Northbrook Energy, LLC

FILED ELECTRONICALLY
December 19, 2011

Office of the Secretary
Federal Energy Regulatory Commission
888 1st Street, NE
Washington, DC 20426

Re: Little Quinnesec Falls Hydroelectric Project, FERC No. 2536
Article 409 - 2010 Exotic Species Reports

Dear Secretary:

In accordance with the Commission order approving the monitoring plan for purple loosestrife and Eurasian watermilfoil at the Little Quinnesec Hydroelectric Project, and the *Milfoil Weevil Monitoring and Eurasian Watermilfoil Adaptive Management Plan*, dated April 2010, enclosed are the following annual reports prepared by White Water Associates, Inc:

1. *Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian Watermilfoil and Purple Loosestrife*, dated November 2011; and

2. *2011 Report of Milfoil Weevil Monitoring and Eurasian Watermilfoil Management for the Little Quinnesec Falls Hydroelectric Project*, dated November 2011.

Eurasian Watermilfoil & Purple Loosestrife Monitoring

In the 2011 survey, no purple loosestrife plants were found in the project area.

In 2011, a dramatic decrease in Eurasian watermilfoil numbers and distribution was documented in the project area. In contrast to the 2010 survey, when twenty-five sites were identified with Eurasian watermilfoil, only one site had this invasive species in 2011. Only five Eurasian watermilfoil plants were observed in 2011. The most conspicuous absence of Eurasian watermilfoil was at Site K where it had been abundant in 2009 and 2010.

Over the years of monitoring at the Little Quinnesec Falls Project it has been noted that small sub-populations of Eurasian watermilfoil come and go, but in 2011 provided the most dramatic decrease observed over the years of monitoring. The reasons for this are unknown, but may indicate the difficulty of invading a thriving native plant community and the natural presence of native watermilfoil weevil (*Euhrychiopsis lecontei*) in the project area.

With only five plants observed in 2011, the actual surface area coverage of Eurasian watermilfoil relative to the size of the impoundment (349 acres) is extremely small. All

14550 N Frank Lloyd Wright #210
Scottsdale, Arizona 85260
480·551·1221/Fax 480·551·1991

Eurasian watermilfoil was absent from Site K in 2011, even though it numbered in the hundreds in 2010. Also present at Site K in 2010 was a natural population of the native watermilfoil weevil (*Euhrychiopsis lecontei*). The watermilfoil weevil is a biological control agent of Eurasian water milfoil and likely played a role in the absence of the Eurasian watermilfoil in 2011.

Milfoil Weevil Monitoring

Consistent with the relative lack of Eurasian watermilfoil in the project area, the sampling protocol for the native watermilfoil weevil (*Euhrychiopsis lecontei*) could not be carried out in 2011.

Modification to Monitoring Frequency

Based on the results of the monitoring programs, and agency comments (enclosed herewith), Northbrook proposes to modify the frequency of monitoring to biannually under both programs. With this modification, there would be no monitoring during 2012.

Very truly yours,

Chuck Ahlrichs
President

Chuck Ahlrichs

From: Piszczek, Paul (DNR) [PiszczekP@michigan.gov]
Sent: Monday, December 19, 2011 7:34 AM
To: Chuck Ahlrichs
Cc: Donofrio, Michael C - DNR; Nick_Utrup@fws.gov; Jessica Mistak (MISTAKJL@michigan.gov); Kramer, Darren (DNR)
Subject: RE: Little Quinnesec Falls Hydro - Exotic Species

Chuck,
Thank you for providing the exotic species report and the opportunity to comment. White Water's cover letter states a data collection period of approximately 15 years, which is somewhat misleading. Appendix A, Table 1 and Table 2 show variable data collection start dates (years) at each of the sampling sites. Notwithstanding, the proposed bi-annual sampling should allow us to determine any trends; MDNR concurs with your request for bi-annual sampling.

Please note I filled the vacancy Jessica Mistak left when she moved to the Northern Lake Michigan Management Unit Supervisor position. Please direct future FERC-related correspondence to me.

Paul

Paul Piszczek, Fisheries Biologist
Michigan Department of Natural Resources
Fisheries Division - Habitat Management Unit
Environmental Assessment Sub-Unit
Escanaba Field Office
6833 U.S. Hwy 2, 41 and M35
Gladstone, MI 49837
(906) 786-2351 x132
(906) 786-1300
piszczekp@michigan.gov
www.michigan.gov/dnr

From: Chuck Ahlrichs [mailto:cahlrichs@nbenergy.com]
Sent: Tuesday, December 13, 2011 11:45 AM
To: Donofrio, Michael C - DNR; Jessica Mistak (MISTAKJL@michigan.gov); Nick_Utrup@fws.gov; Kramer, Darren (DNR)
Cc: Piszczek, Paul (DNR)
Subject: RE: Little Quinnesec Falls Hydro - Exotic Species

Mike- Thanks for the quick response. We assume that you intended to say that you have noticed a slow spread of "Phragmites" northward (not "pragmatism"). Our consultants are always on the lookout for invasive species and would have noted the common reed's occurrence on the project. We will certainly include it specifically in our future monitoring.

Regards,
Chuck

From: Donofrio, Michael C - DNR [mailto:Michael.Donofrio@wisconsin.gov]
Sent: Tuesday, December 13, 2011 7:06 AM
To: Chuck Ahlrichs; Jessica Mistak (MISTAKJL@michigan.gov); Nick_Utrup@fws.gov
Cc: Paul Piszczek
Subject: RE: Little Quinnesec Falls Hydro - Exotic Species

Thanks for the report. WDNR has reviewed this document and supports your request to modify the frequency of monitorin g. We have noticed the slow spread of pragmatism northward and ask that you also monitor your project for this species in future surveys.

From: Chuck Ahlrichs [mailto:cahlrichs@nbenergy.com]
Sent: Wednesday, December 07, 2011 02:45 PM
To: Jessica Mistak (MISTAKJL@michigan.gov); Donofrio, Michael C - DNR; Nick_Utrup@fws.gov
Cc: Dean Premo
Subject: Little Quinnesec Falls Hydro - Exotic Species

Dear Jessica, Mike and Nick,

Please see the attached package comprising 2011 exotic species reports and a recommendation to modify the frequency of surveys. I look forward to your comments.

Regards,
Chuck

Chuck Ahlrichs
Northbrook Energy, LLC
14550 N Frank Lloyd Wright Blvd, Suite 210
Scottsdale, AZ 85260
Email: cahlrichs@nbenergy.com
Voice: +1 (480) 551-1771
Mobile: +1 (312) 550-5827

Chuck Ahlrichs

From: Nick_Utrup@fws.gov
Sent: Tuesday, December 13, 2011 1:04 PM
To: Chuck Ahlrichs
Cc: Dean Premo; michael.donofrio@wisconsin.gov; Jessica Mistak (MISTAKJL@michigan.gov)
Subject: Re: Little Quinnesec Falls Hydro - Exotic Species

Chuck,

The USFWS approves your proposal to change exotic species monitoring from annually to once every two years. We also support WDNR comments regarding monitoring of Phragmites in the future.

Thanks,

Nick

Nicholas J. Utrup
Hydropower Coordinator
U.S. Fish and Wildlife Service
Green Bay Ecological Services Field Office
2661 Scott Tower Drive
New Franken, WI 54229

Office: (920) 866-1736
Cell: (920) 530-9937
FAX: (920) 866-1710
Email: Nick_Utrup@fws.gov

Chuck Ahlrichs <cahlrichs@nbenergy.com>
12/07/2011 02:44 PM

To: "Jessica Mistak (MISTAKJL@michigan.gov)" <MISTAKJL@michigan.gov>, "michael.donofrio@wisconsin.gov" <michael.donofrio@wisconsin.gov>, "Nick_Utrup@fws.gov" <Nick_Utrup@fws.gov>

cc: Dean Premo <dean.premo@white-water-associates.com>

Subject: Little Quinnesec Falls Hydro - Exotic Species

Dear Jessica, Mike and Nick,

Please see the attached package comprising 2011 exotic species reports and a recommendation to modify the frequency of surveys. I look forward to your comments.

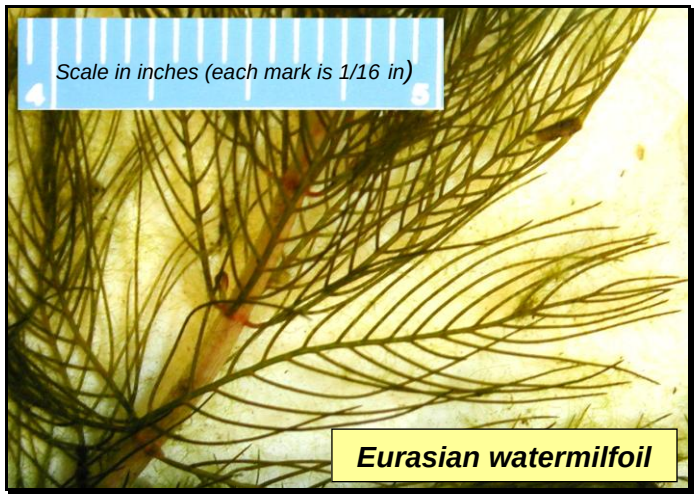
Regards,
Chuck

Chuck Ahlrichs
Northbrook Energy, LLC
14550 N Frank Lloyd Wright Blvd, Suite 210 Scottsdale, AZ 85260
Email: cahlrichs@nbenergy.com
Voice: +1 (480) 551-1771
Mobile: +1 (312) 550-5827
[attachment "2011 1207 Exotic Species Reports.pdf" deleted by Nick Utrup/R3/FWS/DOI]

PROJECT REPORT

Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian Watermilfoil and Purple Loosestrife

FERC Hydro Project No. 2536, Little Quinnesec Falls



Prepared for:

Northbrook Energy, LLC
14550 N Frank Lloyd Wright Blvd, Suite 210
Scottsdale, AZ 85260
Contact: Chuck Ahlrichs
Email: cahlrichs@nbenergy.com
Voice: (480) 551-1771

Prepared by:

White Water Associates, Inc.
429 River Lane, P.O. Box 27
Amasa, Michigan 49903
Contact: Dean B. Premo, Ph.D., Senior Ecologist
Voice: (906) 822-7889

November 2011

PROJECT REPORT

Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian Watermilfoil and Purple Loosestrife

FERC Hydro Project No. 2536, Little Quinnesec Falls

Fieldwork:	Angie (Bergland) Stine, B.S., Field Biologist Dean Premo, Ph.D., Senior Ecologist
Data Analysis And Report	Dean Premo, Ph.D., Senior Ecologist Kent Premo, M.S. Technical Support Scientist

Cite as: Premo, Dean and Kent Premo. 2011. Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian Watermilfoil and Purple Loosestrife (FERC Hydro Project No. 2536, Little Quinnesec Falls). Report to Northbrook Energy, LLC by White Water Associates, Inc.

TABLE OF CONTENTS

SUMMARY 1

INTRODUCTION AND BACKGROUND 2

METHODS 3

FINDINGS 4

Eurasian watermilfoil 4

Purple loosestrife 6

CONCLUSIONS 6

Appendix A – FIGURES AND TABLES

Figure 1. Locations of Eurasian watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536), 2002-2011.

Table 1. History of Eurasian watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536).

Table 2. Summary of Eurasian watermilfoil in the Little Quinnesec Falls Project (FERC #2536).

SUMMARY

Monitoring for Eurasian watermilfoil (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*) was conducted on the Little Quinnesec Falls Project (FERC Hydro Project No. 2536) in 2011 as required by Article 409 of the FERC order issuing a project license. Annual monitoring for these species has occurred at this project since 1998. Both plants have been reported in the Menominee River basin since 1990 although none in the project area before 2002. Scientists from White Water Associates (an independent consulting firm) conducted fieldwork from a boat and on foot on August 3, 2011.

The project area has a robust diversity of native aquatic plants including native watermilfoils. In 2011, a dramatic decrease in Eurasian watermilfoil numbers and distribution was documented in the project area. In contrast to the 2010 survey, when twenty-five sites were identified with Eurasian watermilfoil, only one site had this invasive species in 2011. Only five Eurasian watermilfoil plants were observed in 2011. The most conspicuous absence of Eurasian watermilfoil was at Site K where it had been very abundant in 2009 and 2010.

Over the years of monitoring at the Little Quinnesec Falls Project we have noted that small sub-populations of Eurasian watermilfoil come and go, but in 2011 we documented a the most dramatic decrease observed over the years of monitoring. The reasons for this are unknown, but may indicate the difficulty of invading a thriving native plant community and the natural presence of native watermilfoil weevil (*Euhrychiopsis lecontei*) in the project area.

With only five plants observed in 2011, the actual surface area coverage of Eurasian watermilfoil relative to the size of the impoundment (349 acres) is extremely small. All Eurasian watermilfoil was absent from Site K in 2011, even though it numbered in the hundreds in 2010. Also present at Site K in 2010 was a natural population of the native watermilfoil weevil (*Euhrychiopsis lecontei*). The watermilfoil weevil is a biological control agent of Eurasian water milfoil and likely played a role in the absence of the Eurasian watermilfoil.

No purple loosestrife plants were observed in the project area in 2011. The removal of the single purple loosestrife plant from the project area in 2010 was apparently successful. A number of purple loosestrife plants continue to thrive immediately downstream of the project area on private and public land on the west side of the Menominee River.

INTRODUCTION AND BACKGROUND

In 2011, monitoring for Eurasian watermilfoil (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*) was conducted on the Little Quinnesec Falls Project (FERC Hydro Project No. 2536) as required by Article 409 of the FERC order issuing a project license. Annual monitoring for these non-native species has occurred at this project since 1998. There have been reports of both Eurasian watermilfoil and purple loosestrife within the Menominee River basin since 1990 although none from the project area prior to 2002. Eurasian watermilfoil has been reported since 1995 from the Twin Falls Flowage about ten miles upstream of the project area.

Neither Eurasian watermilfoil nor purple loosestrife were reported from the Little Quinnesec Falls project during surveys conducted for the license application process (1990) and neither species was found in the project area during monitoring in 1998, 1999, 2000, or 2001. Eurasian watermilfoil was first documented in 2002 by observation of a few plants at two locations. In 2002, several specimens of Eurasian watermilfoil and both native watermilfoil species (*M. sibiricum* and *M. heterophyllum*) were collected from the project area and sent to experts Drs. Donald Les and Michael Moody of the University of Connecticut for further identification by genetic analysis. Their analysis of these specimens indicated that no hybrids were present, only the pure forms of each of the three species. Most locations where Eurasian watermilfoil has been found since 2002 have been small areas containing small numbers of individual plants mixed within a diverse community of native aquatic plants. Since 2006, a couple of relatively small areas hosted larger numbers of Eurasian watermilfoil (one to two hundred individual plants). "Beds" or "colonies" where Eurasian watermilfoil is the dominant plant were not observed in the project area through 2008. In 2009, we reported two areas where Eurasian watermilfoil numbers were such that they could legitimately be referred to as "beds." In 2010, only one of these two beds continued to thrive.

Purple loosestrife was first found in 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 one-quarter mile project survey area. Each year White Water Associates staff removed these plants by hand pulling, but they persisted until 2005 when they were absent. In 2005 a single non-flowering plant and two flowering plants were found near the first private property residence about 30 feet downstream of the original patch. White Water staff pulled these plants in 2005 and they were absent in 2006. In 2007, six flowering purple loosestrife plants were observed

along the Wisconsin shoreline downstream of the rafter's boat launch. These were removed by NewPage staff. Downstream from this area, and outside the project survey area, there were numerous flowering purple loosestrife plants in 2007. The City of Niagara was contacted by NewPage and agreed to dispose of these plants; however, the plants remained in 2008, 2009, and 2010. In 2010, a single purple loosestrife plant was found in the project area upstream of the Little Quinnesec dam. It was removed by hand.

This document reports 2011 monitoring results and presents information in five sections: (1) Summary, (2) Introduction and Background, (3) Methods, (4) Findings, and (5) Conclusions. Appendix A contains a figure and two tables.

METHODS

Fieldwork for the 2011 monitoring was completed on August 3, 2011. Angie (Bergland) Stine and Dean Premo of White Water Associates conducted the work on the reservoir and the river downstream of the dam. A 14-foot boat and 9.9 HP engine was used to survey the shoreline and numerous backwater wetlands from the Little Quinnesec Falls Dam upstream to the Big Quinnesec Falls Dam. Most of the backwater wetlands are shallow and densely vegetated with a diversity of aquatic plants making motor use difficult. Water levels encountered during the 2011 survey allowed reasonable access into backwaters. Water clarity conditions were ideal the survey.

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

Purple loosestrife when flowering easily identified. Peak blossoming extends from late July through August in northern Michigan. Wetlands and backwaters connected to the project area reservoir were visually inspected. Binoculars were used to scan the shore and less accessible backwaters. The project area downstream of the Little Quinnesec Falls dam was surveyed on foot.

FINDINGS

This report section presents the finding from the 2010 survey and integrates information from past surveys to provide insight into population dynamics of Eurasian watermilfoil and purple loosestrife in the Little Quinnesec Falls project area.

Eurasian watermilfoil

The project area continues to have a robust diversity and dominance of native aquatic plants. Native watermilfoils in the flowage include *Myriophyllum heterophyllum* and *M. sibiricum*. *Vallisneria americana* and *Potamogeton richardsonii* continue to be some of the most abundant species throughout the flowage. Other species comprising the aquatic plant community include *Elodea canadensis, Elodea nuttallii, Potamogeton spirillus, P. epihydrus, P. diversifolius, P. zosterformis, P. robbinsii, Zosterella dubia, Ceratophyllum demersum, Ranunculus longirostris, Utricularia vulgaris,* and *Bidens (Megalodonta) beckii*.

The aerial photo shown in Figure 1 shows all sites where Eurasian watermilfoil has been detected in the Little Quinnesec Falls project area since 2002. Table 1 presents additional information about these areas, including the latitude/longitude, estimated number of plants observed, and plant surface area involved. Table 2 summarizes the data over all monitoring years (2002 to present).

Over the years of monitoring at the Little Quinnesec Falls project area, the plants identified as Eurasian watermilfoil exhibit considerable morphological variation. The numbers of leaflets are sometimes intermediate between the northern watermilfoil and the Eurasian watermilfoil.

In the 2011 survey, we detected only one site (Site V) in the project area with rooted Eurasian watermilfoil. This was a dramatic decrease from the twenty-five sites documented in 2010 (the highest number of sites recorded in the project area).

Considering the Little Quinnesec Falls population of Eurasian watermilfoil from an historical perspective, we have seen some sub-populations increase in number, some stay the same and some decrease or disappear. The sub-populations observed in 2010 at twenty-four sites disappeared. The sub-population of Eurasian watermilfoil at Site V went from fifteen plants in 2009 and 2010 to only five plants in 2011. These five individual plants existed among the more numerous native aquatic plants.

In 2009, Site D had an estimated two hundred Eurasian watermilfoil plants representing an increase from previous years. In 2010, we estimated only about twenty Eurasian watermilfoil plants existed among other natives in this area. These Eurasian watermilfoil did not appear healthy and were covered by algae. We observed possible evidence of weevil herbivory, but the plants were not in good enough shape to verify this evidence. No weevil life stages were observed. In 2011, we observed no Eurasian watermilfoil plants at Site D.

In 2009, Eurasian watermilfoil numbers at Site K had grown to what could reasonably be labeled a "bed." This remained the case in 2010. The Eurasian watermilfoil at this site are part of a multispecies aquatic plant bed. This site was selected as subject of an intensive survey for the watermilfoil weevil (*Euhrychiopsis lecontei*) in 2010. The weevil was found at this site in fairly robust densities. Despite the presence of the weevil, the 2010 Eurasian watermilfoil at Site K appeared healthy. In 2011, Eurasian watermilfoil were completely absent from Site K.

Over the years of monitoring at the Little Quinnesec Falls Project, we have noted that small sub-populations of Eurasian watermilfoil come and go and (sometimes) come back again. This phenomenon is documented in Table 1. The reasons for this rather tenuous hold of these small sub-populations of Eurasian watermilfoil are unknown, but may indicate the relative difficulty of invading a thriving native plant community. Watermilfoil weevil may also play a role in biological control in the project area.

The actual surface area coverage of Eurasian watermilfoil relative to the size of the impoundment is very small (see Table 2 for summary). We used 349 acres as the size of the project area when calculating percentages. Clearly not all of the impoundment is suitable to Eurasian watermilfoil because of depth or water current. Using aerial photo interpretation and in-the-field ground-truthing, we roughly estimate that between 100 and 150 acres of the project area might be suitable Eurasian watermilfoil habitat (primarily consisting of shoreline areas and quiet backwaters). Even if this more conservative estimate of habitat is used the relative amount of coverage of existing Eurasian watermilfoil is miniscule. The sites where Eurasian watermilfoil has been found in the Little Quinnesec Fall project have been fairly shallow backwaters and areas with little current. In all cases, the species is part of a diverse and healthy community of native aquatic plants including *Potamogeton foliosus, Ranunculus longirostris, Utricularia vulgaris, Ceratophyllum demersum* and the native milfoil, *Myriophyllum sibiricum*. In most of the sites in the project area where Eurasian watermilfoil has been found as a rooted plant in the past, the number of plants was very low.

Purple Loosestrife

In past years of the survey, no purple loosestrife was found within the portion of the project area, lying between the Little Quinnesec Dam and the Big Quinnesec Dam. In 2010, however, a single plant was located on an island along the north shore and about 150 yards downstream of the US 141 Bridge (latitude: 45.7934; longitude: -088.0458; see Figure 1). White Water staff carefully bagged the flower head and dug this plant up being careful to extract the entire root mass. The plant was bagged and disposed of in a sanitary landfill. In 2011, despite careful inspection, no plant was found at this site indicating a successful removal.

Purple loosestrife has been found each year starting in 1998 until present growing along the Wisconsin shoreline of the river downstream of the Little Quinnesec Dam about 100 feet downstream of the public access site. This area is within the one-quarter mile project survey area. Each year, White Water Associates staff removed these plants by hand pulling, but the plants persisted until 2005 when they were absent. In 2005, a single non-flowering plant and two flowering plants were found near the first private property residence about 30 feet downstream of the original patch. White Water Associates staff pulled these three plants in 2005 and this site was absent of plants in 2006 and 2007. In 2007, we observed no purple loosestrife on the Michigan side of the river below the Little Quinnesec Falls Dam. In 2007, six purple loosestrife plants were located on the Wisconsin side of the river, downstream of the rafter's boat launch. NewPage staff removed, bagged, and disposed of these plants. Additional purple loosestrife plants were observed on the Wisconsin shoreline outside of the project survey area along the Niagara City Park. The City of Niagara was contacted by NewPage staff and agreed to dispose of these plants.

From 2008 through 2010, purple loosestrife plants were observed downstream of the Little Quinnesec Falls Dam on the Wisconsin side of the river from about 50 yards downstream of the boat landing parking area to a point approximately one-half mile below the boat landing parking area. In 2011, purple loosestrife was again present and thriving in this area.

CONCLUSIONS

Eurasian watermilfoil is known for spreading rapidly, usurping space, and dominating the aquatic plant community. Over the years at the Little Quinnesec Falls Project area, the Eurasian watermilfoil has been quite limited in occurrence and numbers. It may be that the robust

populations of native plants and the presence of watermilfoil weevil help keep this invasive species in check. The dramatic decline of Eurasian watermilfoil observed in 2011 provides hope that the Little Quinnesec Falls project area population will remain under control.

In 2006, we attempted to hand-pull individual Eurasian watermilfoil plants, but found this to be an impractical means of control in this setting. First of all there is uncertainty about getting the underground portion of the plant and a danger of fragmenting the upper portions and setting some adrift to possibly colonize other areas. The process of wading or swimming and pulling the plants muddies the water making for difficult visibility. We also tried using a rake to pull the plants but the same difficulties exist as with the hand pulling. The attempt at herbicide control of Eurasian watermilfoil at three project area sites showed little or no effect in 2007. In 2008, increased chemical dosage at these same sites appears to have been effective in reducing Eurasian watermilfoil in the 2008 season, but the plant made a strong comeback at two of these sites in 2009. In 2010, the population of Eurasian watermilfoil at one of these two sites (Site D) was greatly reduced. The reason for this decline is unknown. As documented in a separate 2010 report, the watermilfoil weevil was found to be present in the large subpopulation of Eurasian watermilfoil at Site K. The population of Eurasian watermilfoil at Site K was absent in 2011, presumably influenced by watermilfoil weevil herbivory.

The single purple loosestrife plant documented in the project area upstream of the Little Quinnesec Falls dam in 2010 was removed in 2010 and remained absent in 2011. As in the past, numerous purple loosestrife plants exist immediately downstream of the project area on private and public land.

Appendix A

Figure 1

Table 1

Table 2

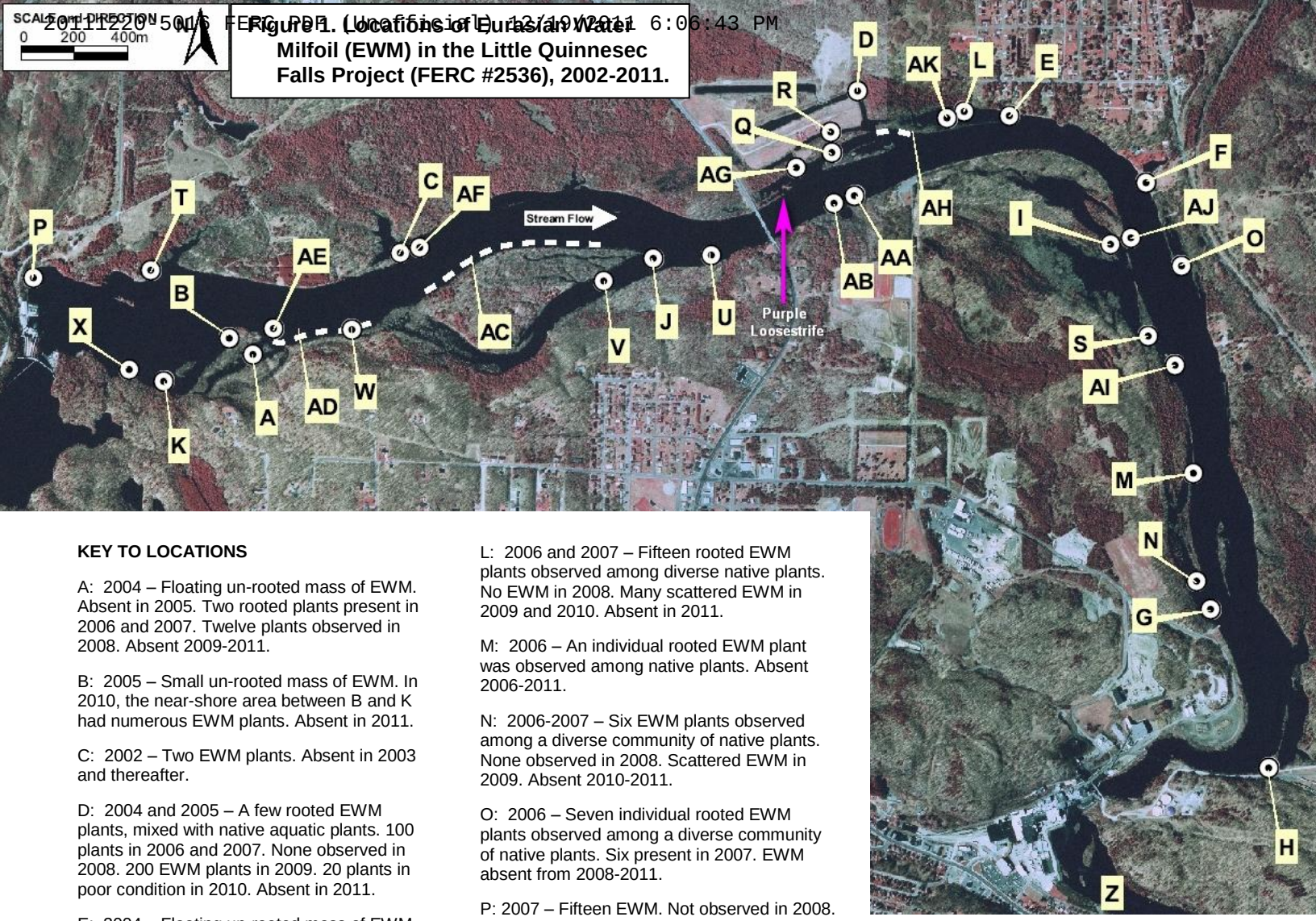


Figure 1. Locations of Eurasian Water Milfoil (EWM) in the Little Quinnesec Falls Project (FERC #2536), 2002-2011.

KEY TO LOCATIONS

A: 2004 – Floating un-rooted mass of EWM. Absent in 2005. Two rooted plants present in 2006 and 2007. Twelve plants observed in 2008. Absent 2009-2011.

B: 2005 – Small un-rooted mass of EWM. In 2010, the near-shore area between B and K had numerous EWM plants. Absent in 2011.

C: 2002 – Two EWM plants. Absent in 2003 and thereafter.

D: 2004 and 2005 – A few rooted EWM plants, mixed with native aquatic plants. 100 plants in 2006 and 2007. None observed in 2008. 200 EWM plants in 2009. 20 plants in poor condition in 2010. Absent in 2011.

E: 2004 – Floating un-rooted mass of EWM. Absent in 2005, 4 plants present in 2006 and 3 in 2007. None in 2008. Scattered plants in 2009 and 2010. Absent in 2011.

F: 2004 – Floating un-rooted mass of EWM. Absent in 2005, but 2 rooted plants present in 2006 and 2007. None observed in 2008-2011.

G: 2004 – Floating un-rooted mass of EWM. Absent 2005-2008. Scattered plants at bay mouth in 2009. None in 2010 or 2011.

H: 2004 – Floating un-rooted mass of EWM. EWM absent in 2005 and 2006. EWM present in 2007, but not 2008. Several plants in 2009 and 2010. Absent in 2011.

I: 2002 – This was the original location for EWM in the LQF Project. The few rooted plants were scattered within a species-rich community of native plants. No change in coverage observed from 2002 to 2005. All EWM absent in 2006. In 2007, shallow water prevented survey. In 2008, 9 rooted plants present. In 2009, 18 plants were observed. None were observed in 2010 and 2011.

J: 2006 – Floating un-rooted EWM mass in an area of diverse native plants. Three un-rooted plants present in 2007. None observed in 2008. A few plants in 2009 and 2010.

K: 2006 – Three rooted EWM plants were observed among a bed of yellow water lilies. Number increased to 100 in 2007 and 200 in 2008. In 2009 and 2010, more numerous plants form a bed. Absent in 2011.

L: 2006 and 2007 – Fifteen rooted EWM plants observed among diverse native plants. No EWM in 2008. Many scattered EWM in 2009 and 2010. Absent in 2011.

M: 2006 – An individual rooted EWM plant was observed among native plants. Absent 2006-2011.

N: 2006-2007 – Six EWM plants observed among a diverse community of native plants. None observed in 2008. Scattered EWM in 2009. Absent 2010-2011.

O: 2006 – Seven individual rooted EWM plants observed among a diverse community of native plants. Six present in 2007. EWM absent from 2008-2011.

P: 2007 – Fifteen EWM. Not observed in 2008. Two plants in 2009. Eight observed in 2010. Absent in 2011.

Q: 2007 – 15 EWM observed. Not present in 2008 or 2009. Fifteen in 2010. Absent in 2011.

R: 2007 – Two EWM. None in 2008. Two in 2009 and eight in 2010. Absent in 2011.

S: 2007 – Six EWM among native plants. Not observed in 2008 or 2009. Eight observed in 2010. Absent in 2011.

T: 2008 – Six EWM observed at river's edge among native plants. Same in 2009. No EWM seen in 2010 or 2011.

U: 2009-2010 – Twenty EWM scattered along shore with native vegetation. Absent in 2011.

V: 2009-2010 – Fifteen EWM scattered among native vegetation. Five present in 2011.

W: 2009 – A single EWM plant in native plants. In 2010, eight EWM were observed. Absent in 2011.

X: 2009 – Five scattered EWM in native plants. Ten observed in 2010. Absent in 2011.

Z: 2008-2011 – No EWM observed.

AA: 2010 – A single EWM among native plants. Absent in 2011.

AB: 2010 – A single EWM among native plants. Absent in 2011.

AC: 2010 – Five EWM among native plants in this half mile of near-shore habitat. Absent in 2011.

AD: 2010 – About fifty EWM scattered among native aquatic plants in this quarter mile stretch of near-shore habitat. Absent in 2011.

AE: 2010 – Observed fragments of EWM floating in the strong current. Absent in 2011.

AF: 2010 – Observed three EWM plants among native plants. Absent in 2011.

AG: 2010 – Observed fifteen EWM among native plants. Absent in 2011.

AH: 2010 – Observed nine EWM plants along this 200 yard long shore among native plants. Absent in 2011.

AI: 2010 – A single EWM among native plants. Absent in 2011.

AJ: 2010 – Observed six EWM among native plants. Absent in 2011.

AK: 2010 – A single EWM among native plants. Absent in 2011.

Purple loosestrife – arrow indicates site of a single plant in 2010 that was removed. Absent in 2011.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
A	2004	45.78759 -88.03029	Y	N	1	2	0.00005	0.000000		Floating un-rooted mass (ca. 4 square feet) of *M. spicatum* at entrance to small bay.
A	2006		Y	Y	2	4	0.00009	0.000000	N	After absence in 2005, two rooted *M. spicatum* in 2006.
A	2007		Y	Y	2	4	0.00009	0.000000	N	Two rooted *M. spicatum* plants among abundant native milfoil and bladderwort.
A	2008		Y	Y	12	24	0.00028	0.000001	N	Twelve rooted *M. spicatum* plants among abundant native milfoil and bladderwort.
A	2009		N							Thorough search revealed no *M. spicatum*.
A	2010		N							Thorough search revealed no *M. spicatum*.
A	2011		N							Thorough search revealed no *M. spicatum*.
B	2005	45.78848 -88.03040	Y	N	1	2	0.00005	0.000000		Small un-rooted mass (ca. 2 square feet) of *M. spicatum* floating downstream.
B	2010		Y	Y	40	80	0.00184	0.000004		The shoreline from B southwest to K has these scattered *M. spicatum* among natives.
B	2011		N							Thorough search revealed no *M. spicatum*.
C	2002	45.79125 -88.02352	Y	Y	2	4	0.00009	0.000000		Two rooted plants present in 2002, but absent in subsequent years.
D	2004	45.79701 -88.00139	Y	Y	6	12	0.00028	0.000001		A few rooted plants of *M. spicatum* , mixed with a variety of native aquatic plants.
D	2005		Y	Y	10	20	0.00046	0.000001		A few rooted plants of *M. spicatum* , mixed with a variety of native aquatic plants.
D	2006		Y	Y	100	200	0.00459	0.000013	N	Rooted plants have increased in number to ca. 100 rooted plants approximately 150 feet in either direction from the GPS point.
D	2007		Y	Y	100	200	0.00459	0.000013	N	Rooted plants at about the same number and dispersion as in 2006.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
D	2008		N							Chemically treated area with no *M. spicatum* and few other macrophytes observed.
D	2009		Y	Y	200	400	0.00918	0.000026	N	A dense bed of *M. spicatum* observed in 2009 with few other macrophytes.
D	2010		Y	Y	20	40	0.00092	0.000002		Many fewer plants and in poorer condition than in 2009. Other native plants present.
D	2011		N							Thorough search revealed no *M. spicatum*.
E	2004	45.7963 -87.99399	Y	N	1	2	0.00005	0.000000		Floating un-rooted mass (ca. 2 square feet) of *M. spicatum* found along river's edge.
E	2006		Y	Y	4	8	0.00018	0.000001	N	After an absence in 2005, 4 rooted plants were present in 2006. These are downslope from several houses on the bank and docks that accommodate boats and pontoon boats.
E	2007		Y	Y	3	6	0.00014	0.000000		Three rooted plants observed in 2007 in conditions similar to 2006.
E	2008		N							None were present in the 2008 survey. Few aquatic macrophytes present; significant filamentous algae present.
E	2009		Y	Y	25	50	0.00148	0.000000	N	*M. spicatum* scattered through the area.
E	2010		Y	Y	15	30	0.00069	0.000002		*M. spicatum* scattered through the area.
E	2011		N							Thorough search revealed no *M. spicatum.*
F	2004	45.7921 -87.98744	Y	N	1	2	0.00005	0.000000		Floating un-rooted mass (ca. 2 square feet) of *M. spicatum* found along river's edge right at the mouth of Fumee Creek.
F	2006		Y	Y	2	4	0.00009	0.000000	N	Two rooted *M. spicatum* found along river's edge right at the mouth of Fumee Creek.
F	2007		Y	Y	2	4	0.00009	0.000000	N	Two rooted *M. spicatum* found along river's edge right at the mouth of Fumee Creek.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
F	2008		N							No *M. spicatum* observed (only native milfoil)
F	2009		N							
F	2010		N							
F	2011		N							
G	2004	45.77982 -87.98366	Y	N	1	2	0.00005	0.000000		Floating un-rooted mass (ca. 2 square feet) of *M. spicatum* caught along river's edge upstream of fire dock.
G	2009		Y	Y	30	60	0.00034	0.000001	N	*M. spicatum* distributed around entry of bay.
G	2010		N	N						No *M. spicatum* noted in area seen in 2009
G	2011		N							Thorough search revealed no *M. spicatum*.
H	2004	45.77453 -87.98065	Y	N	1	2	0.00005	0.000000		Floating un-rooted mass (ca. 2 square feet) caught along river's edge.
H	2007		Y	Y	15	30	0.00069	0.000002	N	Fifteen rooted *M. spicatum* (each ca. 2 sq ft) were observed among a diverse community of native aquatic plants. Eight of these plants were just upstream of the downstream tip of the island on the west side (river side) of the island and seven were just upstream of the downstream tip of the island on east side of the island.
H	2008		N	N						No *M. spicatum* observed in 2008.
H	2009		Y	Y	6	12	0.00028	0.000001	N	*M. spicatum* among native aquatic plants.
H	2010		Y	Y	8	16	0.00028	0.000001		*M. spicatum* among native aquatic plants.
H	2011		N							Thorough search revealed no *M. spicatum*.
I	2002	45.79204 -87.98893	Y	Y	3	6	0.00014	0.000000		A few rooted plants scattered within a species-rich community of native aquatic plants. This was original site for *M. spicatum* in the Little Quinnesec Falls Project area.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
I	2003		Y	Y	4	12	0.00028	0.000001		A few rooted plants scattered within a species-rich community of native plants.
I	2004		Y	Y	4	12	0.00028	0.000001		A few rooted plants scattered within a species-rich community of native plants.
I	2005		Y	Y	4	12	0.00028	0.000001		A few rooted plants scattered within a species-rich community of native plants.
I	2006		N							All *M. spicatum* were absent.
I	2007		N							The low water prevented entry into this bay in 2007. We assume no change since 2006.
I	2008		Y	Y	9	18	0.00021	0.000001	N	Nine plants scattered in channel between long bay and short bay.
I	2009		Y	Y	18	36	0.00084	0.000003	N	*M. spicatum* scattered in this bay among native aquatic plants.
I	2010		N							No *M. spicatum* observed in this area, in fact much less aquatic vegetation than in past.
I	2011		N							Thorough search revealed no *M. spicatum*.
J	2006	45.79119 -88.01104	Y	N	1	2	0.00005	0.000000	N	Floating un-rooted mass (ca. 2 sq. feet) of *M. spicatum* in area of diverse native plants.
J	2007		Y	N	3	6	0.00014	0.000000	N	Floating un-rooted plant fragments (ca. 6 sq. feet) of *M. spicatum* in area of diverse native plants.
J	2008		N							No *M. spicatum* observed in 2008.
J	2009		Y	Y	5	10	0.00023	0.000000	N	A few *M. spicatum* among native plants.
J	2010		Y	Y	12	24	0.00028	0.000001		Several *M. spicatum* among native plants.
J	2011		N							Thorough search revealed no *M. spicatum*.
K	2006	45.78674 -88.034822	Y	Y	3	6	0.00014	0.000000	N	Three rooted *M. spicatum* (each ca. 2 sq ft) observed in a bed of yellow water lilies.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
K	2007		Y	Y	100	200	0.00459	0.000013	N	Rooted plants have increased in number to ca. 100 rooted plants in an area approximately 100x300 feet. These plants are mixed in with *Nuphar, Valisineria*, and *Potamogeton richardsonii*
K	2008		Y	Y	200	400	0.00918	0.000026	N	Rooted plants have increased in number to ca. 200 rooted plants in an area approximately 100x300 feet. These plants are mixed in with *Nuphar, Valisineria*, and *Potamogeton richardsonii*
K	2009		Y	Y	~400	~800	0.01836	0.000052	N	Similar area as in 2008, but denser and excluding other plants. It is accurate to characterize this as a bed. Difficult to estimate number of plants
K	2010		Y	Y	~400	~800	0.01836	0.000052	Y	Similar area as in 2009. Weevil survey here showed all life stages present and plant damage occurring.
K	2011		N							Thorough search revealed no *M. spicatum*.
L	2006	45.796423 -87.996198	Y	Y	15	30	0.00069	0.000002	N	Fifteen rooted *M. spicatum* (each ca. 2 sq ft) were observed among a diverse community of native aquatic plants.
L	2007		Y	Y	15	30	0.00069	0.000002	N	Low water in 2007 prevented access into all parts of this bay, so it was estimated that the same number of rooted *M. spicatum* were present as in 2006 (among a diverse community of native aquatic plants).
L	2008		N							This area was chemically treated in 2007 and 2008.
L	2009		Y	Y	60	120	0.00276	0.000008	N	Numerous *M. spicatum* throughout the bay.
L	2010		Y	Y	60	120	0.00276	0.000008		Numerous *M. spicatum* throughout the bay among native aquatic plants.
L	2011									Thorough search revealed no *M. spicatum*.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
M	2006	45.78440 -87.984675	Y	Y	1	2	0.00005	0.000000	N	An individual rooted plant of *M. spicatum* (ca. 2 square feet) was observed among native plants at the mouth of a small bay.
M	2007		N							No *M. spicatum* were observed from 2007 through 2011.
M	2008		N							
M	2009		N							
M	2010		N							
M	2011		N							
N	2006	45.780751 -87.984406	Y	Y	6	12	0.00028	0.000001	N	Six individual rooted *M. spicatum* (each ca. 2 sq ft) observed among a community of native plants at the mouth of a small bay.
N	2007		Y	Y	6	12	0.00028	0.000001	N	Low water conditions during the 2007 survey prevented access to this shallow bay; we therefore assume conditions to be the same as in 2006.
N	2008		N	N						Low backwater conditions during the 2008 survey prevented thorough access to this shallow bay.
N	2009		Y	Y	6	12	0.00028	0.000001	N	*M. spicatum* scattered in small bay.
N	2010		N	N						No *M. spicatum* observed in 2010 or 2011.
N	2011		N							
O	2006	45.791406 -87.985502	Y	Y	7	14	0.00032	0.000001	N	Seven individual rooted *M. spicatum* (each ca. 2 sq ft) observed among a diverse community of native plants in a bay upstream of Verso park.
O	2007		Y	Y	6	12	0.00028	0.000001	N	Six individual rooted *M. spicatum* (each ca. 2 sq ft) observed among a community of native plants in bay upstream of Verso park.
O	2008		N							No *M. spicatum* were observed in 2008. This area was chemically treated.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
O	2009		N							No *M. spicatum* were observed 2009-2011.
O	2010		N							
			N							
P	2007	45.790 -88.041	Y	Y	15	30	0.00069	0.000002	N	This was a new find in 2007 in an area just below the Big Quinnesec Dam on the north side of the river in a bay with little or no current. Distributed in an area of 10x20 feet.
P	2008		N	N						No *M. spicatum* were observed in 2008.
P	2009		Y	Y	2	4	0.00009	0.000000		Two *M. spicatum* were observed in 2009.
P	2010		Y	Y	8	16	0.00028	0.000001		Eight *M. spicatum* were observed in 2010.
P	2011		N							Thorough search revealed no *M. spicatum*.
Q	2007	45.7949 -88.0025	Y	Y	15	30	0.00069	0.000002	N	This new area was in the area where old man-made excavations (canals) were made. These plants were scattered throughout the backwater channel just outside of the created channels.
Q	2008		N							No *M. spicatum* were observed in 2008 or 2009.
Q	2009		N							
Q	2010		Y	Y	15	30	0.00069	0.000002		*M. spicatum* among native plants.
Q	2011		N							Thorough search revealed no *M. spicatum*.
R	2007	45.7956 -88.0026	Y	Y	2	4	0.00009	0.000000	N	Two rooted plants present in 2007 among native plants.
R	2008		N							No *M. spicatum* were observed in 2008.
R	2009		Y	Y	2	4	0.00009	0.000000		Two *M. spicatum* among native vegetation.
R	2010		Y	Y	8	16	0.00028	0.000001		Eight *M. spicatum* among native vegetation.
R	2011		N							Thorough search revealed no *M. spicatum*.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
S	2007	45.789 -87.987	Y	Y	6	12	0.00028	0.000001	N	Six rooted *M. spicatum* (each ca. 2 sq ft) were observed among a community of native plants in quiet water along the river's edge.
S	2008		N							No *M. spicatum* were observed in 2008 or 2009.
S	2009		N							
S	2010		Y	Y	8	16	0.00028	0.000001		*M. spicatum* seen in 2010 among natives.
S	2011		N							Thorough search revealed no *M. spicatum*.
T	2008	45.79036 -88.03532	Y	Y	6	12	0.00028	0.000001	N	*M. spicatum* observed among native plants in quiet water along the river's edge in 2008 and 2009.
T	2009		Y	Y	6	12	0.00028	0.000001	N	
T	2010		N	N						*M. spicatum* absent in 2010 and 2011.
T	2011		N							
U	2009	45.79145 -88.00748	Y	Y	20	40	0.00092	0.000002	N	*M. spicatum* were scattered along the shore with native aquatic plants
U	2010		Y	Y	20	40	0.00092	0.000002		*M. spicatum* were scattered along the shore with native aquatic plants
U	2011		N							Thorough search revealed no *M. spicatum*.
V	2009	45.79090 -88.01153	Y	Y	15	30	0.00069	0.000002	N	*M. spicatum* were scattered along the shore with native aquatic plants
V	2010		Y	Y	15	30	0.00069	0.000002		*M. spicatum* were scattered among native aquatic plants
V	2011		Y	Y	5	10	0.00023	0.000000	N	
W	2009	45.78946 -88.02341	Y	Y	1	2	0.00005	0.000000	N	One *M. spicatum* on edge of current among native plants.
W	2010		Y	Y	8	16	0.00028	0.000001		Eight *M. spicatum* on edge of current among native plants.
W	2011		N							Thorough search revealed no *M. spicatum*.
X	2009	45.78698	Y	Y	5	10	0.00023	0.000000	N	*M. spicatum* plants among native plants.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
X	2010	-88.04108	Y	Y	10	20	0.00046	0.000001		*M. spicatum* distributed among native plants.
X	2011		N							Thorough search revealed no *M. spicatum*.
Z	2008	The area downstream of LQF Dam	N							*M. spicatum* was not observed in the portion of the project area that is downstream of the Little Quinnesec Falls Dam.
Z	2009		N							
Z	2010		N							
Z	2011									
AA	2010	45.79349 -88.00136	Y	Y	1	2	0.00005	0.000000		A single *M. spicatum* among native plants.
AA	2011		N							Thorough search revealed no *M. spicatum*.
AB	2010	45.79320 -88.00238	Y	Y	1	2	0.00005	0.000000		A single *M. spicatum* among native plants.
AB	2011		N							Thorough search revealed no *M. spicatum*.
AC	2010	0.5 mile of shore between 45.79160 -88.01309 and 45.78988 -88.02192	Y	Y	5	10	0.00023	0.000000		Five *M. spicatum* scattered among native aquatic plants.
AC	2011		N							Thorough search revealed no *M. spicatum*.
AD	2010	0.25 mile of shore between 45.78894 -88.02438 and 45.78807 -88.02931	Y	Y	50	100	0.00230	0.000007		About fifty *M. spicatum* scattered among native aquatic plants in this stretch of shoreline. It seems as though the bed of *M. spicatum* at Site K may be the source of these plants. Fragments observed along the shore here as well as rooted plants.
AD	2011		N							Thorough search revealed no *M. spicatum*.
AE	2010	45.78848 -88.02931	N	N						Observed quite a few fragments of *M. spicatum* in the strong current that breaks around this point. Likely source is Site K.
AE	2011		N							Thorough search revealed no *M. spicatum*.

Table 1. History of Eurasian Watermilfoil (*Myriophyllum spicatum* L.) in the Little Quinnesec Falls Project (FERC #2536)

Site Code	Year	Latitude & Longitude Coordinates	Present (Y/N)	Rooted (Y/N)	Number of Plants	Surface Area (sq. ft).	Surface Area (acres)	% Project boundary acres (349 acres)	Weevil evidence (Y/N)[1]	Comments
AF	2010	45.79136 -88.02235	Y	Y	3	6	0.00014	0.000000		Observed three plants of *M. spicatum* among *M. sibiricum* and other native plants.
AF	2011		N							Thorough search revealed no *M. spicatum*.
AG	2010	45.79438 -88.00425	Y	Y	15	30	0.00069	0.000002		Observed fifteen plants of *M. spicatum* among dense *Elodea* and some *M. sibiricum* and other native plants.
AG	2011		N							Thorough search revealed no *M. spicatum*.
AH	2010	200 yard long shore between 45.79535 -88.00065 and 45.79566 -87.99983	Y	Y	9	18	0.00021	0.000001		Observed nine plants of *M. spicatum* among native plants.
AH	2011		N							Thorough search revealed no *M. spicatum*.
AI	2010	45.78804 -8798569	Y	Y	1	2	0.00005	0.000000		Observed one *M. spicatum* among natives.
AI	2011		N							Thorough search revealed no *M. spicatum*.
AJ	2010	45.79227 -87.98797	Y	Y	6	12	0.00028	0.000001		Observed six *M. spicatum* among natives.
AJ	2011		N							Thorough search revealed no *M. spicatum*.
AK	2010	45.796168 -87.99699	Y	Y	1	2	0.00005	0.000000		Observed one *M. spicatum* among natives.
AK	2011		N							Thorough search revealed no *M. spicatum*.

[1]*Field staff began checking for evidence of weevil herbivory on M. spicatum in 2006. In 2010, field staff did not check generally for weevil herbivory since a specific weevil survey was for targeted areas.*

Table 2. Summary of Total Plant Observations of Eurasian Watermilfoil (EWM) in the Little Quinnesec Falls Project (FERC #2536)

Year of Survey	Number of Sites Observed with EWM	Estimated Number of Plants	Surface Area (square feet)[1]	Surface Area (acres)[1]	Percent Project Boundary Acres[2]
2002	2	5	10	0.00023	0.0001
2003	1	4	12	0.00028	0.0001
2004	2	15	34	0.00078	0.0002
2005	2	14	32	0.00073	0.0002
2006	8	139	278	0.00638	0.0018
2007	13	290	580	0.01331	0.0038
2008	7	265	542	0.01244	0.0037
2009	16	801	1602	0.0361	0.0103
2010	25	739	1478	0.0331	0.0095
2011	1	5	10	0.00023	0.0001

[1] *The surface area is based on the total number of plants (rooted and un-rooted) and assumes two square feet of surface area coverage (as viewed from above) for each plant.*

[2] *Calculation of percent project boundary acres assumes 349 acres for the project area.*

2011 Report of Milfoil Weevil Monitoring and Eurasian Watermilfoil Management for the Little Quinnesec Falls Hydroelectric Project

FERC Hydro Project No. 2536, Little Quinnesec Falls


Susan Fawcett photo

Specimens from the Menominee River on the Little Quinnesec Falls Hydroelectric Project.

On left: Adult and larval Milfoil Weevil *(Euhrychiopsis lecontei*

Below: Eurasian water milfoil (*Myriophyllum spicatum*)


Dean Premo photo

Prepared for:

Northbrook Wisconsin, LLC (the licensee)

14550 N Frank Lloyd Wright Blvd, Suite 210

Scottsdale, AZ 85260

Contact: Chuck Ahlrichs

Voice: (480) 551-1771

Prepared by:

White Water Associates, Inc.

429 River Lane, P.O. Box 27

Amasa, Michigan 49903

Contact: Dean B. Premo, Ph.D., Senior Ecologist

Voice: (906) 822-7889

Date: November 2011

2011 Report of Milfoil Weevil Monitoring and Eurasian Watermilfoil Management for the Little Quinnesec Falls Hydroelectric Project

FERC Hydro Project No. 2536, Little Quinnesec Falls

November 2011

Prepared By: Dean Premo, Ph.D., Senior Ecologist
White Water Associates, Inc.

Field Work: Dean Premo, Ph.D., Senior Ecologist
Angie (Bergland) Stine, Aquatic Biologist

Cite as: Premo, Dean. 2011. 2011 Report of Milfoil Weevil Monitoring and Eurasian Watermilfoil Management for the Little Quinnesec Falls Hydroelectric Project (FERC Hydro Project No. 2536, Little Quinnesec Falls). Prepared for Northbrook Wisconsin, LLC (the licensee) by White Water Associates, Inc.

WHITE WATER ASSOCIATES, INC.

TABLE OF CONTENTS

INTRODUCTION AND BACKGROUND 1

STUDY AREA 2

MILFOIL WEEVIL 3

MILFOIL WEEVIL MONITORING 5

Methods 5

2010 Monitoring Results Review 8

2011 Monitoring Results 8

BIOLOGICAL CONTROL AT THE LITTLE QUINNESEC FALLS PROJECT 9

LITERATURE CITED 10

INTRODUCTION AND BACKGROUND

Monitoring for Eurasian watermilfoil (*Myriophyllum spicatum*) has been conducted on the Little Quinnesec Falls Project (FERC Hydro Project No. 2536) from 1998 through 2011 as required by Article 409 of the FERC order issuing a project license. This monitoring has shown that small sub-populations (several plants) of Eurasian watermilfoil come and go. The reasons for this are unknown, but may be because invasive species finds it difficult to invade the thriving native plant community. The 2010 milfoil weevil monitoring documented presence of this native species (*Euhrychiopsis lecontei*) in the project area. It potentially plays a role in Eurasian watermilfoil control. No large beds of Eurasian watermilfoil exist in the project area. The 2009 survey revealed that two Eurasian watermilfoil sites had increased in plant stem numbers and surface area. One of these "beds" resulted from the rebound of Eurasian watermilfoil after two years of herbicide treatments had depressed native vegetation. The other bed was untreated, but had increased in size from previous years. The surface area of Eurasian watermilfoil in 2009 and 2010 in the 349 acre project area was less than 0.04 acre (Premo and Premo 2010).

Eurasian watermilfoil occurs in much larger populations in the Menominee River watershed in reservoirs upstream and downstream of the Little Quinnesec Falls Project and in lakes. These multi-acre areas of Eurasian watermilfoil have been treated by several methods. The Michigan Department of Natural Resources and Environment (MDNRE) is concerned with the management of Eurasian watermilfoil in Michigan's waters. It is further interested in potential use of biological control agents, specifically the milfoil weevil (*Euhrychiopsis lecontei*) in managing Eurasian watermilfoil. Because of this interest, the MDNRE requested that Northbrook Wisconsin, LLC (the FERC licensee for the Little Quinnesec Falls Project) prepare a milfoil weevil monitoring and treatment plan for the Little Quinnesec Falls Hydroelectric Project. This plan was completed and submitted to the responsible agencies in April 2010.

At the recommendation of the MDNRE, Northbrook Wisconsin, LLC (the licensee) adopted an ***adaptive management*** (Walters, 1986) approach to Eurasian watermilfoil in the project area. This approach uses findings from monitoring activities to inform management actions and periodic refinement of the plan. This second annual report on milfoil weevil monitoring and Eurasian watermilfoil management is presented in six sections: (1) Introduction and Background, (2) Study Area, (3) Milfoil Weevil Ecology, (4) Survey for Milfoil Weevil, (5) Eurasian Watermilfoil Management at the Little Quinnesec Falls Project, and (6) Literature Cited.

STUDY AREA

The Little Quinnesec Falls Hydroelectric Project is located on the Menominee River approximately ninety miles upstream from where it flows into Lake Michigan (in Menominee, Michigan). The Menominee River is a border stream between Michigan and Wisconsin. The study area of interest to this plan is the impounded area from the Little Quinnesec Falls Dam upstream approximately 4.4 miles to the Big Quinnesec Falls Dam. The surface area of this riverine impoundment is 349 acres. The shoreline is about 15 miles long and nearly all is vegetated in forested riparian area. Just a little more than one-half mile of the shoreline is developed (principally manifested by the Big Quinnesec Falls Dam and the Little Quinnesec Falls Dam and mill site). Very little residential development exists along the river in the study area.

In this section, we describe two components of the biota in the study area. In the first subsection, we discuss the aquatic plant community with emphasis on Eurasian watermilfoil. In the second subsection, we discuss the fish community of the study area since some fish have particular importance as predators of the milfoil weevil.

The study area has consistently displayed a robust diversity of native aquatic plants. Native watermilfoils in the flowage include *Myriophyllum heterophyllum* and *M. sibiricum*. The most abundant species throughout the flowage are *Vallisneria americana* and *Potamogeton richardsonii*. Other species comprising the aquatic plant community include *Elodea canadensis, Elodea nuttallii, Potamogeton spirillus, P. epihydrus, P. diversifolius, P. zosterformis, P. robbinsii, Zosterella dubia, Ceratophyllum demersum, Ranunculus longirostris*, *Utricularia vulgaris,* and *Megalodonta beckii*.

Eurasian watermilfoil was first documented in 2002 by observation of a few plants at two locations. Most locations where the plant has been found since 2002 have been small areas containing small numbers of individual plants mixed within a diverse community of native aquatic plants. In 2009, we documented an increase in Eurasian watermilfoil density and dominance at Site D (estimated 200 plants) and Site K (400 plants). This was the first time that we referred to a "bed" of Eurasian watermilfoil in the study area. These two sites were identified as sites to monitor for milfoil weevils in 2010, but since Eurasian watermilfoil at Site D was great diminished in 2010, weevil monitoring occurred only at Site K.

The study area offers a large diversity of aquatic habitat. This ranges from quiet shallow backwaters with dense beds of native aquatic vegetation to deep river pools with significant

current and cobble bottom. The natural shoreline of the study area continuously contributes large woody material to the river edges forming good habitat for invertebrates and fish. A variety of fish spawning habitat is also present in the study area. For these reasons, the fish community in the study area is also diverse. It includes species that are known predators of the milfoil weevil. Game fish species present in the study area include: Northern Pike (*Esox lucius*), Muskellunge (*Esox masquinongy*), Smallmouth Bass (*Micropterus dolomieui*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*), Bluegill (*Lepomis macrochirus*), Rock Bass (*Ambloplites rupestris*), Black Crappie (*Pomoxis nigromaculatus*), Walleye (*Stizostedion vitreum*), and Yellow Perch (*Perca flavescens*). Pumpkinseed and Bluegill are known to be significant predators of the milfoil weevil (Newman 2004; Sutter and Newman 1997). A large variety of cyprinid and other minnows and darters exist in the study area (Becker 1983). Some of these are potential, but not yet documented, predators of the milfoil weevil.

MILFOIL WEEVIL

Eurasian watermilfoil is one of North America's most noxious and aggressive weeds. It represents an ecological threat to native aquatic plants and the animals that use these native plants as habitat. As a result, tremendous effort has been applied to control and management of Eurasian watermilfoil. Three North American insect species have been considered as agents of biological control for Eurasian watermilfoil. Of these, the milfoil weevil (*Euhrychiopsis lectontei*) has shown the greatest promise (Newman 2004). For this reason it is under consideration as a biological control agent in the study area.

Euhrychiopsis lectontei specializes in using water milfoil as its host plant and food. This native weevil feeds solely on native and Eurasian watermilfoils with the native Northern watermilfoil comprising its principal food source (Newman 2004; Herman 2009). Milfoil weevils over-winter in the organic material (leaves and other organic debris) in the vegetation of the near-shore riparian area. Weevil populations are reported to be higher where natural riparian zone exists (Herman 2009). They crawl, swim, or fly to this overwintering habitat and return to milfoil beds by the same means in spring (Creed and Sheldon 1994). Adults feed on watermilfoil leaves and spend their time clinging to plants underwater (Newman et al. 2001). Female milfoil weevil lays one or two eggs per day on the tips of water milfoil plants and may lay more than a hundred

eggs over the course of a season. The eggs hatch in a few days and the grub-like larvae feed on the tips of the milfoil plant working their way down the stem feeding on vascular tissues. The larvae use the upper three feet of the milfoil plant and burrow (by chewing) in and out of the plant, leaving small pin-holes. At the end of their development, the larvae burrow into the lower and thicker part of the milfoil stem and pupate. The adult emerges from the pupa and exits the stem through a "blast hole" (larger than the pin hole entrances of the larvae). The complete life cycle is completed in a little less than four weeks and three or four generations are possible during the summer (Cofrancesco and Crosson 1999; Newman 2004). In late August to mid-September (in Minnesota and Vermont) adults stop laying eggs and move to shore to overwinter (Sheldon and O'Bryan 1996; Newman et al. 2001).

Adult milfoil weevils feed on the meristems (the growing tips of the plant), leaves, and stems of the milfoil plant and can suppress growth (Creed and Sheldon 1993). The larvae, however, have the greater impact on the milfoil plant. Young larvae feeding on the meristem suppress plant growth and elongation (Creed and Sheldon 1993). Older larvae mine the stems and consume vascular tissue thus inhibiting transport of nutrients (Newman et al. 1996) which may affect root carbohydrate stores and reduce vigor and ability to overwinter (Creed and Sheldon 1995). Larval mining of stems can cause the plants to leak gasses and become less buoyant and sink out of the upper water column (Creed et al. 1992).

Although milfoil weevil has been associated with numerous milfoil declines in the field, many are poorly documented. Newman (2004) summarizes the literature and states that "densities of 1 or more weevils per stem can control milfoil and densities of <0.1 per stem are not likely to control the plant." Since most of this reported work has been done on very large and dense populations of Eurasian watermilfoil, it is not known what dynamic is in play between weevils and milfoil in small Eurasian watermilfoil populations. In fact, R.M. Newman indicated (pers. com. 2010) that no one has looked at the minimum water milfoil bed size needed to maintain a viable weevil population and stated that if the overall plant density is less than a few stems per square meter it would probably be hard to support a significant weevil population.

Successful biological control results in a suppression of the pest plant, not its elimination (Gettsinger et al. 2002; Newman 2004). Because this control is potentially cyclical, it is more useful for long term control in lower priority sites and over large areas. If biological control is implemented, at least several years must be provided to determine if suppression will take place (Newman 2004).

MILFOIL WEEVIL MONITORING

The *Milfoil Weevil Monitoring and Eurasian Watermilfoil Adaptive Management Plan for the Little Quinnesec Falls Hydroelectric Project* (Premo 2010a) called for investigating presence and abundance of the milfoil weevil in the study area. The milfoil weevil is common and can be abundant in lakes of the Great Lakes states (Newman 2004). Its distribution in riverine systems is less well known, but it has been found as a native in Menominee River impoundments upstream of the study area (Grisar, pers. com, 2010). In this section, we describe 2010 monitoring methods, review the 2010 weevil monitoring results, and present 2011 monitoring results.

Methods

We developed the survey protocol for the study area by researching scientific literature and contacting experts (outlined in 2010a). The plan called for us to monitor for weevils at Eurasian watermilfoil beds of size similar to the two "beds" identified in the study area in 2009 (Sites D and K). In 2010, only a single bed in the study area (Site K) met this criterion (Premo and Premo 2010, Premo 2010b). We mapped the aquatic plant at Site K bed using a hand-held GPS unit. Three parallel transects were established in the bed that were oriented along the long axis of the bed. One transect was established through the center of the bed and the flanking transects were positioned half-way between the middle transect and the edges of the bed (the three transects divide the bed into parallel quarters). Five collection points were established equidistant along each transect with one located at the shoreward edge of the bed, one at the outside edge, one in the middle, one between the middle and outside edge, and one between the middle and shoreward edge. Exhibit 1 is a generalized layout of transects and sampling points. Exhibit 2 shows an aerial photograph with the actual size and shape of the plant bed at Site K.

The water depth and substrate required the use of a boat to sample the fifteen collection points at Site K. At each point, we collected one rooted Eurasian watermilfoil stem from each side of the boat (randomly selected by collecting the first rooted stem contacted with the hand). On a few occasions a rake was used to collect stems. With the two stems in the boat, we collected the top 24 inches of each and placed both in a plastic sample bag marked with transect letter and point number. The plant samples thus collected were stored in a cooler on wet ice. The unused portion of the Eurasian watermilfoil stems were placed in a plastic bag and retained for proper

disposal (composting). After all fifteen points were sampled, a total of 30 plant stems were collected and transported back to the White Water Associates' laboratory for examination.

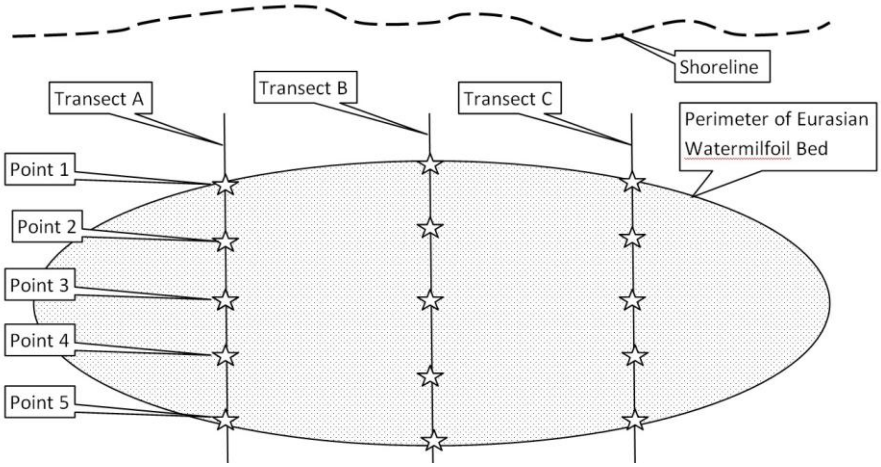
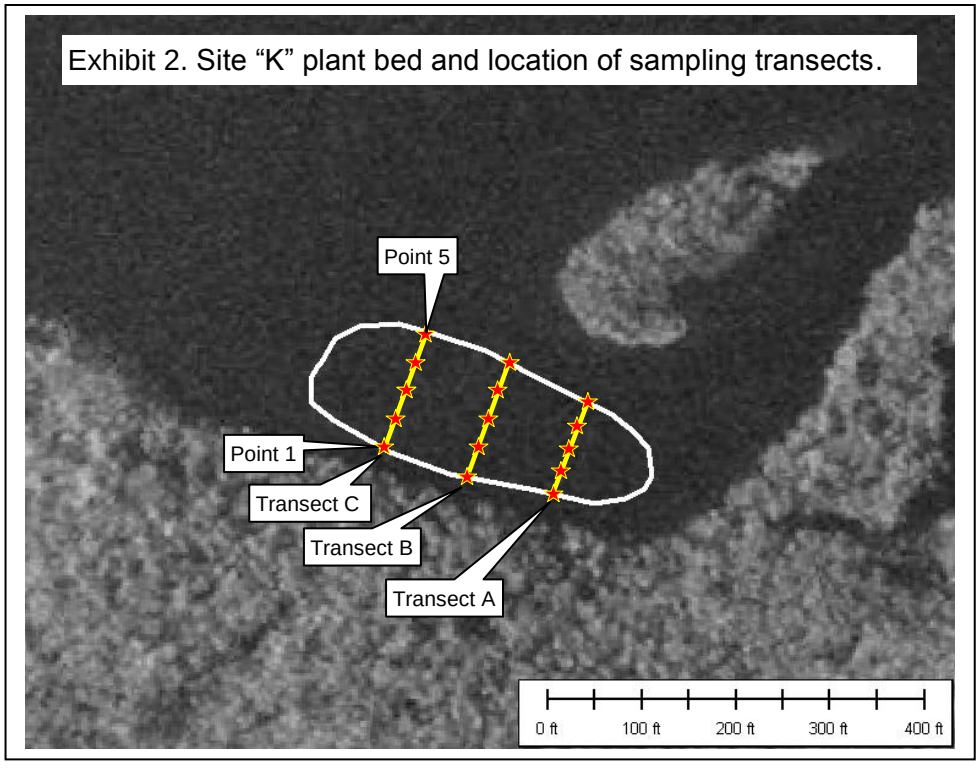


Exhibit 1. Generalized layout of sampling transects.



We measured a Secchi transparency depth at the subject Eurasian watermilfoil bed. We also measured temperature, dissolved oxygen, pH, and conductivity at the water surface. We recorded substrate type in the bed. We used a laser range-finder to measure distance to the nearest shore from the shoreward edge of the bed. We recorded a description of the shoreline and riparian area vegetative cover. We also recorded qualitative observations regarding the overall health of the Eurasian watermilfoil, presence of weevils or weevil damage, and native plants present.

At sampling Point 3 of each transect (A, B, and C) we used a double-sided fourteen-tine rake to make a one meter tow to collect vegetation. All plants on the rake were identified and a rake fullness rating was applied for each species. The rake fullness values were based on the Wisconsin Department of Natural Resources Point-Intercept Protocol for aquatic plant surveys as follows: (1) rake fullness rating 1 is given when plant is present and occupies less than one-half of tine space, (2) rating 2 is given when plant is present and occupies more than one-half of tine space, (3) rating 3 is given when plant is present and occupies all or more than tine space. This approach provides a baseline estimate of Eurasian watermilfoil density in the bed.

In order to compare to other Eurasian watermilfoil stands in the Menominee River basin, we will also applied the "estimated density rating" used by We Energies in their annual monitoring (We Energies 2009 Annual Report – Nuisance Plant Control). The ratings are: (1) Sparse: 0-5% cover; (2) Moderately Sparse: >5-25% cover; (3) Moderate: >25-75% cover; (4) Moderately dense: >75-95% cover; and (5) Dense: >95% cover.

In the laboratory, Eurasian watermilfoil samples were examined for presence of all milfoil weevil life stages using magnification. Quantitative data are reported as number of weevils per stem. Voucher specimens were sent to Wisconsin scientist Amy Thortenson to verify identification.

For the 2010 weevil monitoring even, field work was conducted on July 28, 2010. We predicted that Eurasian water milfoil (and potentially milfoil weevils) would be at maximum population size around that date. In 2011, we conducted the fieldwork on August 3.

2010 Monitoring Results Review

The 2010 watermilfoil weevil monitoring results have been previously reported (Premo 2010b) and are reviewed here for context. We planned to monitor for weevils at the two Eurasian watermilfoil subpopulations identified as "beds" in the study area in 2009 (Sites D and K) and any other subpopulations that were recognized in 2010 to have reached a similar size. The 2010 Eurasian watermilfoil monitoring revealed that only one site (Site K) still met this size criterion (Premo and Premo 2010). The aquatic macrophyte bed that constitutes Site K was 370 feet by 134 feet and had a surface area of just under one acre. We judged good quality overwintering habitat for weevils was available in the nearby shoreline and riparian area. The plant bed at Site K was comprised of a diverse assemblage of native plant species and Eurasian watermilfoil.

During the 2010 field sampling, we observed one adult milfoil weevil **(***Euhrychiopsis lecontei***)** and one larva on Eurasian watermilfoil stems. In the laboratory and under better magnification we found a total of twelve adults, seventeen eggs, and thirty-nine larvae. The density of watermilfoil weevils (all life stages) over the entire bed was 2.27 per stem. Newman (2004) indicated that densities of one or more weevils per stem can control Eurasian watermilfoil.

2011 Monitoring Results

In 2011, we planned to monitor for weevils at Site K and any other site with a sufficiently large subpopulation of Eurasian watermilfoil. On the August 3, 2011 survey of the entire project area, we were surprised to find that of the 25 sites that had Eurasian watermilfoil in 2010, only one had Eurasian watermilfoil in 2011. The plant bed at Site K, the largest subpopulation of Eurasian watermilfoil in 2010, had none in 2011. The one site that had Eurasian water milfoil in 2011 had five relatively small plants (down from 15 in 2010). We saw no sign of weevil herbivory on these plants. As result of the lack of Eurasian watermilfoil, the sampling protocol for milfoil weevil could not be carried out in 2011.

BIOLOGICAL CONTROL AT LITTLE QUINNESEC FALLS PROJECT

After reviewing the extensive literature on Eurasian watermilfoil and speaking with experts on the subject, we recognized in 2010 that the relatively small population of the invasive Eurasian watermilfoil in the Little Quinnesec Falls study area was "under control" by most standards. Our observations in the 2011 survey could accurately be characterized as a population crash for Eurasian watermilfoil. To what extent this is attributable to watermilfoil weevils remains unknown, but in 2010 they had sufficient density at Site K to affect control. The adaptive management of the Eurasian watermilfoil in the study area has focused on the potential for biological control.

Part of the adaptive management approach involves increasing the ecological knowledge base for the system being managed. The Little Quinnesec Falls study area provides a potential opportunity to test the efficacy of biological control in very small populations of Eurasian watermilfoil. Laura Herman (University of Wisconsin Extension Lakes program) expressed that a bed of at least four or five acres was needed before weevil treatment (that is, introduction of weevils) was warranted (pers. com 2010). Raymond Newman (Professor, Fisheries, Wildlife and Conservation Biology, University of Minnesota) offered the opinion that the Eurasian watermilfoil population at the Little Quinnesec Falls study area might be too small to support milfoil weevils, but indicated that no one has researched this topic (pers. com. 2010). The 2010 study found a native population of milfoil weevils in fairly high densities at Site K despite the small size of the Site K bed (about one acre).

The adaptive management plan (Premo 2010a) calls for augmentation of biological control of Eurasian watermilfoil by introducing milfoil weevils in the Little Quinnesec Falls study area if two criteria are met:

1. The Eurasian watermilfoil population increases in size for two consecutive years (2010 and 2011) in areas that constitute beds; and
2. The population of milfoil weevils in these beds is less than 0.1/stem, the lower threshold for likely effective control according to Newman (2004).

In 2010, neither of these criteria was met. In 2011, the first criterion was not met since Eurasian watermilfoil had greatly decreased from the previous year. There is no need for artificial

augmentation of the watermilfoil weevil population at this time. Future monitoring will follow the status of both the Eurasian watermilfoil and the milfoil weevil at this location, as well as subpopulations in other parts of the study area.

In his review paper, Newman (2004) states that although the milfoil weevils can be effective control agents if adequate densities can persist (through summers and years), many sites investigated have failed to sustain this density. In spite of significant research, it is not yet possible to predict when suppression of Eurasian watermilfoil will occur. The Little Quinnesec Falls project area has demonstrated a dramatic and interesting suppression of Eurasian watermilfoil, some of which might be attributed to the watermilfoil weevil. Given the complexity of this ecosystem, it is likely that additional factors play a role in the population dynamics of the Eurasian watermilfoil as well.

Follow-up monitoring will track the success of the adaptive management process. Part of this adaptive process will be to communicate with other ecosystem managers in the region, resource agency technical staff, and scientists with expertise in Eurasian watermilfoil management.

LITERATURE CITED

Becker, George C. 1983. Fishes of Wisconsin. The University of Wisconsin Press. 1052 pages.

Cofrancesco, Alfred F. and Holly Crosson. 1999. Euhrychiopsis lecontei (Dietz) as a Potential Biocontrol Agent of Eurasian Watermilfoil (Myriophyllum spicatum L.). Aquatic Plant Control Research Program. US Army Corps of Engineers. Volume A-99-3, August 1999.

Creed, R.P. Jr. and S.P. Sheldon. 1993. The effect of feeding by a North American weevil, Euhrychiopsis lecontei, on Eurasian watermilfoil (Myriophyllum spicatum). Aquatic Bot. 45: 245-256.

Creed, R.P. Jr. and S.P. Sheldon. 1995. Weevils and watermilfoil: did a North American herbivore cause the decline of an exotic plant? Ecological Applications. 5: 1113-1121.

Creed, R. P., Jr., and Sheldon, S. P. 1994. Potential for a native weevil to serve as a biological control agent for Eurasian watermilfoil. Technical Report A-94-7, U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Creed, R. P., Jr., S.P. Sheldon, and D.M. Cheek. 1992. The effect of herbivore feeding on the buoyancy of Eurasian watermilfoil. J. Aquatic Plant Management. 30: 75-76.

Getsinger, K.D., A.G. Poovey, W.F. James, R.M. Stewart, M.J. Grodowitz, M.J. Maceina, and R.M. Newman. 2002. Management of Eurasian watermilfoil in Houghton Lake, Michigan: Worship Summary. US Army Corps of Engineers Aquatic Plant Control Research Program (ERDC/EL TR-02-24). 88 pages.

Herman, Laura. 2009. Aquatic Invasive Species Monitoring Procedures. Chapter 12-Water milfoil weevil monitoring protocol. Pages 259-282. Citizen Lake Monitoring Network, University of Wisconsin-Extension.

Newman, R.M. 2004. Biological control of Eurasian watermilfoil by aquatic inscects: basic insights from an applied problem. (Invited Review). Arch. Hydrobiol.

Newman, R.M., K.L. Holmberg, D.D. Biesboer, and B.G. Penner. 1996. Effects of a potential biocontrol agent, Euhrychiopis lecontei, on Eurasian watermilfoil in experimental tanks. Aquatic Bot. 53: 131-150.

Newman, R.M., Ragsdale, D.W., Milles, A. and Oien, C. 2001. Overwinter habitat and the relationship of overwinter to in-lake densities of the milfoil weevil Euhrychiopsis lecontei, a Eurasian watermilfoil biological control agent. J. Aquat. Plant Management. 39: 63-67.

Premo, Dean. 2010a. Milfoil Weevil Monitoring and Eurasian Watermilfoil Adaptive Management Plan for the Little Quinnesec Falls Hydroelectric Project (FERC Hydro Project No. 2536, Little Quinnesec Falls). Prepared for Northbrook Wisconsin, LLC (the licensee) by White Water Associates, Inc.

Premo, Dean. 2010b. Annual Report of Milfoil Weevil Monitoring and Eurasian Watermilfoil Management for the Little Quinnesec Falls Hydroelectric Project (FERC Hydro Project No.

2536, Little Quinnesec Falls). Prepared for Northbrook Wisconsin, LLC (the licensee) by White Water Associates, Inc.

Premo, Dean and Kent Premo. 2010. Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian watermilfoil and Purple Loosestrife (FERC Hydro Project No. 2536, Little Quinnesec Falls). Report to Northbrook Energy, LLC by White Water Associates, Inc.

Sheldon, S.P. and O'Bryan, L.M. 1996. Life history of the weevil Euhrychiopsis lecontei, a potential biological control agent of Eurasian watermilfoil. Entomological News 107: 16-22.

Sutter, T.J. and Newman, R.M. 1997. Is predation by sunfish (Lepomis spp.) an important source of mortality for the Eurasian watermilfoil biocontrol agent Euhrychiopsis lecontei? Journal of Freshwater Ecology. 12: 225-234.

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+.

Document Content(s)

20101215AnnualExoticSpeciesRpt.PDF.....1-44