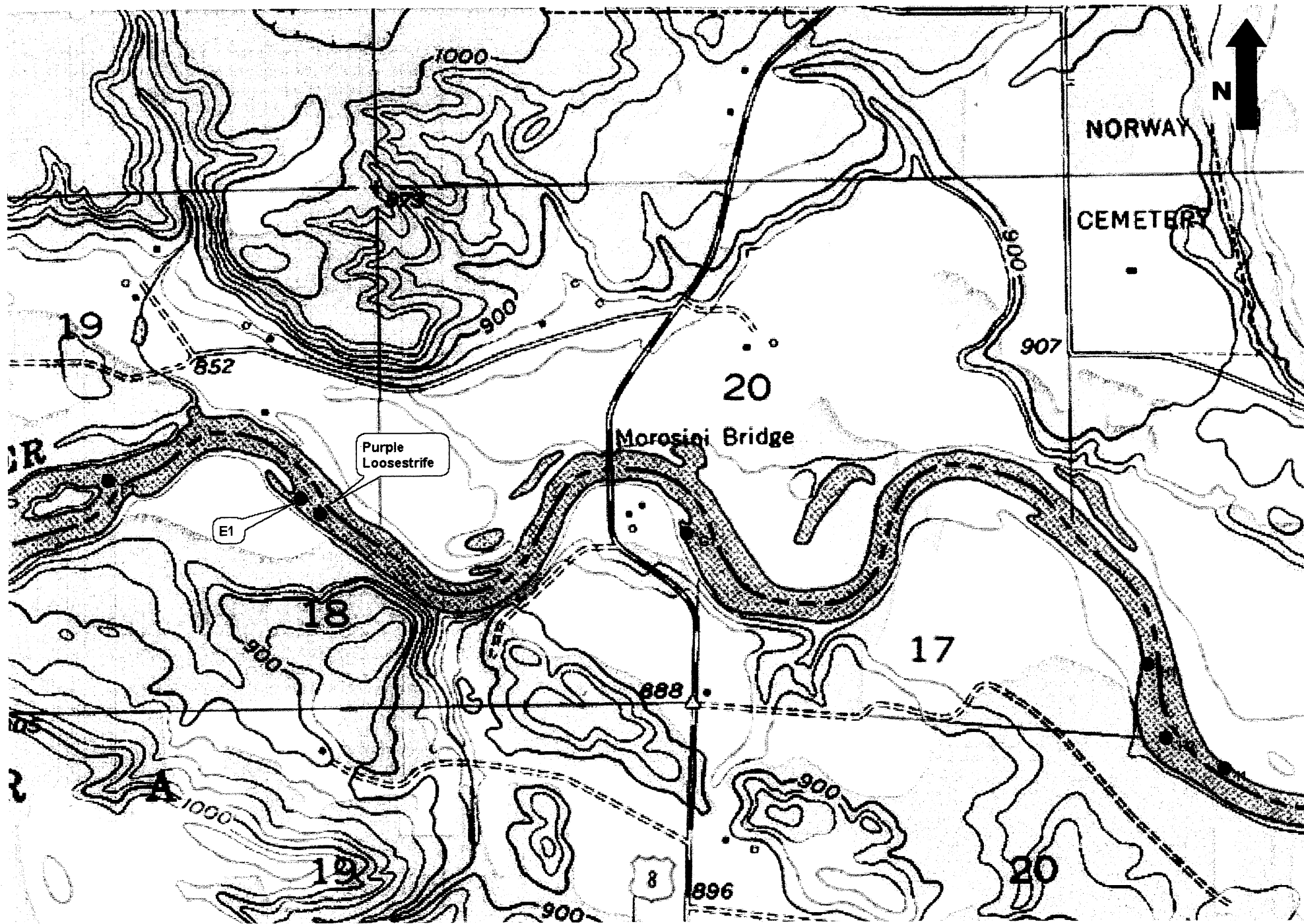
**Action Objective 7.** Re-evaluate status and establish objectives for the year 2008.

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**APPENDIX A**  
**(FIGURES AND TABLE)**

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Figure 1. Locations of Eurasian Water Milfoil (*Myriophyllum spicatum* L.) and Purple Loosestrife (*Lythrum salicaria*) in the Sturgeon Falls Hydroelectric Project



Site Code	Year	Latitude, Longitude	Number of Plants <sup>1</sup>	Estimated Bed Width (ft)	Estimated Bed Length (ft)	Surface Area (acres)	Percent Project Area	Description
N1	2006	N45.75556 W87.87653	B	20	30	0.01	0.00	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM)
N2	2006	N45.75711 W87.87879	B	20	25	0.01	0.00	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM)
N3	2006	N45.75743 W87.87798	B	20	40	0.02	0.00	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM). EWM was found at this site in 2000.
N4	2006	N45.75761 W87.87362	B	20	25	0.01	0.00	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM)
N5	2006	N45.75418 W87.87223	B	50	150	0.17	0.04	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM)
N6	2006	N45.75403 W87.87355	C	150	350	1.21	0.27	EWM mixed with other aquatic plants
O1	2006	N45.75039 W87.86971	B	50	100	0.11	0.03	EWM mixed with other aquatic plants
P1	2006	N45.75144 W87.86563	B	50	100	0.11	0.03	EWM plants in small patch within an area other aquatic plants (part of an area with several patches of EWM). EWM was found at this site in 2000.
P2	2006	N45.75324 W87.86373	C	60	100	0.14	0.03	Dense patch of EWM, visually dominating in a mixture of other aquatic plants. This in an area with other patches of EWM.
P3	2006	N45.75277 W87.86236	C	40	75	0.07	0.02	Dense patch of EWM, visually dominating in a mixture of other aquatic plants. This in an area with other patches of EWM.
P4	2006	N45.75095 W87.86367	C	100	100	0.23	0.05	EWM mixed with lilies
P5	2006	N45.75158 W87.86222	C	100	150	0.34	0.08	Fairly dense EWM, mixed with other aquatic plants
A	2006	N45.75402 W87.86096 (west limit) N45.75372 W87.85860 (east limit) N45.75411 W87.8594 (ca. center)	D	700	800	12.85	2.92	Dense patch of EWM, visually dominating in a mixture of other aquatic plants. This area is in front of the public access site. Interestingly, no EWM was reported for this area in the 2000 survey.

Site Code	Year	Latitude, Longitude	Number of Plants <sup>1</sup>	Estimated Bed Width (ft)	Estimated Bed Length (ft)	Surface Area (acres)	Percent Project Area	Description
B	2006	N45.75241 W87.85882 (NE limit) N45.75070 W87.86063 (SW limit) N45.75152 W87.85945 (ca. center)	D	600	1000	13.77	3.13	A very large colony of EWM, nearly everywhere it is dense, but mixed with other plants. EWM was found at this site in 2000.
C	2006	N45.75224 W87.85013	C	100	300	0.69	0.16	Scattered EWM throughout other aquatic plants, but not dominant
Q1	2006	N45.75051 W87.84539	A	50	50	0.06	0.01	Small patch of EWM (a few plants) among other plants; not visually dominant
R1	2006	N45.75555 W87.84260	B	100	200	0.46	0.10	EWM among other plants; not visually dominant
Q3	2006	N45.75110 W87.84714	A	50	75	0.09	0.02	Small patch of EWM (a few plants) among other plants; not visually dominant
D1	2006	N45.75019 W87.84476	C	400	500	4.59	1.04	EWM that is fairly dense; not quite visually dominant. EWM was found at this site in 2000.
D2	2006	N45.74935 W87.84268	A	100	300	0.69	0.16	Scattered EWM throughout other aquatic plants
D3	2006	N45.75063 W87.84414	A	100	300	0.69	0.16	Scattered EWM throughout other aquatic plants
TOTAL ACRES OF EURASIAN WATER MILFOIL (ALL SITES):						63.85		
PERCENTAGE OF TOTAL PROJECT AREA ACREAGE (440 Acres):							14.51	

1. Number of plants reported as one of four categories of estimated numbers: "A" is <10 individual plants, "B" is 11 to 100 plants, "C" is 101-1000 plants, "D" is >1000 plants.

Figure 2. Locations of Eurasian Water Milfoil (*Myriophyllum spicatum* L.) in the Sturgeon Falls Hydroelectric Project

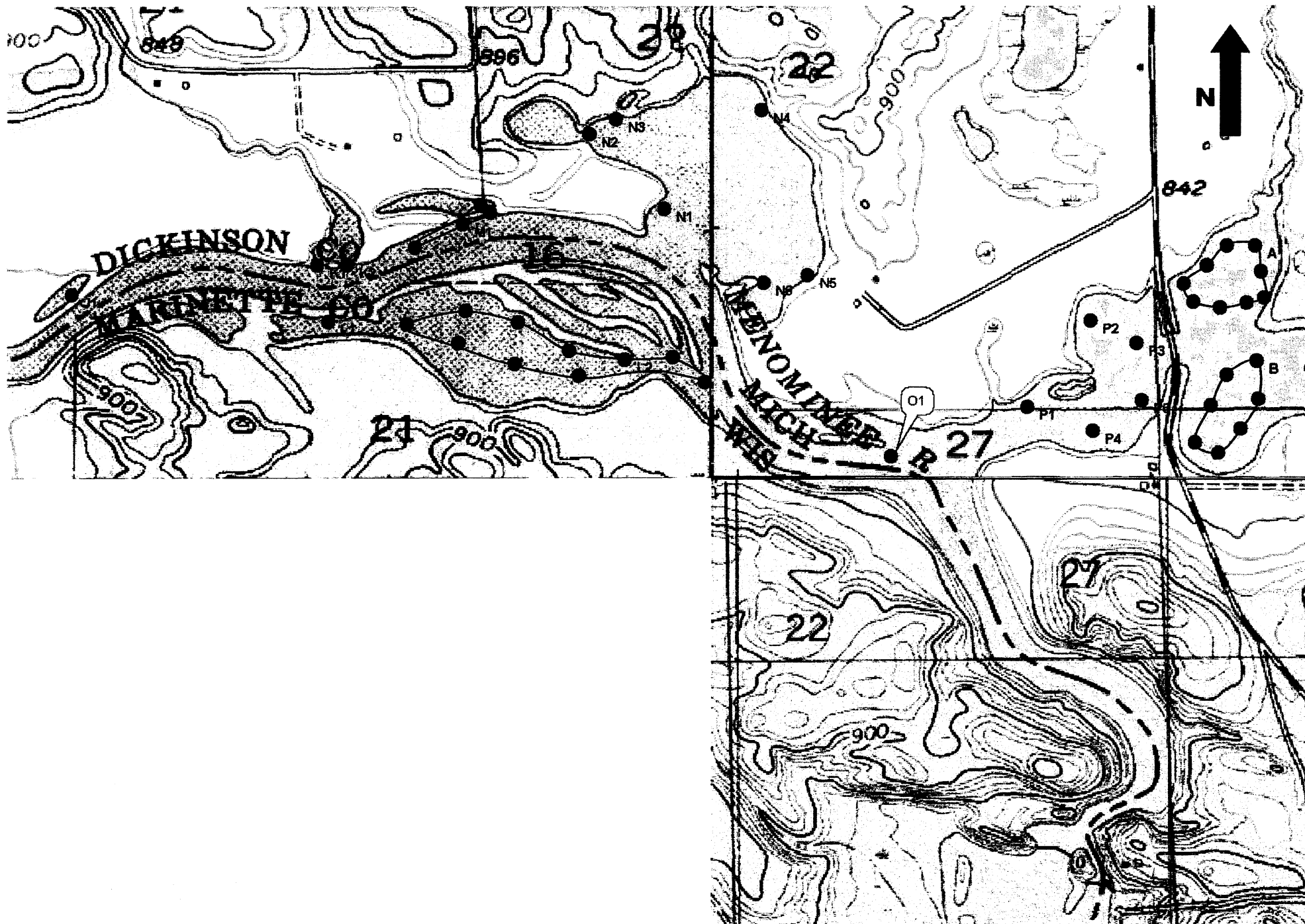
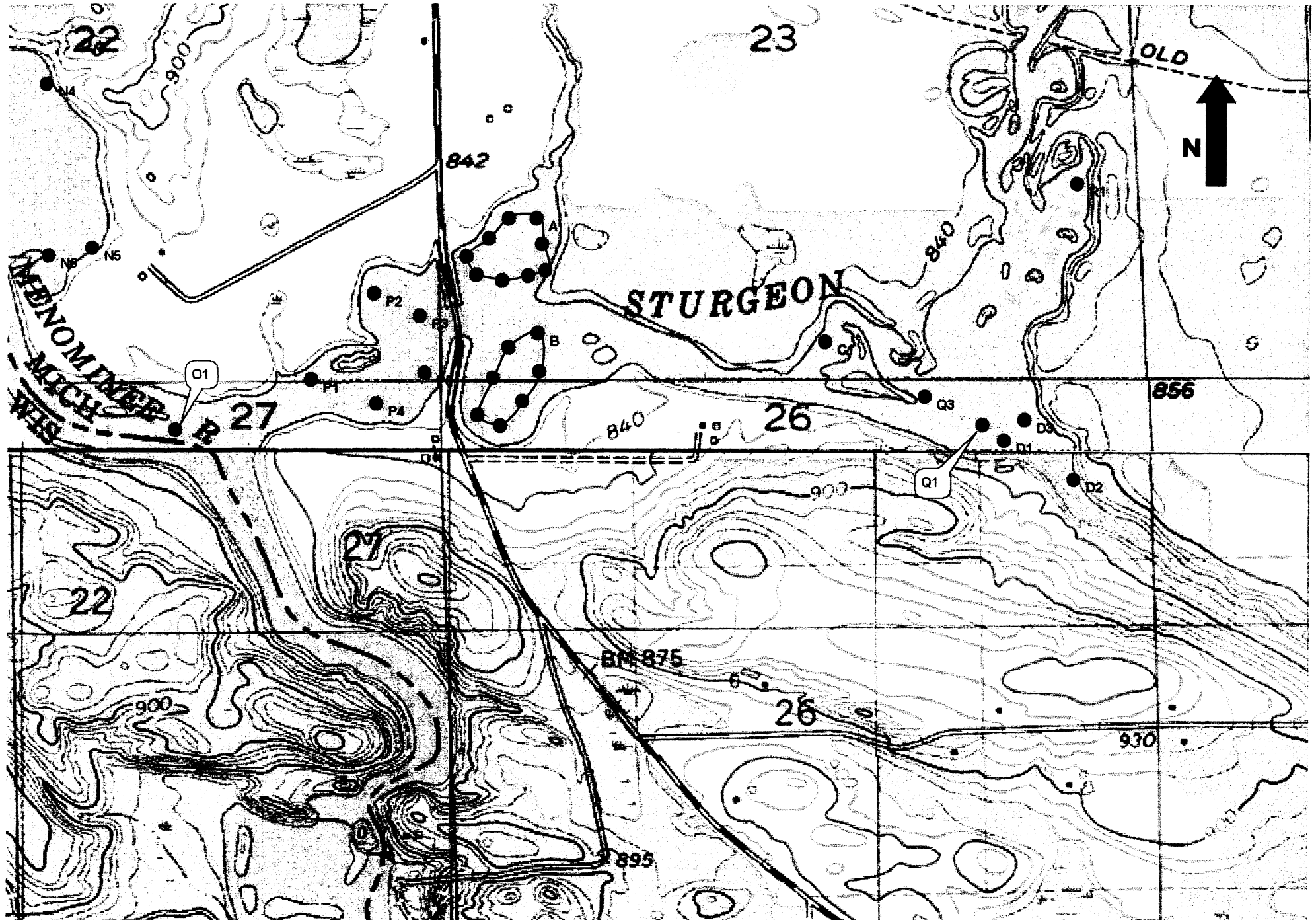


Figure 3. Locations of Eurasian Water Milfoil (*Myriophyllum spicatum* L.) in the Sturgeon Falls Hydroelectric Project





**Table 1. Eurasian Water Milfoil in the Sturgeon Falls Hydroelectric Project (FERC #2720)**

Site Code	Year	Latitude, Longitude	Number of Plants <sup>1</sup>	Estimated Bed Width (ft)	Estimated Bed Length (ft)	Surface Area (acres)	Percent Project Area	Description
F1	2006	N45.75934 W87.93252	A	50	150	0.17	0.04	A few plants mixed with other aquatic plants
E1	2006	N45.75895 W87.92674	C	100	200	0.46	0.10	A bed of EWM with other plants, but EWM is visually dominant
G1	2006	N45.75818 W87.91510	C	100	150	0.34	0.08	A bed of EWM with other plants, but EWM is visually dominant. EWM was found at this site in 2000.
H1	2006	N45.75542 W87.90127	C	50	300	0.34	0.08	A bed of EWM with other plants, but EWM is visually dominant. EWM was found at this site in 2000.
H2	2006	N45.75387 W87.90074	B	75	150	0.26	0.06	Small bed, mixed with other aquatic plants. EWM was found at this site in 2000.
I1	2006	N45.75324 W87.89899	A	50	150	0.17	0.04	Small bed, mixed with other aquatic plants
J1	2006	N45.75379 W87.89433	B	50	100	0.11	0.03	Small bed, mixed with other aquatic plants. EWM was found at this site in 2000.
K1	2006	N45.75441 W87.88694	A	75	150	0.26	0.06	Small bed, mixed with other aquatic plants
K2	2006	N45.75440 W87.88606	A	50	100	0.11	0.03	Small bed, mixed with other aquatic plants
L1	2006	N45.75322 W87.88662	A	75	150	0.26	0.06	Mixed with other aquatic plants
L2	2006	N45.75316 W87.88427 (west limit) N45.75197 W87.87531 (east limit)	D	400	2500	22.96	5.22	Extensive colony, consisting of patches where EWM visually dominates, but mixed with other aquatic plants throughout this area. EWM was found at this site in 2000.
M1	2006	N45.75477 W87.88403 (west limit) N45.75548 W87.88176 (east limit)	C	100	900	2.07	0.47	Long narrow area of EWM mixed with other aquatic plant species.