# Final Report

# AEPP-249-10

# Regional AIS Coordinator


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Our 2010-2011 Regional AIS Coordinator program was wonderfully successful, and was enthusiastically received by residents and professional partners of Portage, Wood, Waushara, and Marathon Counties. Four educational workshops were held across the area, 58 AIS surveys were conducted, two lakes were hand-pulled to the point of the EWM being at a level below detection by visual kayak surveys, and many more accomplishments are noted in the report below. We would like to express sincere appreciation to the Wisconsin Department of Natural Resources AIS Grants Program for their funding assistance to our AIS program.

Listed below are the goals and objectives of our AIS program, including descriptions of how those were met during the grant period.

**Goals and Objectives:**

ALL COUNTIES

**CBCW, CLMN workshops**

A total of four workshops were held across the region:

- CBCW at Hartman Creek State Park
- CLMN at Hartman Creek State Park
- Marathon Co. Park Dept.
- CBCW at Pike Lake (Marathon Co.)

As in previous years, attendance has been higher at citizen lake monitoring workshops compared to watercraft inspection workshops. Attendees seem to be more interested in science-based monitoring rather than boat launch monitoring, despite both efforts being equally important. Pike Lake in Marathon County hosted one of the CBCW workshops, and about 8 people attended the workshop – a good-sized audience for this type of workshop. Their group became active in watercraft inspections immediately after the workshop, and Pike Lake continues to be one of the lakes in Marathon County without Eurasian watermilfoil, despite heavy transient boat traffic. The Pike Lake group also joined Paul for a later AIS survey of the lake, demonstrating their genuine concern for the health of Pike Lake.

**Biological control of purple loosestrife promotion**

Purple loosestrife beetle (*Galerucella* beetle) rearing projects were started at Boston School Forest in Plover-Portage County, McDill Pond-Portage County (Olson Residence), and Jordan Pond-Portage County (Wysocki residence). All rearing projects produced well. Most of the beetles were released on July 8th in the median of Interstate Highway 39 north of Hwy DB in northern Portage County. Kaycie Stushek (Regional AIS Specialist) coordinated this effort with the Wisconsin Department of Transportation, who assisted with the release. Purple loosestrife is abundant throughout the highway median in this area, and other management options are less promising due to the dangerous work location. Remaining beetles were released along Hwy 66 west of Stevens Point. Purple loosestrife rearing permits and beetle release reports were filed with WDNR.

Photo: WIDOT

*Kaycie (RC&D) and Rochell (WDOT) releasing beetles on I39.*

**Milfoil weevil surveys**
Surveys were conducted in July, 2010, of Spring Slough, on McDill Pond, Portage County, to collect quantitative data on the weevil population naturally occurring there. (Appendix A) This bay has been a productive site for collecting milfoil weevils and hosting milfoil weevil training workshops, therefore, quantitative data on the population density was desired. Surveys found weevil densities ranging from 0.0 – 3.0 weevils/stem. The average was 0.65 weevils/stem, which is on par with average weevil densities in the state.

Surveys were conducted in July, 2010, of Springville Pond, Portage County, at the request of the lake group. (Appendix A) This pond has historically had strong weevil populations, with milfoil beds on the east end as high as 4.43 weevils/stem, well above statewide averages. Surveys in 2010 found weevil densities ranging from 0.0 – 5.0 weevils/stems, and a pond-wide average of 1.0 weevil/stem.

**Two milfoil weevil micro-studies**.
Milfoil Weevil Light Attraction Study, 2 years (Appendix B)
Phytobius and *E. lecontei* Compatibility Study (Appendix C)

**Update quad-county AIS inventory**
Our spreadsheet for all four counties was updated as we located new aquatic invasive species in the region. A total of 16 new AIS populations were discovered in our project area, including 11 mystery snail populations, 1 rusty crayfish population, 2 Eurasian watermilfoil, 1 curly-leaf pondweed, and 1 Japanese knotweed. All of these new populations listed above were found during the Marathon County AIS surveys conducted during the summer of 2010 as the first step in creating the Marathon County AIS Plan. All new AIS populations were entered into the statewide SWIMS database, and voucher specimens submitted to WDNR. Thanks to many improvements made to the SWIMS database and Surface Water Data Viewer, county-wide lists and maps can now be extracted from those programs and do not need to be created at the county level. County AIS maps, extracted from SWDV, are attached in Appendix D.

**Education/outreach program**
Education and outreach was a major component of this project, as it needs to be. Education of the public and their encouragement to assist in AIS monitoring and control is crucial in the battle against aquatic invasive species in Central Wisconsin and beyond. Paul (Regional AIS Education Specialist) presented at 11 public meetings to educate residents and other stakeholders about AIS of concern, especially those in close proximity to the meeting location. Whenever possible, live and preserved specimens of each species discussed at the meeting were provided during the presentation for the attendees. Current informational brochures and handouts were also made available for the attendees to take home with them. Many positive comments were received from the audience regarding the availability of live specimens, especially from those that have no experience with plant or animal taxonomy. They are better able to understand identifying characters when they can see and touch the actual species during and after the discussion. A number of reports of new AIS have come in after these meetings, suggesting that the audience members feel capable of conducting AIS monitoring after just this brief introduction to AIS and the problems they cause.

Several site visits were requested by residents that believed they had discovered new populations of AIS on or near their properties. In most cases, these were native species that looked similar to a listed aquatic invasive species:

Ribbon-leaf pondweed (*Potamogeton epihydrus*) reported as CLP; northern watermilfoil (*Myriophyllum sibiricum*) reported as EWM; leafy pondweed (*P. foliosus*) reported as CLP; Chara and Nitella spp. reported as EWM; Japanese plume grass (*Miscanthus sacchariflorum*) reported as *Phragmites* (exotic species either way – occurrence was noted); Devil crayfish (*Cambarus diogenes*) reported as rusty crayfish; and slender waterweed (*Elodea nuttallii*) reported as EWM. Although the species were not of concern, the residents appreciated the quick response and reassurance of RC&D staff. One case of purple loosestrife was reported at Lake Thomas, Portage County, and Paul and Alyse Milanowski (AIS intern) assisted the landowner with hand-removal of the loosestrife plants along the shoreline. Also, one case of EWM was correctly reported in a private pond in Wood County. The landowner admitted that fish from the Wisconsin River were stocked into the private pond, which occurred shortly before the EWM was noticed in the pond. This landowner was given Scott Provost's contact information to discuss a possible herbicide application permit.

Our new environmental education program was launched in the spring of 2011. AIS lessons were taken into 5$^{th}$ grade classrooms in all four counties, with the help of two work-study students from UW-Stevens Point. The students developed an AIS lesson plan suitable for the classroom setting, and sent notice of the free lesson to all 5$^{th}$ grade teachers. Lessons were booked on a first-come-first-serve basis. Numbers of students reached by these lessons were as follows: Marathon County – 25; Portage – 268; Wood – 33; Waushara – 46.

RC&D education and outreach extended to 19 events, including:

**Port Edwards High School Earth Day Celebration**
Port Edwards H.S. invites speakers from around Central Wisconsin to give presentations to groups of kids on topics related to environmental science. The kids choose which presentations they would like to hear about. Paul co-presented with Tracy Arnold, Conservation Programs Director from the Wood County Land Conservation Department. Both sessions were standing-room-only because so many kids had signed up to hear about this topic! Other topics included a wildlife show-and-tell and groundwater education.

**Wisconsin Lakes Convention**
Paul and Amy gave several presentations at the 2011 Wisconsin Lakes Convention in Green Bay. Amy presented a poster and an oral presentation on Eurasian watermilfoil weevil rearing. Paul presented a poster and an oral presentation on "non-profit & lake district partnerships", focusing on past AIS work with the Lake Helen Protection & Rehabilitation District in Portage County. Paul was also asked to assist with the aquatic plant identification portion of the Clean Boats, Clean Waters morning workshop.

**Big Silver Lake (Waushara County) Kid's AIS Day**
Over 100 5$^{th}$ graders from Wautoma and the surrounding area learned about the history and ecology of Big Silver Lake. Four volunteers from the lake district donated their time and pontoon boats for the day to take the kids around the lake and point out aquatic invasive species, particularly zebra mussels and Eurasian watermilfoil. Paul and Ed Kissinger (Silver Lake Management District President) discussed past management strategies that Big Silver Lake has undertaken to combat the EWM.

**Waushara County Conservation Field Days**
Over 200 4th and 5th graders played a game explaining the interactions between native species and invasive (exotic) species. Paul developed a new game based on a game used by Reesa Evans, Adams County AIS Coordinator. The kids were very active in the game and readily understood the concept of how invasive species outcompete native species and decrease species diversity.

In the game, each kid begins by standing on a laminated photograph of a native plant (water lily or yellow water crowfoot) or invasive plant (CLP or EWM). Each card has a native species on one side and an invasive on the other. The card displays the number of yellow (sunlight) and green (nutrients) cards that the player must collect each round to survive as their species. The native species require more cards to survive. Kids standing on an invasive species get to start collecting cards for a few seconds before the natives, to demonstrate the early-season growth that many invasive species exhibit. After those few seconds, the other players also begin reaching for as many cards as they can obtain around themselves. All players must remain "rooted" by keeping one foot on their plant card at all times. Uprooted plants "die" and leave the game. Players that do not collect enough cards of each type either flip their card over (native turns into an invasive) or leave the game (invasive did not collect enough). After several rounds, it is clear that most of the native species have been displaced by invasive species. When asked how this happened, each group of kids offered an excellent explanation – the invasive species got to collect sunlight and nutrients earlier, and they also required fewer of each to survive. Most groups of kids contained between 20 and 25 kids, but the game has enough cards to handle a group of 40 kids.

**D.C. Everest Outdoor Education Days**
The kids at D.C. Everest Elementary School attend two weeks of outdoor educational lessons south of Rothschild. Paul was invited to discuss AIS with them and pass around live samples of AIS during his talk. The kids were taken on a short boardwalk hike through the on-site wetland to look for AIS. None were found. Kaycie was asked to return in summer 2011 to teach a similar lesson for the kids, and she played the new AIS game that was developed for the Waushara County Conservation Field Day. She discussed AIS and they affect activities the kids enjoy doing, while passing around live samples of AIS and their look-alikes for the kids to inspect.

*D.C. Everest Students inspecting the invasive rusty crayfish.*

**Wisconsin High School Conference on the Environment**
Paul gave a 45-minute overview on the problems of AIS. This conference is located at UW-Stevens Point and invites a limited number of science teachers and students from each high school around the state.

**USDA-NRCS All-Employees Meeting**
Paul gave a 1-hour overview on the problems of AIS. This meeting is a conference of all NRCS employees from across the state, and employees get to choose from many breakout sessions. Paul's AIS talk attracted over 120 people.

**Wisconsin Land & Water Conservation Association Annual Conference**
Paul co-presented on invasive species management with Ted Ritter, Vilas County Invasive Species Coordinator. They discussed the problems associated with invasive species, as well as solutions for managing them and creating partnerships. The conference participants are primarily County Land Conservation Department staff and other agency staff.

**Citizen Lake Monitoring Train the Trainer Meetings**
UW-Extension asked Paul to present on identification of common aquatic invasive species, as well as potential AIS that may show up in the future. Species covered included EWM, CLP, rusty crayfish, mystery snails, zebra and quagga mussels, spiny water fleas, Brazilian waterweed, Carolina fanwort, brittle naiad, parrot feather, and hydrilla. This was primarily to assist many new county AIS staff members in getting up to speed, but also served as a refresher for other AIS staff.

**DNR Aquatic Plant Identification Training Workshop**
DNR staff asked Paul to speak to the group on identification and impacts of NR40-prohibited aquatic plant species, as well as water hyacinth and water lettuce, which are unregulated by NR40. Paul also assisted Susan Knight with the "Advanced plant ID" session of the workshop.

**Northern Region and Southern Region Aquatic Invasive Species Coordinators' Meetings**
Paul and Chris Hamerla (Lumberjack RC&D AIS Coordinator) presented to the groups on strategies for hand-removal of Eurasian watermilfoil.

**AIS and Watercraft Inspection Training for Statewide AIS Seasonal Staff at UW-Stevens Point**:
Kaycie and Paul attended this training along with the summer intern staff, and provided assistance with role-playing during the training.

**Fleet Farm Kids' Fishing Day**
Our AIS specialists and interns staffed educational booths at three Fleet Farm stores: Marshfield, Stevens Point, and Waupaca, on July 9. At this event, about 200 people participate at each store, learning about fishing techniques and equipment, fish identification, and thanks to our display booths, aquatic invasive species. An abundance of informational materials and live samples of common AIS were provided.

**Isaak Walton League Fisheree on McDill Pond, Portage County**
The Isaak Walton League and McDill Lake District put on a winter "fisheree" event each year, which attracted about 100 participants in 2010. Paul staffed an AIS education booth with Krista Olson, Secretary of the McDill Inland Lake P&R District.

**Wisconsin Waterfowl Hunters' Conference, Stevens Point**
Paul staffed an AIS education booth with Diane Schauer, Calumet County AIS Coordinator. Their display focused mainly on faucet snails and *Phragmites*, both of which are commonly associated with waterfowl.

Other education and outreach efforts included newspaper and newsletter articles written for local media and various newsletters on topics including NR40 and the lack of new AIS found in Wood County over the 2010 summer season. Paul also partnered with Chris Hamerla (Lumberjack RC&D AIS Coordinator) to produce a new informational brochure entitled "Eurasian Watermilfoil Manual Removal", which was adopted and printed by the UW-Extension Lakes Program. Distribution of this brochure was launched at the 2011 Wisconsin Lakes Convention, and Paul and Chris intend to expand the brochure into a larger "guide to EWM manual removal" at a later date, and also plan to create a video compilation to serve as a visual tutorial for lake groups interested in controlling pioneer populations of EWM with minimal financial investment.

**Give training on EWM identification and hand-pulling as requested**
Lake groups engaging in hand-pulling efforts benefit from training in EWM ID and removal techniques and identification of native "AIS look-alike species". It is important for lake residents to be able to recognize beneficial native species that may be mistaken for invasive species like EWM, CLP, Brazilian waterweed, or *Hydrilla*.

Thirteen identification and hand-pulling events were held across the four counties, with cooperation from local residents, lake associations, and/or county Land Conservation Department staff. These events were held at Bear, Wolf, Sunset, Emily, Rocky Run, and Collins Lakes in Portage County; Lake Lucerne in Waushara County; and Wadley and Mission Lakes in Marathon County. No EWM plants were found at Collins Lake in 2011, suggesting that the combination of early detection and hand-pulling efforts in 2009 and 2010 were very effective and could possibly have eradicated Eurasian watermilfoil from the lake. Rocky Run Wetland is showing promise as well, but scattered plants continue to be found on each visit, and are removed by the roots. Contracting with divers in 2012 may be necessary for this lake.

**Assist lake residents as needed**
RC&D AIS staff attended county organizational meetings as requested, which included regular meetings of each county's Land Conservation Department and/or Land Conservation Committee, as well as the Waushara County Watershed Lakes Council, a county-wide group representing most of the lakes within Waushara County. Paul assisted Pickerel, Lime, and Sunset Lakes in Portage County with preparing an Early Detection AIS grant to treat their newly discovered populations of EWM.

The Lake Helen Protection & Rehabilitation District asked Kaycie to assist with GPS-mapping their scattered EWM population. Kaycie also assisted with mapping EWM on Lake Emily, per the lake association's request.

Kaycie led a Japanese knotweed removal party on Big Silver Lake, Waushara County with over a dozen volunteers. The group experimented with a new control method involving a scraper to reveal the stem's vascular tissue, and then applying an herbicide foam (Rodeo + foaming agent) to the wounded area, which clings to the stem. Stems that could not be treated in this manner were cut and burned, and their bases were treated with herbicide

from a small squirt bottle with a fabric wick for even product application.

**Provide LTE Support**
Two full-time limited-term employees were hired for the summer season to conduct CBCW inspections, assist with mapping new infestations, assist with hand-pulling of pioneer AIS populations, and develop educational materials. LTEs worked across all four counties. An additional part-time LTE was hired to focus on lakes with Portage County parks adjacent to them; this position was supported with funding from the Portage County Parks Department.

**AIS Incident response services**
Many residents and partners reported suspected populations of AIS, and RC&D staff conducted site visits to confirm these populations, or verified specimens that were mailed in to the office. Paul also assisted WDNR and U.S. Fish & Wildlife Service staff with a water lettuce and water hyacinth "search and destroy" effort on the Mississippi River near Alma, WI. Photographs and maps were created and distributed to the lake management unit, County, and WDNR as new AIS populations were verified. All incident reports were also entered into SWIMS and maps uploaded, as well.

**Improve and update public access maps**
Land Conservation and Zoning staff from each county continue to search for and document additional public access locations and plot them on their public access maps.

**Develop AIS webpages for each county**
Each county now has their own page on the Golden Sands RC&D website (http://www.goldensandsrcd.org). These pages include downloadable county AIS plans, links to information about upcoming workshops, links to lists of AIS in their county, and links to more information about each species of concern. Screenshots of the pages created are attached in Appendix E.

**Yellow Iris removal experiment**
Other states, especially Washington, have serious nuisance populations of yellow-flag Iris (*Iris pseudoacorus*), an exotic, emergent herb. Pike Lake in Marathon County has a large population of yellow Iris that was likely started by ornamental plantings along the shoreline. A large proportion of the private landowners have at least one yellow Iris plant occurring along their shorelines. The population is particularly aggressive near the outlet of Pike Lake, where a high-quality fen occurs on both sides of the outlet stream. These plants could not have been planted due to the soft, unstable surface of the bog mat and peaty substrate. It is suspected that they spread through the outlet stream by seed dispersal from other parts of Pike Lake.

*Removing a yellow Iris colony with rhizomes.*

Kaycie and Paul visited Pike Lake to remove the yellow Iris population from the outlet stream with the cooperation of the Pike Lake Association (Jon Blume) and members of the Marathon County Land Conservation and Zoning Department. Plants were cut below the water line with garden loppers, in an attempt to drown out the plants by removing their ability to exchange gases with the atmosphere. Where possible, entire plants were pulled up,

including the rhizomes. This was possible in areas where the substrate was very soft, and other vegetation was sparse. In most cases, this was at the edge of the bog/sedge mat. Cut material was stored in a canoe provided by Jon Blume, and was disposed of on a field away from the lake. During the removal of these Irises, several unusual native plant species were noted, including purple pitcher plants (*Sarracenia purpurea*), sage willow (*Salix candida*) and green twayblade orchids (*Liparis loeselii*), confirming that this was a habitat that should be protected from invasion by yellow Iris or other aquatic invasive species.

*Yellow Iris plants were stored on a canoe for transport to the shore.*

A few yellow Iris plants were not able to be reached, but were jabbed with kayak paddles as close to the water level as possible, in an effort to break them off below water. If nothing else, they were unlikely to flower and produce seed for another season. RC&D AIS staff will monitor the yellow Iris population on Pike Lake in 2012 and take action as needed to remove the remaining plants. A map of yellow Iris plants was created before the removal effort began, so future monitoring will be easier.

MARATHON COUNTY

1. **Write Marathon County AIS Plan.** A county-wide AIS management plan was created for Marathon County, with the helpful assistance of the Marathon County Land Conservation and Zoning Department. The plan is cited by the LCZ Department in their Land & Water Plan. The LCZ Department has continued to be very supportive whenever the RC&D staff is in need of assistance in completing objectives outlined within the plan. The plan is attached as Appendix F.

PORTAGE COUNTY

1. **Collaborate with Lake Management Plan Project.** Paul has presented at all of the Portage County lake management planning meetings to discuss AIS survey results and management options. Live samples were provided whenever possible to bring a short identification component to each meeting. Each presentation offered free training workshops or assistance with AIS project implementation.

2. **Write Portage County AIS Plan.** A county-wide AIS management plan was created for Portage County, with the helpful assistance from Steve Bradley, Portage County Conservationist and Randy Slagg, Conservation Technician. The plan will be cited by the LCD in their Land & Water Plan at the time it is renewed. The Portage County Land Conservation Department has continued to be very supportive whenever the RC&D staff is in need of assistance in completing objectives outlined within the plan. The plan is attached as Appendix G.

3. **Contract divers for assistance with pioneer infestations on lakes with Portage County parks.**
   A diver was utilized for mapping Eurasian watermilfoil on Bear Lake, Portage County. The EWM has been treated in the past, but has been slowly coming back. Stained water color made it difficult to see all of the EWM from a boat, but the diver's assistance with mapping provided a very accurate map to provide to the township. The township is considering

another herbicide treatment to be completed in spring 2012.

WAUSHARA COUNTY

1. **Annual review and update of Waushara County AIS Plan.**
   The Waushara County AIS plan was reviewed and updated with input from Ed Hernandez, Waushara County Conservationist.

2. **Collaborate with Lake Management Plan Project.** Waushara County's lake management project is in the early stages of implementation, and has not yet required assistance from our AIS staff. The topic of AIS is expected to surface very soon, and Golden Sands AIS staff will readily participate in public meetings and other events where an AIS professional would be beneficial.

WOOD COUNTY

1. **Annual review and update of Wood County AIS Plan.**
   The Wood County AIS Plan was reviewed and updated with generous input from Tracy Arnold, Wood County Conservation Programs Coordinator and Jerry Storke, Wood County Conservationist.

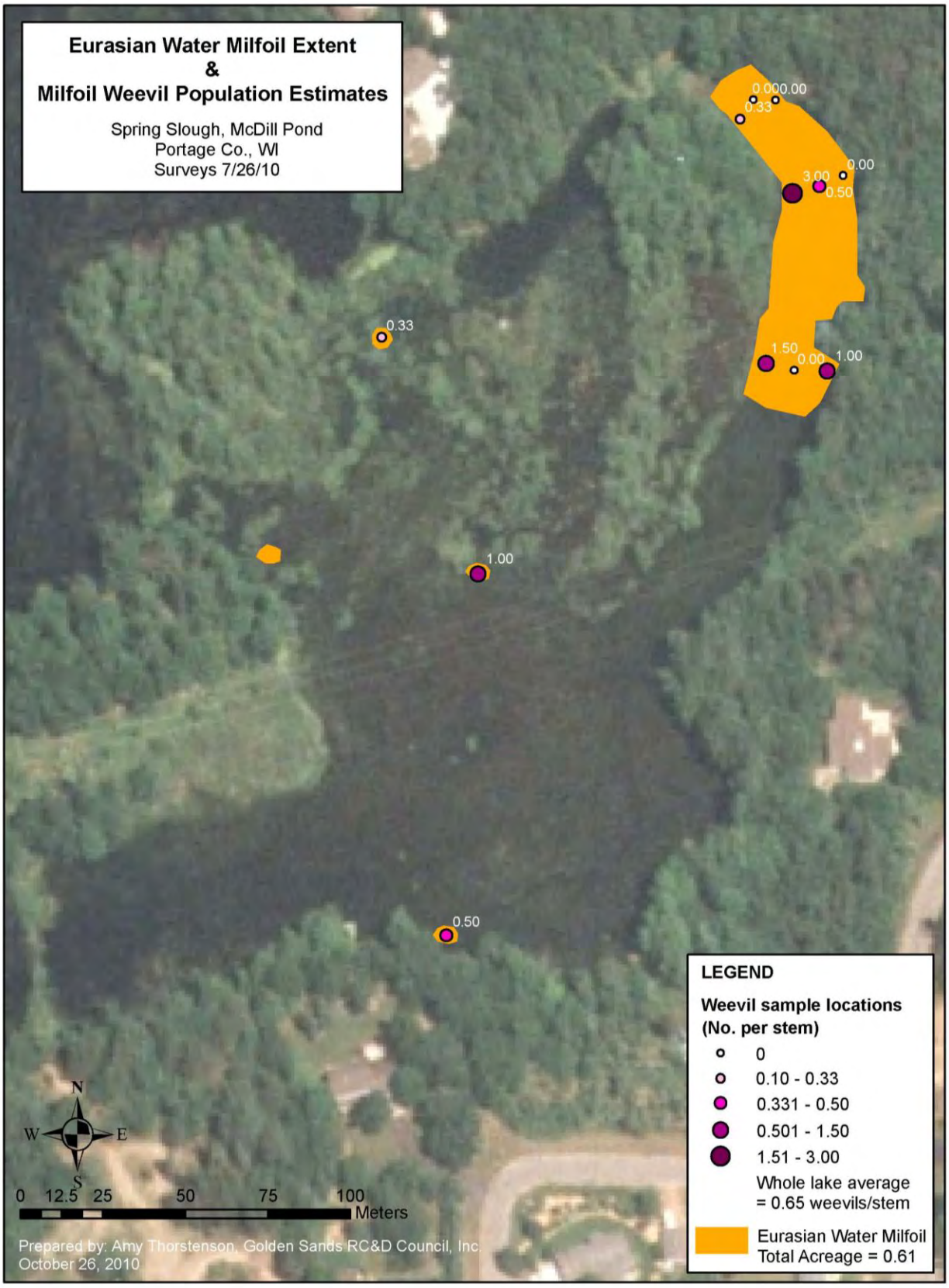
2. **Rusty crayfish trapping as an educational program.** The rusty crayfish trapping project completed in 2009 was refined and conducted again in the spring of 2011 with cooperation from the Wood County Land Conservation Department and Pittsville High School. Trapping was completed earlier this time so that female crayfish would be caught while still "in berry" (carrying eggs), effectively removing hundreds of potential crayfish instead of just one female. Kids from the Advanced Biology classes formed teams of 2-3, and were told to choose their own baits and trap placement locations. After baiting and placing their traps, the kids checked their traps every other day, and recorded number of crayfish caught, length and sex of each crayfish, and whether it was a native species or a rusty (no natives were found). Trapping efforts were very successful, and most traps caught about 15 crayfish per trap-day.

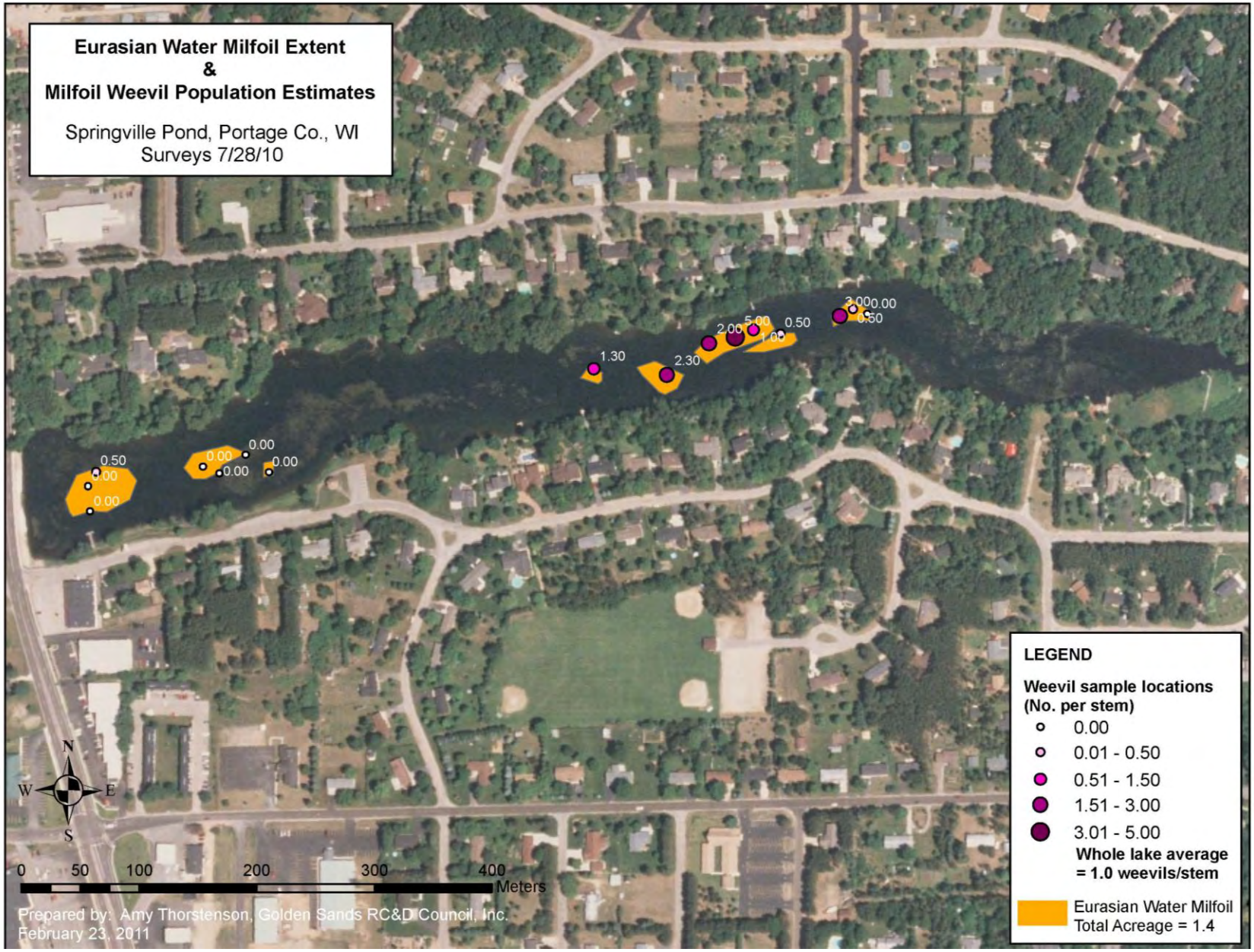
**Project Deliverables:**

- ✓ Final Report – A summary report of AIS activities and results, including all EWM or CLP maps produced, county AIS maps, and photographs of volunteer and workshop activities.
- ✓ Micro-study reports – Reports of results of the two milfoil weevil micro-study will be provided to DNR, including methods, results, discussion, recommendation for application, and any pertinent photos. (Appendices B, C)
- ✓ Quad-County AIS Inventory – For all four counties. A GIS depiction of which lakes have confirmed cases of priority AIS species, and which lakes have CBCW and CLMN volunteer activity. We originally began tracking our own maps, but now the Surface Water Data Viewer offers these mapping capabilities (although the maps are still rough and have limited formatting options. (Appendix D)
- ✓ AIS webpages – A printout of each county's new AIS website will be attached to the final report as verification of completion of this grant objective. (Appendix E)
- ✓ Portage County AIS Plan – A copy of the new Wood County AIS Plan will be provided as an attachment to the final report. (Appendix G)
- ✓ Marathon County AIS Plan - A copy of the new Wood County AIS Plan will be provided as an attachment to the final report. (Appendix F)

## Appendix A

Weevil Surveys


Eurasian Water Milfoil Extent
&
Milfoil Weevil Population Estimates
Spring Slough, McDill Pond
Portage Co., WI
Surveys 7/26/10
0.00
0.00
0.33
0.00
3.00
0.50
0.33
1.50
0.00
1.00
1.00
0.50
LEGEND
Weevil sample locations
(No. per stem)
0
0.10 - 0.33
0.331 - 0.50
0.501 - 1.50
1.51 - 3.00
Whole lake average
= 0.65 weevils/stem
Eurasian Water Milfoil
Total Acreage = 0.61
N
W
E
S
0 12.5 25 50 75 100
Meters
Prepared by: Amy Thorstenson, Golden Sands RC&D Council, Inc.
October 26, 2010


Eurasian Water Milfoil Extent
&
Milfoil Weevil Population Estimates
Springville Pond, Portage Co., WI
Surveys 7/28/10
0.50
0.00
0.00
0.00
0.00
0.00
1.30
2.30
2.00
5.00
1.00
0.50
3.00
0.00
0.50
N
W
E
S
0
50
100
200
300
400
Meters
Prepared by: Amy Thorstenson, Golden Sands RC&D Council, Inc.
February 23, 2011
LEGEND
Weevil sample locations
(No. per stem)
0.00
0.01 - 0.50
0.51 - 1.50
1.51 - 3.00
3.01 - 5.00
Whole lake average
= 1.0 weevils/stem
Eurasian Water Milfoil
Total Acreage = 1.4

## Appendix B

Milfoil Weevil Light Attraction Studies

2010

2011

# Light attraction for collecting milfoil weevils (*Euhrychiopsis lecontei*) from Eurasian watermilfoil (*Myriophyllum spicatum*)

2010

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## Abstract

The objective of this study was to determine if capture of weevils was more efficient using light as an attractant than by hand-collecting. The first experiment was conducted in the field using light as the treatment and dark as the control. For the second experiment, Eurasian watermilfoil (*Myriophyllum spicatum*) was collected from the field and brought back into the lab in a bucket to test using light for extracting the weevils. The field collection experiment did not show a significant difference between treatment (light) points and control (no light) points. However, the bucket test proved that light could be used to attract weevils to the surface with 100% efficiency, suggesting the field collection experiment could be successful if sufficient light intensity and duration is used. These findings show that using light to collect weevils has the potential to be more efficient than hand picking.

## Introduction

The exotic aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*), was introduced to the United States in the 1940's (Couch and Nelson 1986), and is now found in 45 states and four Canadian provinces (USDA, NRCS 2010). Eurasian watermilfoil reproduces vegetatively by fragmentation (Nichols 1975). Many control methods have been used to suppress Eurasian watermilfoil, including mechanical and chemical control, though such removal is only a short-time solution and requires repeated application (Crowell et al. 1994, Getsinger et al. 1997, Parsons et al. 2001).

An optional control method that shows potential is biological control by a native weevil, *Euhrychiopsis lecontei* (Sheldon and Creed 1995, Newman 2004). The native weevil co-evolved with native milfoils, but demonstrates a preference for Eurasian watermilfoil among weevils reared on Eurasian watermilfoil (Solarz and Newman 1996). A study in Minnesota documented suppressed recovery of Eurasian watermilfoil due to extensive weevil damage (Newman and Biesboer 2000).

Weevils use both chemical cues (Marko et al. 2005) and sight to identify Eurasian watermilfoil, and have been determined to be attracted to light (Reeves et al. 2008). In Reeves et al.'s (2008) experiment, weevils climbed plants towards laboratory lights, which was thought to be how they would use sun as a directional cue to climb upward on plants.

Our objective was to determine if capture of weevils was more efficient using light than by hand-picking. Currently, milfoil weevils are collected for rearing and stocking operations by hand-picking them off plants, either by waders, snorkelers, or divers. Weevils that are collected from plants are then reared in laboratories to be sold for control of Eurasian watermilfoil. We expected to find that light would attract the weevils to the milfoil at the water surface, and

thereby increase percentages of weevils collected from milfoil samples at the treatment point.

## Methods

*Study area* —McDill Pond, located in Portage County, Wisconsin, is a 261-acre pond with a maximum depth of 14 feet. The lake was created when a dam was installed on the Plover River. Water enters the lake from the Plover River and exits the pond into the Plover River. The bottom of the lake is made up of primarily sand and some gravel, silt and muck. Fish species that can be found in the lake include panfish, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*) and northern pike (*Esox lucius*). Eurasian watermilfoil was found in the pond in 2003. The lake was drained in autumn of 2008 to control the invasive watermilfoil. Most of the Eurasian watermilfoil disappeared, but returned in spots, especially in Spring Slough, a small bay with groundwater springs and a maximum depth of 1.2 m. Our study was conducted in Spring Slough, where naturally-abundant weevil populations have been observed.

*Study Design* — Sampling for the bucket collection experiment was at three different patches of Eurasian watermilfoil during the afternoon on a sunny day during summer. For each patch, data collectors quietly approached each milfoil bed and collected five handfuls of Eurasian watermilfoil from the top 63 cm of the stem and then gently placed each collection into a sample "bucket" - a 68 L navy Rubbermaid Roughneck storage tote half full of lake water. Each bucket was covered by a lid and then wrapped with a black plastic bag to eliminate light. Each bucket was then allowed to sit for 20 minutes. After 20 minutes, the tote was uncovered and any weevils visible on the surface of the water were counted. The same experiment was repeated with the same milfoil, except a flashlight was aimed down through a hole in the cover of the

bucket. The flashlight was suspended in the hole at about 20 cm above the milfoil floating on the water surface. The bucket and flashlight were covered with a black plastic bag to eliminate external light and was left to sit for 20 minutes. After 20 minutes, the cover was removed and visible weevils were counted and recorded. The bucket, with water and milfoil, were then taken back to the lab. The experiments were repeated in a dark room of the lab, with treatment times of 30 minutes or more, and the flashlight positioned at 4 cm above the milfoil floating at the water surface, to test the efficacy of added time and light concentration. When light experiments were completed, the milfoil and all of the contents were placed into 70% isopropyl alcohol and then sorted to count all weevils present in the collected milfoil.

The field collection experiment was completed in the field at four locations during daytime and four different locations during nighttime (eight total locations). Each of the eight Eurasian watermilfoil beds was approached quietly and the anchor was dropped quietly into the water to minimize disturbance of the Eurasian watermilfoil. Floating markers were placed on either side of the canoe to mark the control point and the treatment point. On the treatment point side of the canoe, a Coleman camping lantern with a 15W compact fluorescent light bulb was covered with two plastic bags to help water proof the lantern and was suspended from a wooden broomstick secured to the canoe over-hanging the treatment point. A reflector was placed on top of the lantern facing down to enhance light intensity. No light was suspended over the control point. Treatment and control points were then left alone for 60 minutes, after which weevils visible on the surface were counted and recorded for both points. One handful of milfoil (top 63 cm only) was collected from both the treatment point and control point. Each sample was placed into a 7.5 L plastic bag with 70% isopropyl alcohol. The 16 sample bags were taken back to the

lab where they were placed into a refrigerator until they were sorted to count the number of weevils in the sample.

*Data Analysis* — Weevils were counted and recorded. A paired, one-tailed, t-test was used for both the bucket collection experiment and the field collection experiment to determine if the number of weevils differed between the treatment (light) and control (no light) field collection points and between the treatment and control buckets ($P \leq 0.05$).

## Results

In the field collection experiment, the number of weevils observed at the treatment points was not significantly higher than the number observed at the control points (Table 1). Weevils were observed on the surface of only one sample point while in the field. The number of weevils counted through laboratory examination did not differ significantly between treatment and the control samples ($P = 0.387$). The number of weevils counted through laboratory examinations did not differ significantly between treatment and control points for either the day experiments ($P=0.384$) or the night experiments ($P=0.500$).

The bucket experiment showed that the 20-minute treatment duration in the field was not long enough for weevils to swim to the top in the bucket experiment. The number of weevils observed for light and dark periods of 20 minutes was not significantly different ($P = 0.106$). However, when the time was extended to 30 minutes or more, the efficacy rate was 100% (Table 2, Figure 2).

## Discussion

Weevils' attraction to light in this study agreed with the findings of Reeves et al. 2008 that weevils were attracted to light. The bucket experiment clearly demonstrated the potential for

rapidly extracting weevils using light, however results were best in a dark lab room with treatment time of 30 minutes or more, rather than in the field with 20-minute treatment. Although the field collection experiments did not show a significant difference between treatment and control samples, the experiment may be improved by increasing the intensity and duration of the light. It is inconclusive whether daytime weevil collections could be effective, but experimentation with a brighter light and longer treatment time may improve that experiment as well. We will be pursuing this idea in 2011. If the field collection method can be proven to attract weevils, pairing it with the bucket extraction method could provide an easy and cheap way to collect weevils for use in biological control programs.

## Acknowledgments

This study was part of a region-wide aquatic invasive species program coordinated by Golden Sands Resource Conservation & Development Council, Inc., and funded by an Aquatic Invasive Species Grant (#AEPP-249-10) from the Wisconsin Department of Natural Resources. Technical assistance came from Paul Skawinski, Regional AIS Education Specialist, Golden Sands RC&D Council, Inc. Scott Caven, AIS Technician with Golden Sands RC&D Council, Inc., assisted with the collecting of the specimens.

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by the Phytophagous Aquatic Specialist *Euhrychiopsis lecontei* Dietz (Coleoptera: Curculionidae). Journal of Insect Behavior 22: 54-64.

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TABLE 1— Number of weevils observed (Observed) in the field and counted (Counted) in laboratory examination of Eurasian watermilfoil samples pulled from treatment and control points in McDill Pond, Wisconsin, in 2010. Treatment points had a 15W compact fluorescent light applied as an attractant for a duration of 60 minutes. Control points had no light applied.

| | | Treatment (1 hr) | | Control (1 hr) | |
|---|---|---|---|---|---|
| Point | Day or Night | Observed | Counted | Observed | Counted |
| 1 | Day | 0 | 5 | 0 | 0 |
| 2 | Day | 0 | 0 | 0 | 1 |
| 3 | Day | 3 | 1 | 0 | 3 |
| 4 | Night | 0 | 3 | 0 | 1 |
| 5 | Night | 0 | 0 | 0 | 2 |
| 6 | Night | 0 | 3 | 0 | 2 |
| 7 | Day | 0 | 2 | 0 | 2 |
| 8 | Night | 0 | 1 | 0 | 2 |

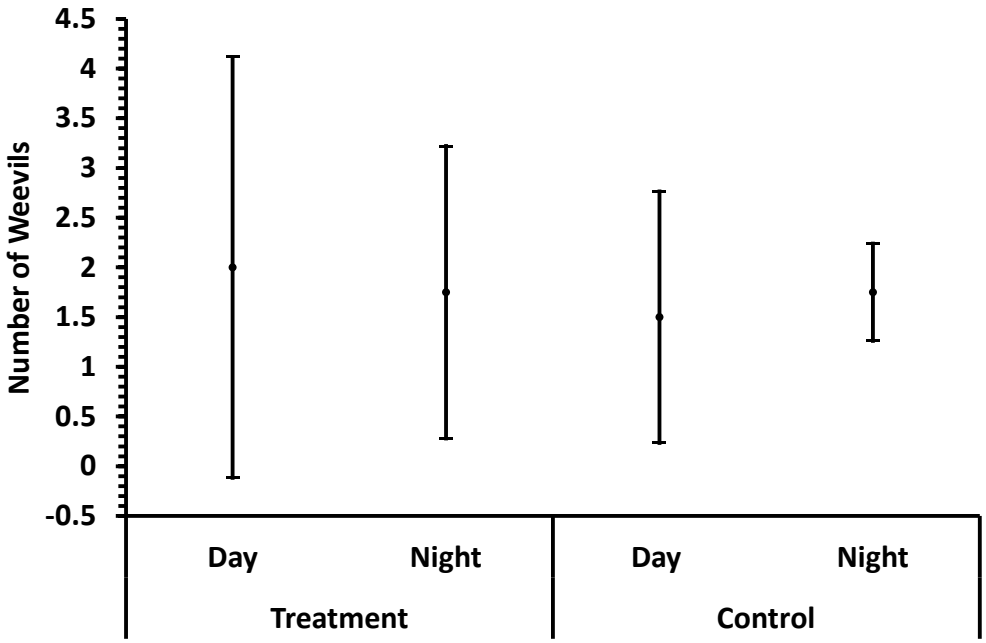


FIGURE 1— Number of weevils counted in laboratory examination of Eurasian watermilfoil samples pulled from treatment points and control points McDill Pond, Wisconsin, in 2010. Treatment points had a 15W compact fluorescent light applied as an attractant for a duration of 60 minutes. Control points had no light applied. Four experiments were conducted during the day and four experiments were conducted at night to determine whether light attraction could be equally effective during the day as it was at night.

TABLE 2— Number of weevils observed in three samples of Eurasian watermilfoil pulled from McDill Pond, Wisconsin, in 2010. Samples were placed in buckets and observed first under control conditions (dark) and then under treatment conditions (light). Flashlights were affixed through bucket lids for 30 minutes or more to attract weevils to surface. Laboratory examination of milfoil samples confirmed the total number of weevils present in each sample to assess the total number of weevils present in the sample.

| | Weevils | | |
|---|---|---|---|
| Point | Control | Treatment | Laboratory Verification |
| 1 | 0 | 3 | 3 |
| 2 | 1 | 5 | 5 |
| 3 | 0 | 2 | 2 |

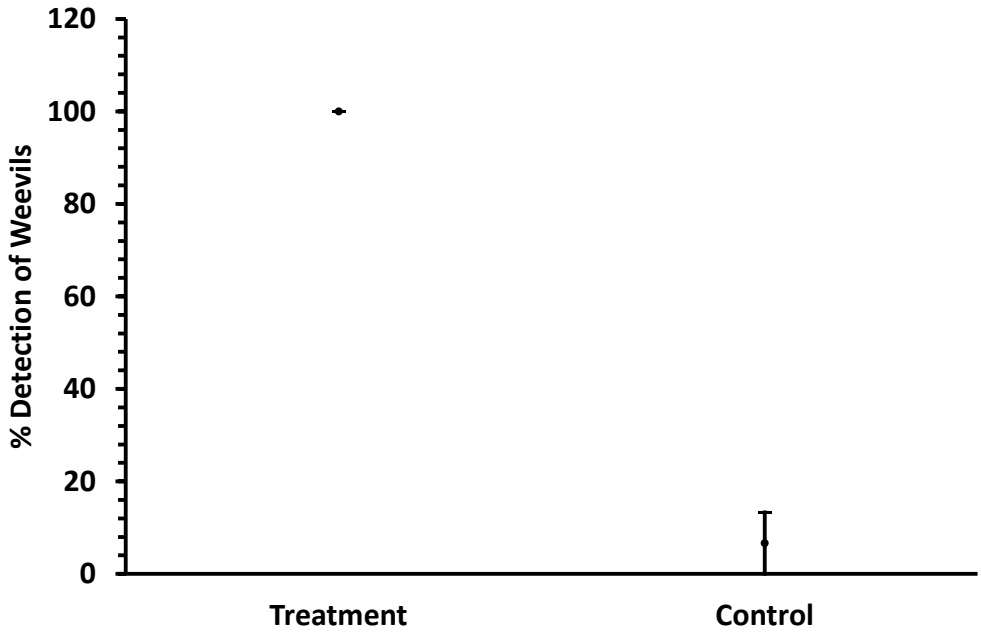


FIGURE 2— Percent detection of weevils in three samples of Eurasian watermilfoil pulled from McDill Pond, Wisconsin, in 2010. Samples were placed in buckets and observed first under control conditions (dark) and then under treatment conditions (light). Flashlights were affixed through bucket lids for 30 minutes or more to attract weevils to surface. Laboratory examination of milfoil samples confirmed the total number of weevils present in each sample to assess what percent of the weevils present had been attracted to the light.

# Light attraction for collecting milfoil weevils (*Euhrychiopsis lecontei*) on Eurasian Watermilfoil (*Myriophyllum spicatum*)

2011

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**Abstract**

The objective of this study was to determine if collection of the milfoil weevil, *Euhrychiopsis lecontei*, a biological control agent of Eurasian watermilfoil, was more efficient using light as an attractant than without. We conducted the experiment in the field using the application of an artificial light source as the treatment, and no light source as the control. Field collections did not produce enough weevils to evaluate the treatment with statistical tests. This experiment should be repeated in milfoil beds more heavily populated with weevils.

## Introduction

The exotic aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*), was introduced to the United States in the 1940's (Couch and Nelson 1986), and is now found in 45 states and four Canadian provinces (USDA, NRCS 2010). Eurasian watermilfoil reproduces vegetatively by fragmentation (Nichols 1975). Many control methods have been used to suppress Eurasian watermilfoil, including mechanical and chemical control, though such removal is only a short-time solution and requires repeated application (Crowell et al. 1994, Getsinger et al. 1997, Parsons et al. 2001).

An optional control method that shows potential is biological control by a native weevil, *Euhrychiopsis lecontei* (Sheldon and Creed 1995, Newman 2004). The native weevil co-evolved with native milfoils, but demonstrates a preference for Eurasian watermilfoil among weevils reared on Eurasian watermilfoil (Solarz and Newman 1996). A study in Minnesota documented suppressed recovery of Eurasian watermilfoil due to extensive weevil damage (Newman and Biesboer 2000).

Weevils use both chemical cues (Marko et al. 2005) and sight to identify Eurasian watermilfoil, and have been determined to be attracted to light (Reeves et al. 2008). In Reeves et al.'s (2008) experiment, weevils climbed plants towards laboratory lights, which was thought to be how they would use sun as a directional cue to climb upward on plants. Our experiments in 2010 confirmed that weevils are attracted to light, and can be drawn to a flashlight for rapid collection from milfoil plants placed in a dark container.

Our objective for this study was to determine if capture of weevils from a milfoil bed was more efficient using light as an attractant than without a light. Currently, milfoil weevils are collected for rearing and stocking operations by hand-picking them off plants, either by waders,

snorkelers, or divers. Weevils that are collected from plants are then reared in laboratories to be sold for control of Eurasian watermilfoil. We expected to find that light would attract the weevils to the milfoil at the water surface, and thereby increase percentages of weevils collected from milfoil samples at the Treatment Site.

## Methods

*Study areas* — Lake Joanis, located in Portage County, Wisconsin, is a 23-acre man-made lake with a maximum depth of 25 feet. The bottom of the lake is made up of primarily sand and fine gravel, with a little silt. Fish species that can be found in the lake include bluegill sunfish (*Lepomis macrochirus)* black crappie (*Pomoxis nigromaculatus)* largemouth bass (*Micropterus salmoides*) and northern pike (*Esox lucius*). Eurasian watermilfoil was found in the lake in 2003. A low, natural population of weevils is known to be present, and 23,000 weevils were artificially stocked to the lake between 2008 and 2009.

Our second area of study was Springville Pond, located in portage county, Wisconsin. It is an 18 acre impoundment of the Little Plover River, with a maximum depth of 12 ft. The bottom of the lake is primarily sand with a layer of overlying silt however some parts are sand with overlying muck. The fish species found in this body of water include those listed above in Lake Joanis, but also include brown trout (*Salmo trutta)* and smallmouth bass (*Micropterus dolomieu)*. Weevils have been recorded to be naturally occurring here at levels well above the statewide average 0.65 weevils/stem.

Our study was conducted during four nights between 08/08/11-08/16/11 in a dense milfoil bed on the east side of Lake Joanis where weevil damage to milfoil stems was evident,

and a moderately-dense milfoil bed in Springville Pond where naturally-abundant weevil populations have been historically recorded.

*Study Design* — Each evening before dusk, between the hours of 6:30 and 8pm, a Treatment Site was set up by floating a buoyant light contraption with an 18-inch, 15-watt black light 3 inches above the surface of water surface over a Eurasian watermilfoil bed. The light fixture had a square glass plate below it and a tin shielding above it. This protected the light from water and focused the light downward onto the milfoil. The light apparatus was attached to a kayak using bungee cords and shock cord. The light contraption was tied in both the front and back near where the anchors were tied to minimize drifting with a Resolute® 23-amp, 200 minute, marine deep cycle battery inside as a power source. The kayak was anchored both in front and back to minimize or eliminate any drifting that may occur overnight. The control site for each test site was an adjacent patch of milfoil that was deemed dense enough to support weevils, but also far enough from the test site to be unaffected by the light. The control site was marked using an anchored buoy. Control and Treatment equipment were left in place overnight, undisturbed. Just before dawn the following morning, while it was still dark, a canoe was used to quietly reach the sample site, disturbing the Treatment and Control Sites as little as possible. At the Treatment Site, the collector quietly reached one hand down under the light as deep into the water as possible without upsetting the canoe, grabbed as many milfoil stems as possible with that one hand, and pulled them to the surface. The stems were then placed into a resealable bag with some of the water from the water body. This sampling process was repeated at the Control Site immediately after the Treatment Site was sampled. Samples were kept refrigerated until extraction and examination in the laboratory.

To extract the weevils from the samples, the samples were transferred into a 3.8-liter Rubbermaid bin and filled them with enough water to cover the milfoil. Next the bin was placed into a 68-liter, navy, Rubbermaid Roughneck storage tub with a hole in top through which we suspended a Mag-lite® 6-cell flash light. We then affixed the light into place 4 cm above the water surface using duct tape and adjusted the focal point to be a concentrated beam on the water surface. The lid was kept shut for 20-25 minutes to attract the weevils towards the light so extracting them would be simplified. If there were any insects present in the sample we used an eyedropper to remove them from the sample then placed them in 70% isopropyl alcohol. Since this light extraction method is new (developed during our 2010 study), we confirmed that all weevils were successfully extracted and none were remaining in the sample by inspecting the stems in a 9-in by 13-in glass pan of water on a light table, using 3X magnifying goggles.

## Results

During this experiment no weevils were collected therefore no statistical analyses are available.

## Discussion

It is inconclusive whether it is more effective to collect weevils after a night of light treatment. However modifications on location of the study may improve the quality of data we recorded. Lake Joanis has a relatively low weevil population, which likely had a factor in the lack of weevils found. The second sample area, Springville Pond, has historically had weevil population densities in various milfoil beds ranging from 0-4.4 weevils/stem. However a recent decline in the milfoil population appears to have lead to a reduction in weevil density resulting in zero weevils captured. A future study at a site known to contain an abundant population of

weevils and a high density of milfoil may lead to improved data collection and therefore more conclusive results.

## Acknowledgments

This study was part of the Regional Aquatic Invasive Species program coordinated by Golden Sands Resource Conservation & Development Council, Inc., and funded by an Aquatic Invasive Species Grant (#AEPP-249-10) from the Wisconsin Department of Natural Resources. Technical assistance and laboratory work came from Amy Thorstenson, Regional AIS Coordinator, Golden Sands RC&D Council, Inc. Lead field work came from Samual Betterly, AIS LTE, Golden Sands RC&D. Lance Grenzow, Kathleen Johnson, and Matthew Teske, aided in the field data collection.

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**Appendix C**

Compatibility study of the native weevils

*Phytobius leucogaster* and *Euhrychiopsis lecontei*

**Compatibility study of the native weevils**

***Phytobius leucogaster* and *Euhrychiopsis lecontei***

2012

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## Introduction

The exotic aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*), was introduced to the United States in the 1940's (Couch and Nelson 1986), and is now found in 45 states and four Canadian provinces (USDA, NRCS 2012). *M. spicatum* reproduces vegetatively by rhizomes and fragmentation (Reed 1977). Many control methods have been used to suppress *M. spicatum*, including mechanical and chemical removal, though such removal is only a short-time solution and requires repeated application (Crowell et al. 1994, Getsinger et al. 1997, Parsons et al. 2001). An optional control method that shows potential is biological control by a native weevil, *Euhrychiopsis lecontei* (Sheldon and Creed 1995, Newman 2004). The native weevil originally fed on northern watermilfoil (*Myriophyllum sibiricum*), but demonstrates a preference for *M. spicatum* among weevils reared on Eurasian watermilfoil (Solarz and Newman 1996). A study in Minnesota documented suppressed recovery of *M. spicatum* due to extensive weevil damage (Newman and Biesboer 2000). However, artificial stocking of *E. lecontei* populations has shown mixed results (Reeves et al. 2008). Our study investigated the potential for pairing two herbivorous weevils, *E. lecontei* and *Phytobius leucogaster*, together to potentially increase the potency of biological control of *M. spicatum*.

*E. lecontei* females lay their eggs on the meristems of milfoil plants (Sheldon & O'Bryan 1996, Sheldon & Jones 2001). Larvae emerge, eat the meristem, then bore down into the stem and mine the stem. They may mine approximately 15 cm of stem tissue during this stage of the life cycle (Mazzei et al. 1999). They then move farther down the stem (0.5 to 1 m from the meristem) before boring into the stem to form a

pupal chamber (Mazzei et al. 1999). These feeding behaviors are damaging to the health and vigor of *M. spicatum* in several ways: It is damaging to the vascular tissue (Newman et al. 1996) and release cellular gases, which reduces stem buoyancy and cause the plant to sink below the water surface (Creed et al. 1992). Larval stem-mining also reduces the transfer of nutrients and carbohydrates from leaves to stems to roots (Newman et al.1996). Larvae create openings for secondary infections by pathogens and deposit frass in the stem, which may promote those infections (Creed 2000).

Another natural pest of *M. spicatum* is *Phytobius leucogaster* (= *Litodactylus leucogaster*), which has been shown to cause extensive damage to flower spikes in laboratory conditions (Buckingham and Bennett 1981), but which has questionable value as a stand-alone biocontrol agent (Buckingham et al 1981, Van Driesche et al. 2002). Adults can live only a short time under water (8-15 hours), therefore the females will lay eggs on emersed flower spikes (on ovaries or flower buds), and rarely on submersed ones (Buckingham and Bennett 1981). Larvae emerge and initially feed on the interior of the bud, then feed on the exterior of the bud, and finally encircle the stem while feeding on the flowers (Buckingham and Bennett 1981). The pupal cocoon is formed about 3-13 cm below the flower spike and has holes in it to allow air exchange, without which, the pupa dies (Buckingham and Bennett 1981). Adults feed on emersed flower spikes and do some feeding on leaves below the water surface, but this is occasional (Buckingham and Bennett 1981). In all life stages, feeding and development below the water surface is occasional, if ever (Buckingham and Bennett 1981), indicating the importance of emersed flower spikes in the ecology of *P. leucogaster*.

Integrated biological control (the use of multiple biological agents at the same

time) is not new. Purple loosestrife (Lythrum salicaria) is controlled with two leaf-eating beetles (*Galluracella pusillus* and *G. calmariensis*) and a root mining weevil (*Hylobius transversovittatus*) (WI DNR). Exploring the potential of integrated biological control agents for *M. spicatum*, Shearer (2009) found that the endophytic fungus *Mycoleptodiscus terrestris* was only detrimental to Eurasian watermilfoil when the plant was stressed, and suggested that milfoils weevil may be useful in stressing the plant.

Our objective was to explore the compatibility of *P. leucogaster* and *E. lecontei* for integrated biological control by evaluating the feeding behaviors and reproductive success co-existing on the same *M. spicatum* stems.

## Methods

*Study Design* — Milfoil stems with *P. leucogaster* and *E. lecontei* were collected from Springville Pond, an 18-acre impoundment of the Little Plover River, and McDill Pond, a 261-acre impoundment of the Plover River, both located in Portage County, WI. *P. leucogaster* was collected in the pupal stage, since pupal cocoons of *P. leucogaster* are easy to positively identify. *E. lecontei* was collected in various life stages. Both ponds were known to *P. leucogaster* present, and abundant populations of *E. lecontei*. Milfoil stems were placed in a re-sealable plastic bag with pond water. Stems were handled gently to avoid breaking pupal cocoons or larval tunnels open. Bags of milfoil stems were placed in a bucket filled with lake water to keep weevils cool for transportation back to the laboratory.

Laboratory and rearing work was performed in the greenhouse at the College of Natural Resources, University of Wisconsin-Stevens Point. Milfoil stems were

examined immediately upon arriving at the laboratory, to avoid unduly stressing the weevils. Stems were floated in dechlorinated water in 9-inch by 13-inch glass pans. Pans were placed over a light table and examined with the aid of 3x OptiVisor® glass binocular magnifiers. The assistance of a 30x Carson Magniscope ™ was used for identification of specimens when needed. Weevils were counted on each stem and tallied by species and life stage.

Weevil-bearing stems were bundled together, bound to a clean rock with a rubber band, and placed into 10-gallon aquarium filled with room temperature dechlorinated water. A maximum of eight weevils were introduced to each tank and recorded. The tank stocking plan is shown in Table 1.

For each tank stocked with weevils, 15 healthy milfoil stems were rinsed with dechlorinated water, bundled to a clean rock with a rubber band, and placed into the tank next to the weevil-bearing stems to feed the weevils. An aquarium thermometer was hung in the tank and the tanks were then netted with no-see-um mesh netting.

Tanks were monitored semi-daily to observe and record stem damage, record temperatures (monitored with aquarium thermometers), and top off tanks with low water or that were warmer than 80.6 F. After 21 days, the milfoil stems in each tank were removed, placed into a re-sealable plastic bag, preserved with 70% isopropyl alcohol, labeled, and refrigerated until laboratory examination. Stems were later examined (methods as stated above) to record the number of weevils of each species, as well as observations of feeding damage and the location of that damage on the stem.

*Data Analysis* — Weevils were counted and recorded. Return rates were calculated by dividing the number of weevils produced (by species) divided by the number of weevils originally introduced (by species) to the tank.

## Results

A total of 44 *E. lecontei* and 16 *P. leucogaster* were collected and stocked to the tanks; 4 Treatment Tanks (*E. lecontei* and *P. leucogaster*) and 4 Control Tanks (*E. lecontei*), Due to an insufficient quantity of *P. leucogaster*, no Control Tanks for *P. leucogaster* were established. A total of 163 *E. lecontei* and 6 *P. leucogaster* were produced. Average return rate for *E. lecontei* overall was 4.0 weevils produced per weevil stocked. Average return rate for *P. leucogaster* was 0.38 weevils produced per weevil stocked (negative production). In Control Tanks, where *E. lecontei* was the sole species, return rate was 2.9 weevils produced per weevil stocked. In Treatment Tanks where both species were stocked together, *E. lecontei* average return rate was 5.1 weevil produced per weevil stocked, compared to an average return rate of 0.38 for *P. leucogaster*.

Stem inspections of *E. lecontei* Control Tanks showed stem damage indicative of *E. lecontei* herbivory on an average of 64% of milfoil stems per tank. Inspections of Treatment Tanks showed stem damage indicative of *E. lecontei* herbivory on an average of 41% of stems per tank, and damage indicative of *P. leucogaster* herbivory on an average of 7% of stems per tank.

Observed feeding damage indicative of *E. lecontei* corroborated existing literature, and included stem mining, including the center vein, and pupal chambers in

the center of the stem, with no exterior bulging. Observed feeding damage indicative of P. *leucogaster* also corroborated existing literature, and included stem mining on exterior tissues, not center vein, mining/chewing of flowers, and pupal cocoons like bulging "warts" made from shallow excavations of stem tissue. Feeding damage from the two species was not observed to occur on the same stem.

## Discussion

*P. leucogaster* may be useful in integrated biological control, but will likely be difficult to artificially stock, and would represent a riskier investment in artificial stocking because:

1) We found them difficult to collect and rear.
2) They are capable of flight and will likely appear on their own when conditions are favorable.

*P. leucogaster* proved difficult to collect in sufficient numbers. (No control tanks could be stocked.) The few we could collect for treatment tanks appeared to have a lower productivity rate and higher mortality rate than *E. lecontei*, possibly due to *P. leucogaster*'s low tolerance for prolonged submersion. Transferring of weevils from lake to aquarium may have resulted in longer submersion and more stress than *P. leucogaster* can tolerate; an ideal candidate for artificial stocking would be easy to collect and have high productivity in captive conditions. Stem may also have become submerged in the treatment tanks, due to reduced stem buoyancy caused by *E. lecontei* feeding damage.

The feeding behaviors of these two weevils appear to be incompatible as *simultaneous* biological control: We did not see evidence of the two species co-existing

on the same stems, and *E. lecontei* feeding damage reduces stem buoyancy and flower production, which would make conditions unfavorable for *P. leucogaster*. *P. leucogaster* does not, however, make conditions unfavorable for *E. lecontei*. Therefore, in the scenario of *sequential* biological control, where *E. lecontei* follows *P. leucogaster*, the weevils may be compatible: at peak flowering, *P. leucogaster* moves in and begins impacting *M. spicatum* flowering structures, then moves on to better habitat as *E. lecontei* populations boom and create unfavorable conditions for *P. leucogaster*. While this scenario may occur naturally, it would be difficult to artificially induce, due to the difficulty of artificial rearing of *P. leucogaster* and the risky investment of stocking insects that may fly away from the target location.

*P. leucogaster* lives on emersed flower spikes, and therefore is capable of flight all season long. This is in contrast to *E. lecontei*, which spends is capable of flight in spring just long enough to migrate from shore to the lake, and then its flight muscles atrophy and it spends all summer submersed. Because *E. lecontei* is incapable of flight during the summer, it would need to be transported and artificially stocked to new milfoil beds where it is needed. *P. leucogaster*, being capable of flight, is likely to appear on its own when conditions are right (abundant emersed flower spikes).

While artificial rearing and stocking of *P. leucogaster* may be difficult and likely unnecessary, *P. leucogaster* is naturally occurring and may appear at sites where *M. spicatum* is abundant and flowering. It is recommended that lake managers learn to discern between *P. leucogaster* and *E. lecontei* for monitoring purposes, and understand that:

1) *P. leucogaster* does damage *M. spicatum* flowers, but is not likely to

provide insufficient control on its own,

2) The presence of *P. leucogaster* does not create unfavorable conditions for *E. lecontei*.

## Acknowledgments

This study was part of the Regional Aquatic Invasive Species Program coordinated by Golden Sands Resource Conservation & Development Council, Inc., and funded by an Aquatic Invasive Species Grant (#AEPP-249-10) from the Wisconsin Department of Natural Resources. Technical assistance came from Paul Skawinski, Regional AIS Education Specialist, Golden Sands RC&D Council, Inc. Scott Caven, AIS Technician with Golden Sands RC&D Council, Inc., assisted with the collecting of the specimens.

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TABLE 1— Tank stocking plan; Treatment tanks and Control tanks.

| **Tank type** | # of Tanks To Fill | *E. lecontei* Added | *P. leucogaster* Added | Clean Food Stems Added |
|---|---|---|---|---|
| **Treatment** (Combo) | 4 | 4 | 4 | 15 |
| **Control I** (*P. leucogaster*) | 4* | 0 | 7 | 15 |
| **Control II** (*E. lecontei*) | 4* | 7 | 0 | 15 |
| Total Needed | 12 | 44 | 44 | 45 |

TABLE 2— Tank stocking records.

Waterbody of origin: **Spring Slough, McDill Pond**

Rearing Location: UWSP Greenhouse

| Tank # | Date IN | Date OUT | # Days in Tank | Shade Cloth | # Weevil stems in | # Healthy stems in | Number introduced | | Number Extracted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | E. lecontei | | | | | Phytobius | | | | |
| | | | | | | | E. lecontei | Phytobius | egg | larv | pupa | adult | TOTAL | egg | larv | pupa | adult | TOTAL |
| **E1** | 7/12/10 | 8/2/10 | 20 | Y | 7 | 15 | 7 | 0 | 1 | 2 | 10 | 4 | 17 | | | | | |
| **E2** | 7/12/10 | 8/2/10 | 20 | Y | 7 | 15 | 7 | 0 | 8 | 9 | 2 | 4 | 23 | | | | | |
| **E3** | 7/12/10 | 8/4/10 | 22 | Y | 7 | 15 | 7 | 0 | 12 | 3 | 2 | 5 | 22 | | | | | |
| **E4** | 7/12/10 | 8/4/10 | 22 | Y | 7 | 15 | 7 | 0 | | | | | 20 | | | | | |
| **T1** | 7/12/10 | 8/6/10 | 24 | Y | 7 | 15 | 4 | 4 | | | | | 3 | | | | | 0 |
| **T2** | 7/12/10 | 8/6/10 | 24 | Y | 7 | 15 | 4 | 4 | | | | | 1 | | | | | 0 |
| **T3** | 7/12/10 | 8/6/10 | 24 | Y | 7 | 15 | 4 | 4 | | | | | 29 | | | | | 0 |
| **T4** | 7/16/10 | 8/2/10 | 19 | Y | 8 | 15 | 4 | 4 | 13 | 20 | 12 | 3 | 48 | 1 | 4 | 1 | 0 | 6 |

Notes: Food stems inspected for health and vigor, with no magnification.
Were not inspected for other (predator or competitor) insects.

TABLE 2 (CONT'D) — Tank stocking records.

Waterbody of origin: **Spring Slough, McDill Pond**

Rearing Location: UWSP Greenhouse

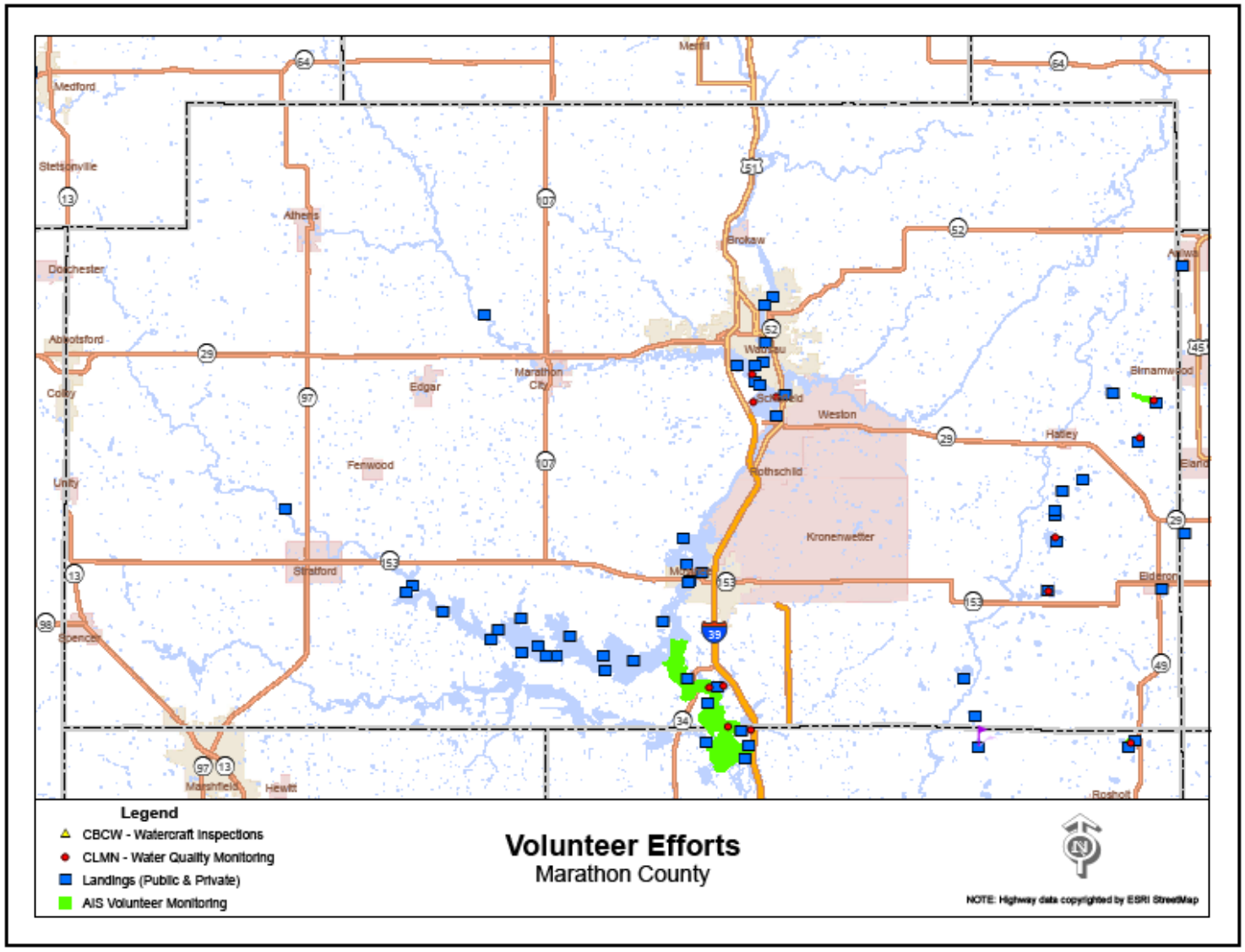
| Tank # | # Damaged Stems | | Damage co-occurring? | Observations |
|---|---|---|---|---|
| | E. lecontei | Phytobius | | |
| **E1** | 14 | | N/A | 1 spent egg. Egg & pupa sites lim'd. 1 pupa 2" behind flower. several mayfly addults & juv, aphids, caddis flies |
| **E2** | 11 | | N/A | waterstriders, mayflies, dragon fly, larv, aphids |
| **E3** | 15 | | N/A | mayflies, chew marks (Phyt?) below 1 flr |
| **E4** | 15 | | N/A | 4 mosquitos, 69 mayflies, 2 damsel, 1 dragon, 2 feeding holes below flrs |
| **T1** | 7 | | N/A | 72 mayflies, 2 dragon,, 2 acentria, 1 tricho, 3 mosquito |
| **T2** | 7 | 1 | N/A | Phytobius dmg was on a frag. So not co-occurring. 223 mayflies, 1 acentria, 2 damsel, 2 mosquitos |
| **T3** | 8 | 3 | no | 1 E. lecontei had markings like Phyt., but 7th eletrya not raised. 1 bagus. 2 dead phytob. pupa. 223 mayflies, 1 mosq, 40 aphid, 7 acentria, 9 chirono, 1 strider, 3 trich, 1 dragon, 1 damsel |
| **T4** | 15 | 2 | no | 2 adult phytobius stocked 7/19, 3 phyt stocked 7/23, 1 looked questionable. mayflies, mites. 1 phytob. Looks dead, 1 larv on outside of flr. 1 spent egg on flr, & 1 dead, deflated pupal wart = the ones introduced. Larv fouind outside flr stalk @ base of stalk = larv from spent egg? Adjacent stem burrowed, pinhole chewed @ base of stalk. 3 larv found mining exterior tissues, not vein, 1" down from dmg'd flr. 1 egg found on flr. 1 wart w/ dead phyt. & chewed/burrowed flr above. |

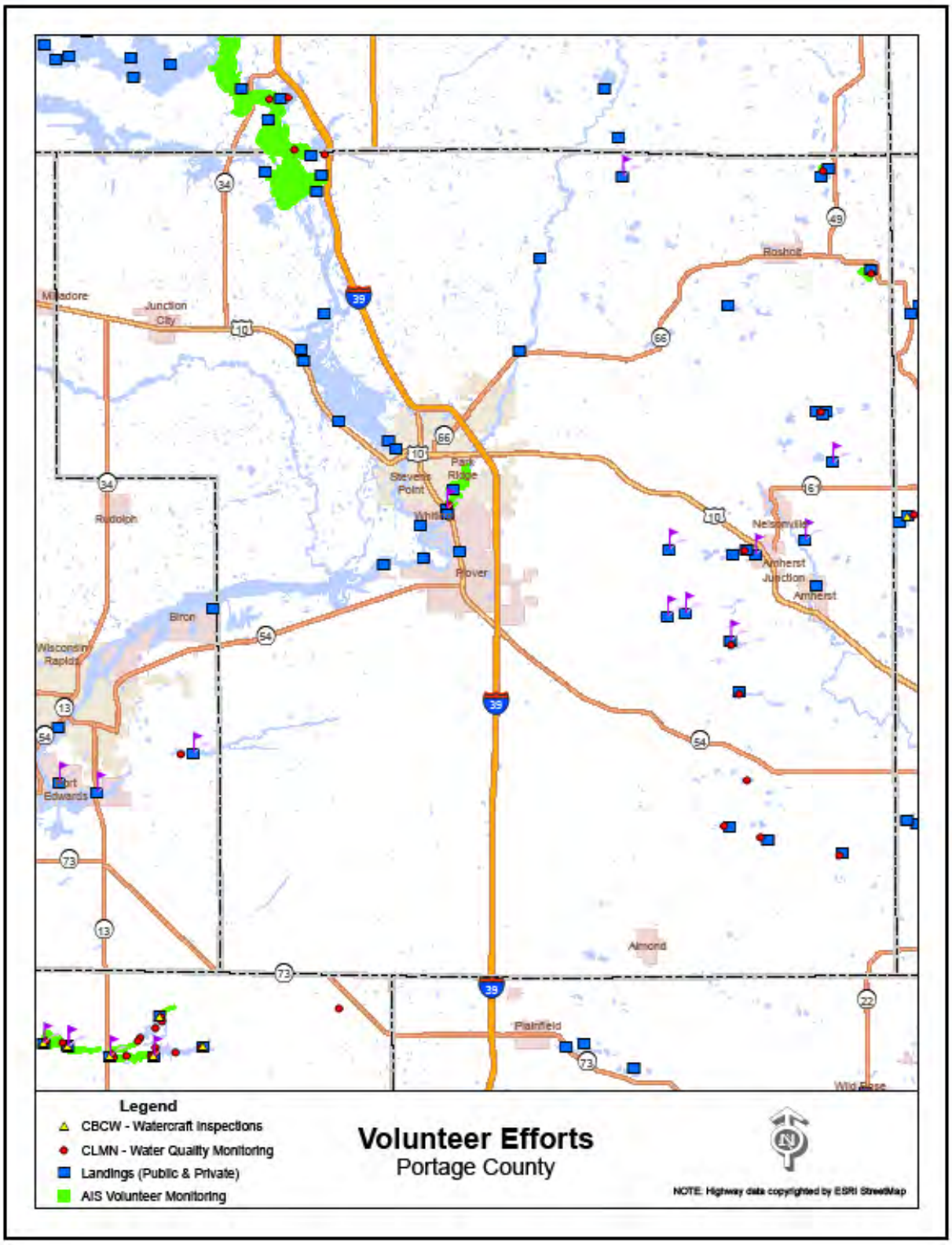
Notes: Food stems inspected for health and vigor, with no magnification.
Were not inspected for other (predator or competitor) insects.

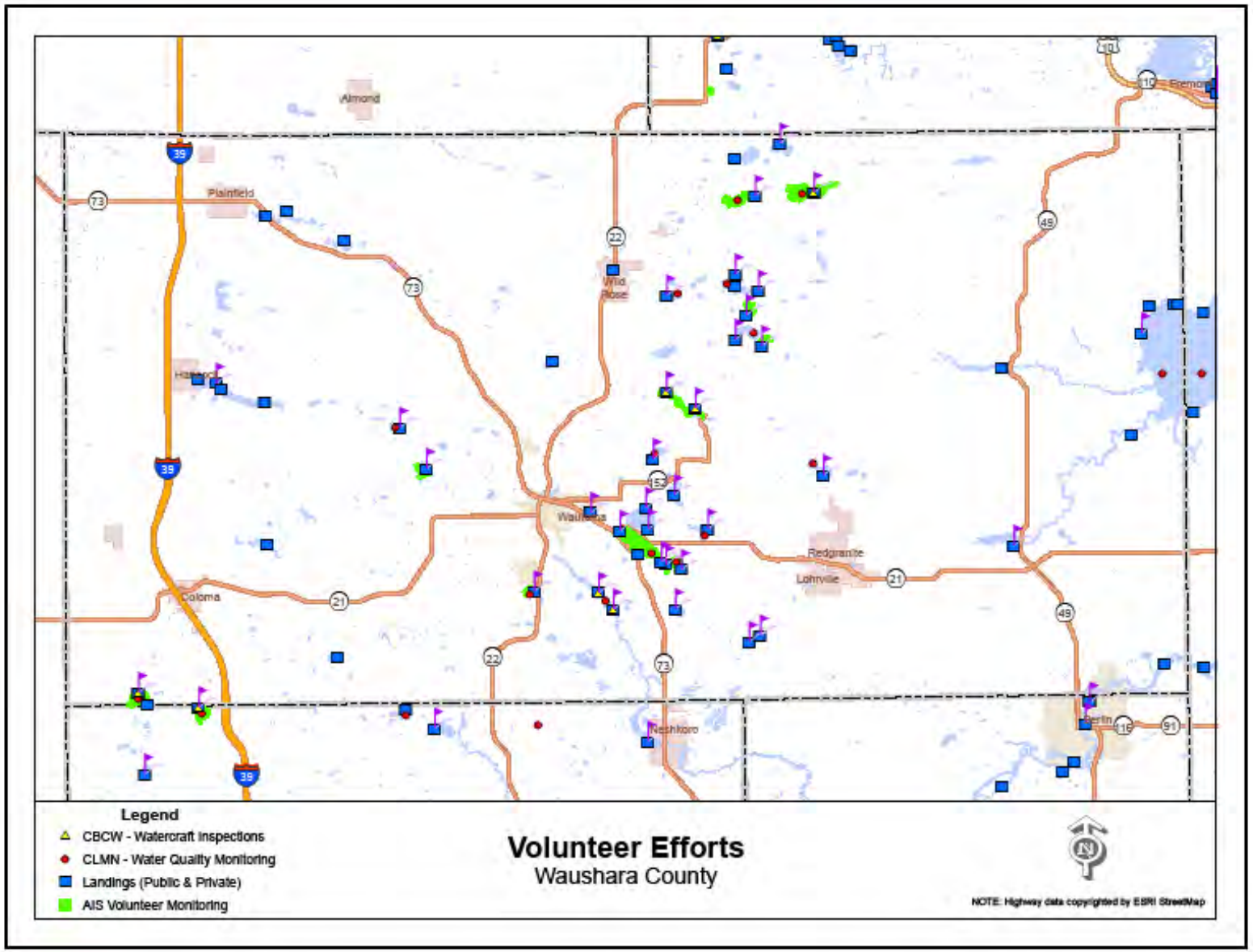
## Appendix D

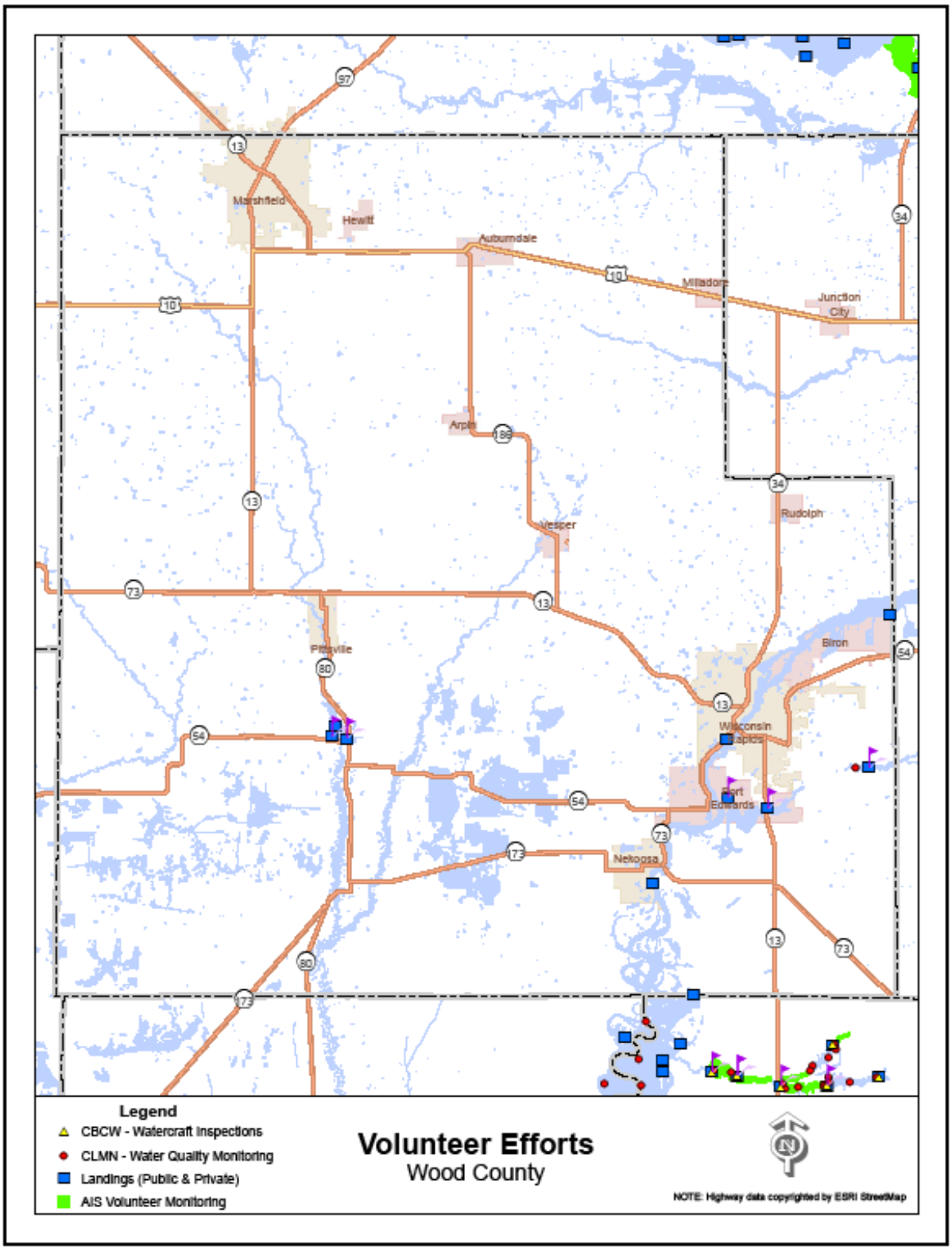
Quad County AIS Inventory

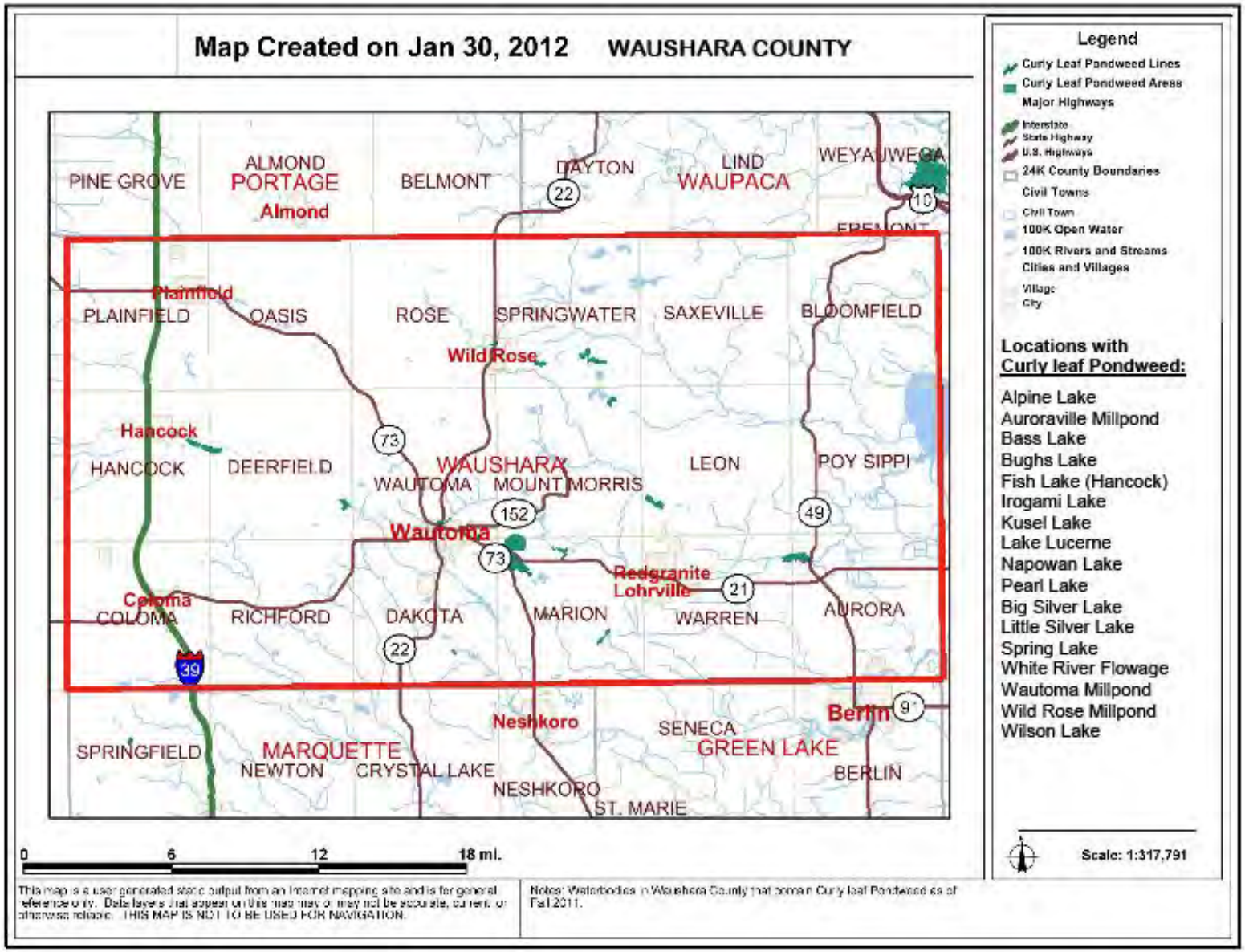
(Maps extracted from Surface Water Data Viewer)

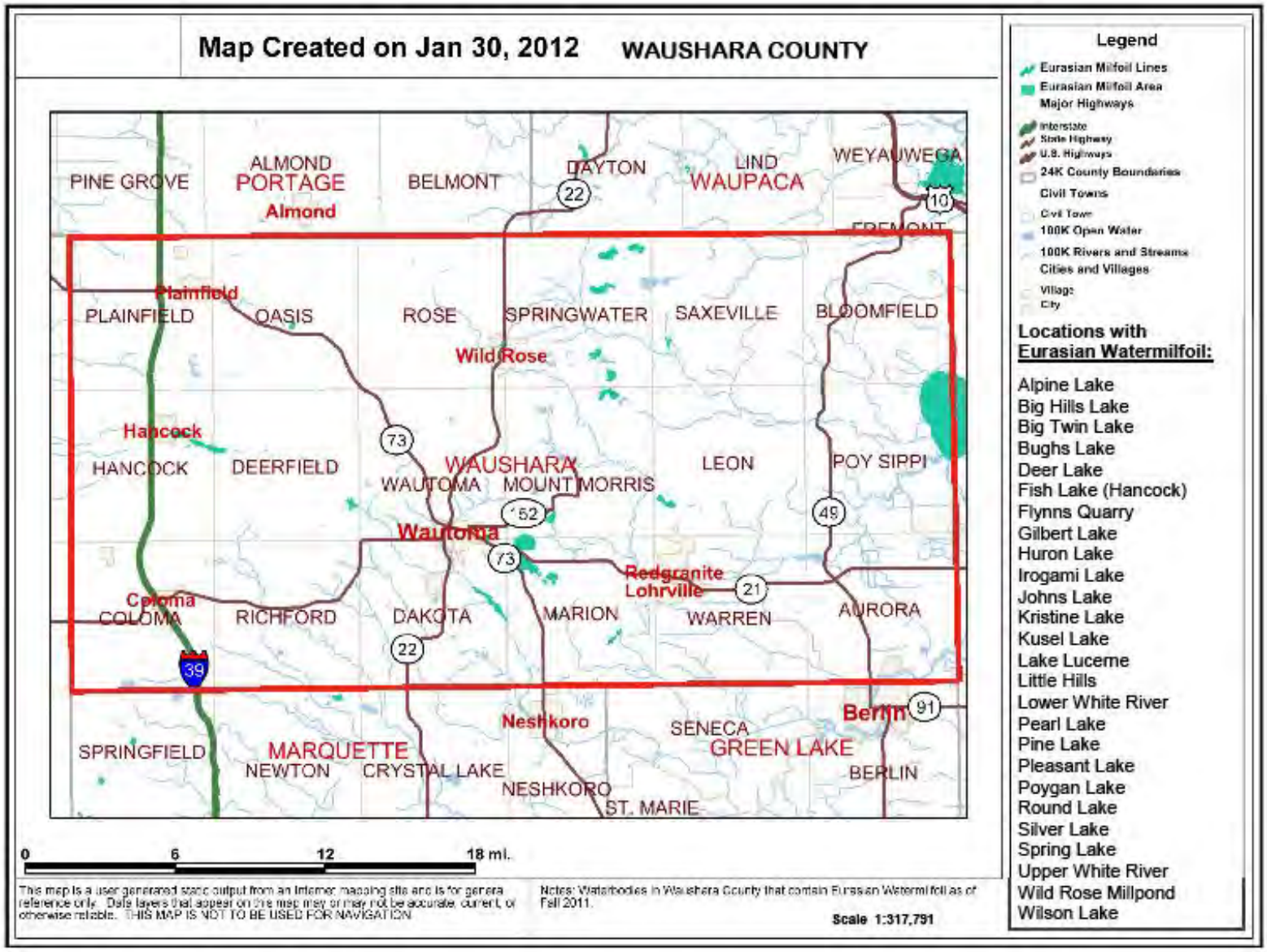

Legend
CBCW - Watercraft Inspections
CLMN - Water Quality Monitoring
Landings (Public & Private)
AIS Volunteer Monitoring
Volunteer Efforts
Marathon County
NOTE: Highway data copyrighted by ESRI StreetMap
Medford
Stetsonville
Athens
Merrill
Brokaw
Dorchester
Abbotsford
Colby
Edgar
Marathon City
Wausau
Weston
Hatley
Birnamwood
Elderon
Rothschild
Kronenwetter
Fenwood
Unity
Stratford
Spencer
Marshfield
Hewitt
Rosholt


Legend
CBCW - Watercraft inspections
CLMN - Water Quality Monitoring
Landings (Public & Private)
AIS Volunteer Monitoring
Volunteer Efforts
Portage County
NOTE: Highway data copyrighted by ESRI StreetMap
Junction City
Rudolph
Stevens Point
Plover
Nelsonville
Amherst Junction
Amherst
Wisconsin Rapids
Almond
Plainfield


Almond
Plainfield
Wild Rose
Waushara
Redgranite
Lohrville
Coloma
Neshkoro
Berlin
Legend
CBCW - Watercraft Inspections
CLMN - Water Quality Monitoring
Landings (Public & Private)
AIS Volunteer Monitoring
Volunteer Efforts
Waushara County
NOTE: Highway data copyrighted by ESRI StreetMap


Marshfield
Hewitt
Auburndale
Vesper
Rudolph
Pittsville
Nekoosa
Legend
CBCW - Watercraft Inspections
CLMN - Water Quality Monitoring
Landings (Public & Private)
AIS Volunteer Monitoring
Volunteer Efforts
Wood County
NOTE: Highway data copyrighted by ESRI StreetMap


Map Created on Jan 30, 2012
WAUSHARA COUNTY
PINE GROVE
ALMOND
PORTAGE
Almond
BELMONT
DAYTON
LIND
WAUPACA
WEYAUWEGA
Plainfield
PLAINFIELD
OASIS
ROSE
SPRINGWATER
SAXEVILLE
BLOOMFIELD
Wild Rose
Hancock
HANCOCK
DEERFIELD
WAUSHARA
WAUTOMA
MOUNT MORRIS
LEON
POY SIPPI
Wautoma
Redgranite
Lohrville
Coloma
COLOMA
RICHFORD
DAKOTA
MARION
WARREN
AURORA
SPRINGFIELD
MARQUETTE
NEWTON
CRYSTAL LAKE
Neshkoro
NESHKORO
ST. MARIE
SENECA
GREEN LAKE
Berlin
BERLIN
0
6
12
18 mi.
Legend
Curly Leaf Pondweed Lines
Curly Leaf Pondweed Areas
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
100K Open Water
100K Rivers and Streams
Cities and Villages
Village
City
Locations with
Curly leaf Pondweed:
Alpine Lake
Auroraville Millpond
Bass Lake
Bughs Lake
Fish Lake (Hancock)
Irogami Lake
Kusel Lake
Lake Lucerne
Napowan Lake
Pearl Lake
Big Silver Lake
Little Silver Lake
Spring Lake
White River Flowage
Wautoma Millpond
Wild Rose Millpond
Wilson Lake
Scale: 1:317,791
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Notes: Waterbodies in Waushara County that contain Curly leaf Pondweed as of Fall 2011.


Map Created on Jan 30, 2012
WAUSHARA COUNTY
PINE GROVE
ALMOND
PORTAGE
Almond
BELMONT
DAYTON
LIND
WAUPACA
WEYAUWEGA
FREMONT
Plainfield
PLAINFIELD
OASIS
ROSE
SPRINGWATER
SAXEVILLE
BLOOMFIELD
Wild Rose
Hancock
HANCOCK
DEERFIELD
WAUSHARA
WAUTOMA
MOUNT MORRIS
LEON
POY SIPPI
Wautoma
Redgranite
Lohrville
Coloma
COLOMA
RICHFORD
DAKOTA
MARION
WARREN
AURORA
Neshkoro
Berlin
SENECA
GREEN LAKE
SPRINGFIELD
MARQUETTE
NEWTON
CRYSTAL LAKE
NESHKORO
ST. MARIE
BERLIN
22
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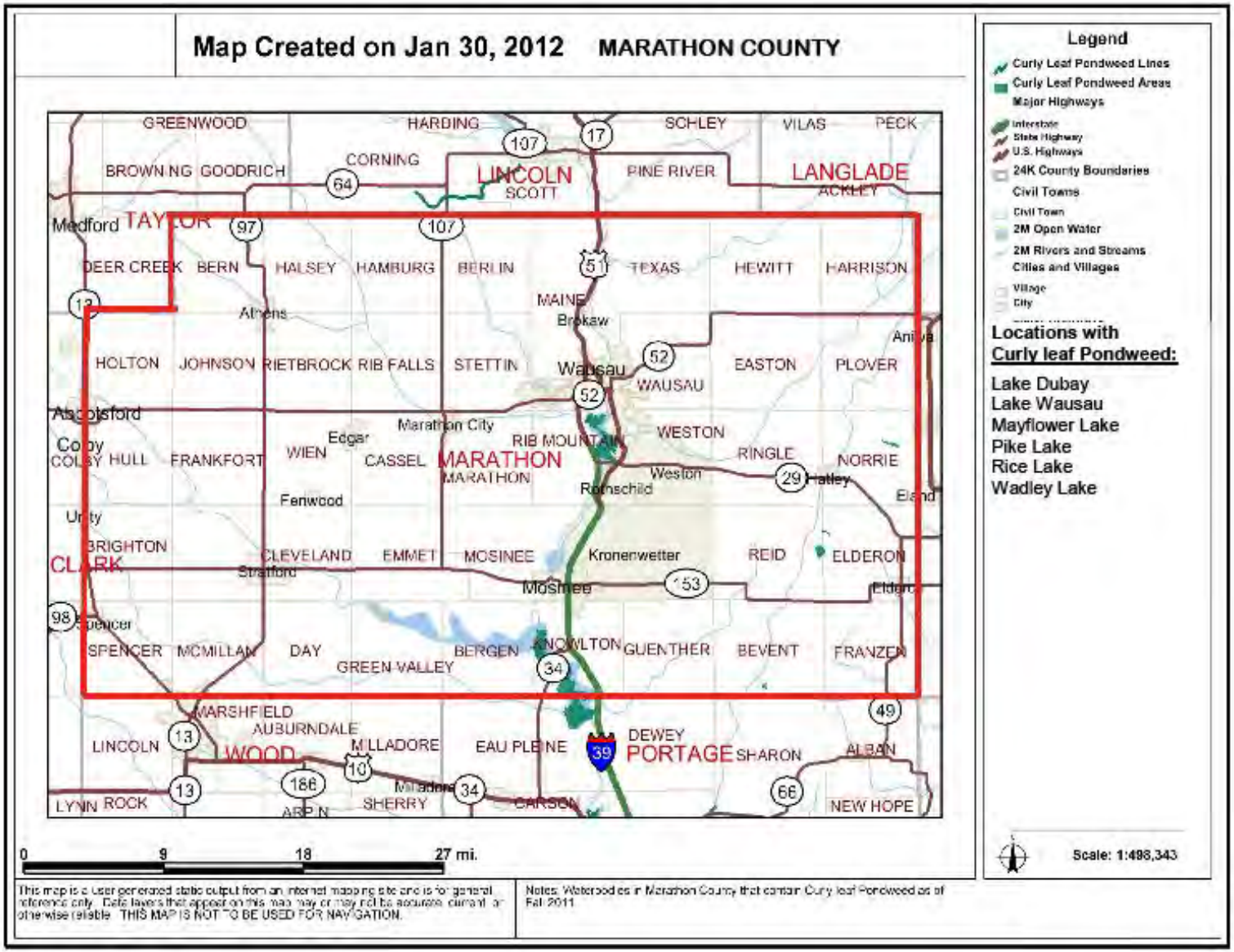
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION
Notes: Waterbodies in Waushara County that contain Eurasian Watermilfoil as of Fall 2011.
Scale 1:317,791
Legend
Eurasian Milfoil Lines
Eurasian Milfoil Area
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
100K Open Water
100K Rivers and Streams
Cities and Villages
Village
City
Locations with Eurasian Watermilfoil:
Alpine Lake
Big Hills Lake
Big Twin Lake
Bughs Lake
Deer Lake
Fish Lake (Hancock)
Flynns Quarry
Gilbert Lake
Huron Lake
Irogami Lake
Johns Lake
Kristine Lake
Kusel Lake
Lake Lucerne
Little Hills
Lower White River
Pearl Lake
Pine Lake
Pleasant Lake
Poygan Lake
Round Lake
Silver Lake
Spring Lake
Upper White River
Wild Rose Millpond
Wilson Lake


Map Created on Jan 30, 2012 MARATHON COUNTY
GREENWOOD
HARDING
SCHLEY
VILAS
PECK
BROWNING GOODRICH
CORNING
LINCOLN
SCOTT
PINE RIVER
LANGLADE
ACKLEY
Medford
TAYLOR
DEER CREEK
BERN
HALSEY
HAMBURG
BERLIN
TEXAS
HEWITT
HARRISON
Athens
MAINE
Brokaw
HOLTON
JOHNSON
RIETBROCK
RIB FALLS
STETTIN
Wausau
WAUSAU
EASTON
PLOVER
Abbotsford
Marathon City
Edgar
WESTON
Colby
COLBY
HULL
FRANKFORT
WIEN
CASSEL
MARATHON
RIB MOUNTAIN
RINGLE
NORRIE
Weston
Rothschild
Hatley
Fenwood
Unity
BRIGHTON
CLARK
CLEVELAND
EMMET
MOSINEE
Kronenwetter
REID
ELDERON
Stratford
Mosinee
Spencer
SPENCER
MCMILLAN
DAY
GREEN VALLEY
BERGEN
KNOWLTON
GUENTHER
BEVENT
FRANZEN
MARSHFIELD
AUBURNDALE
LINCOLN
WOOD
MILLADORE
EAU PLEINE
DEWEY
PORTAGE
SHARON
ALBAN
LYNN
ROCK
SHERRY
CARSON
NEW HOPE
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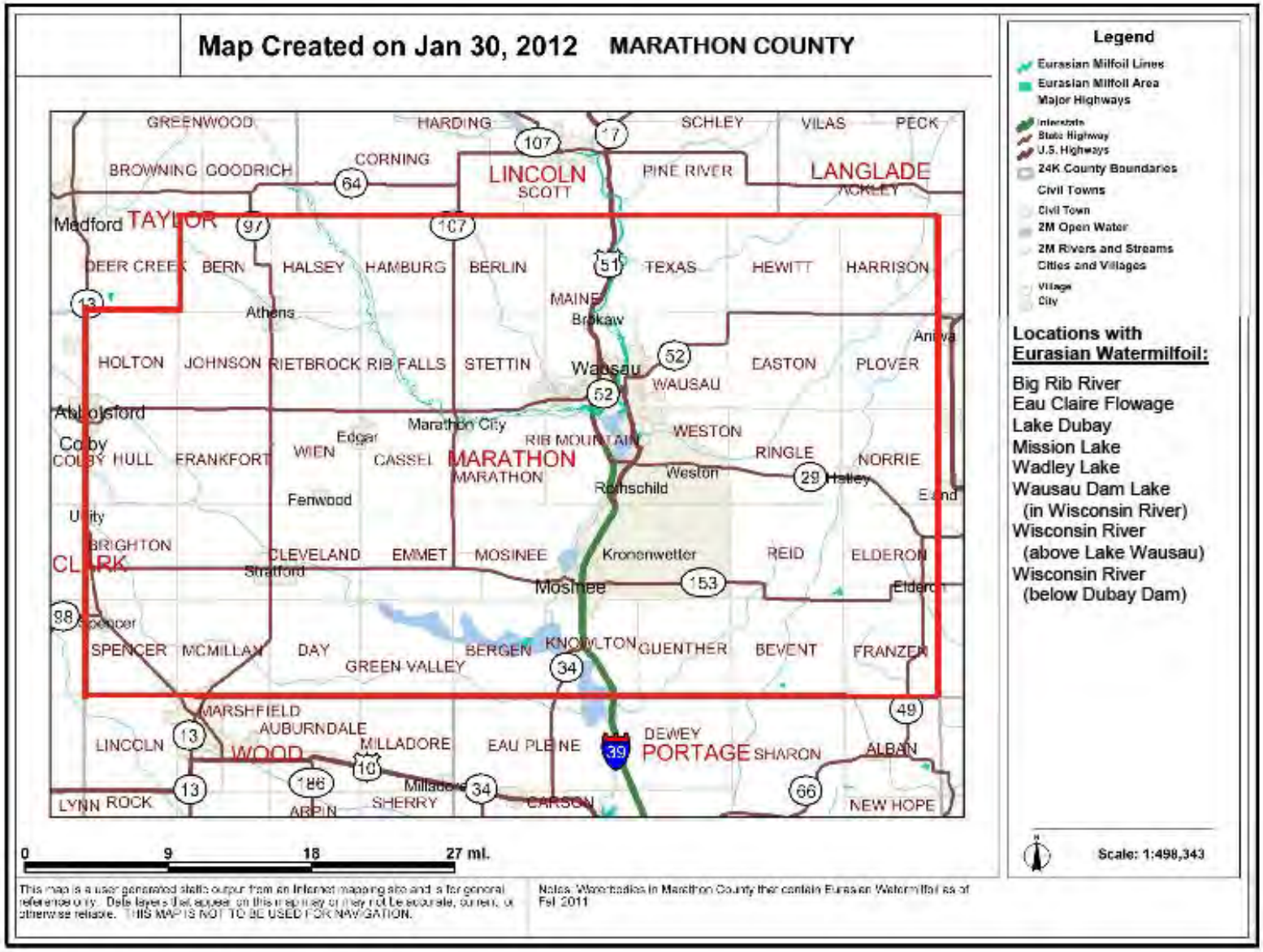
Legend
Curly Leaf Pondweed Lines
Curly Leaf Pondweed Areas
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
2M Open Water
2M Rivers and Streams
Cities and Villages
Village
City
Locations with
Curly leaf Pondweed:
Lake Dubay
Lake Wausau
Mayflower Lake
Pike Lake
Rice Lake
Wadley Lake
Scale: 1:498,343
This map is a user generated static output from an internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Notes: Waterbodies in Marathon County that contain Curly leaf Pondweed as of Fall 2011


Map Created on Jan 30, 2012 MARATHON COUNTY
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HARDING
SCHLEY
VILAS
PECK
BROWNING
GOODRICH
CORNING
LINCOLN
SCOTT
PINE RIVER
LANGLADE
ACKLEY
Medford
TAYLOR
DEER CREEK
BERN
HALSEY
HAMBURG
BERLIN
TEXAS
HEWITT
HARRISON
Athens
MAINE
Brokaw
Antigo
HOLTON
JOHNSON
RIETBROCK
RIB FALLS
STETTIN
Wausau
WAUSAU
EASTON
PLOVER
Abbotsford
Colby
COLBY
HULL
FRANKFORT
WIEN
Edgar
CASSEL
Marathon City
MARATHON
RIB MOUNTAIN
WESTON
RINGLE
NORRIE
Rothschild
Weston
Hatley
Eland
Fenwood
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MOSINEE
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REID
ELDERON
Stratford
Mosinee
Elderon
Spencer
SPENCER
MCMILLAN
DAY
GREEN VALLEY
BERGEN
KNOWLTON
GUENTHER
BEVENT
FRANZEN
MARSHFIELD
AUBURNDALE
LINCOLN
WOOD
MILLADORE
EAU PLEINE
DEWEY
PORTAGE
SHARON
ALBAN
Milladore
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ROCK
ARPIN
SHERRY
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Eurasian Milfoil Lines
Eurasian Milfoil Area
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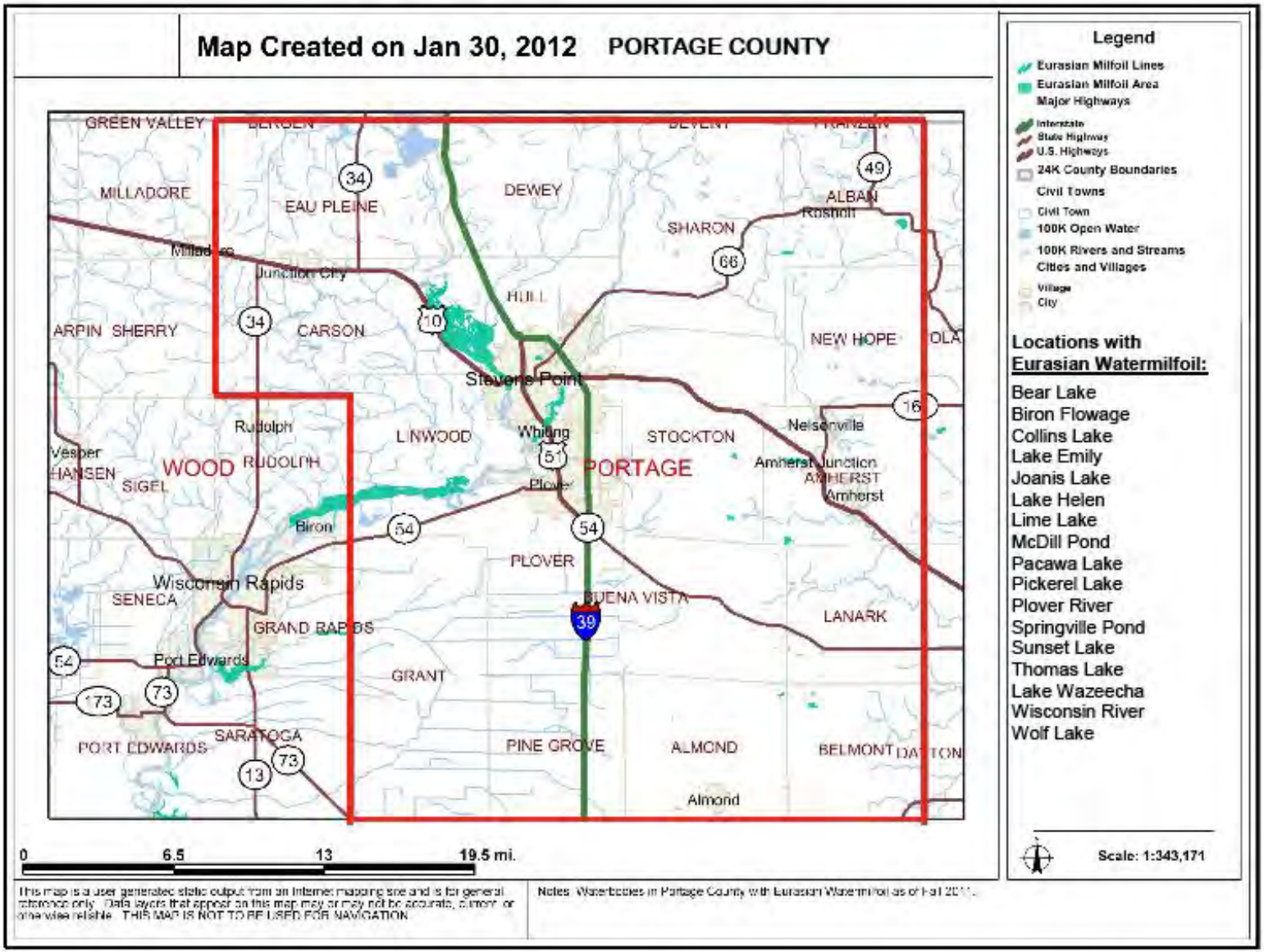
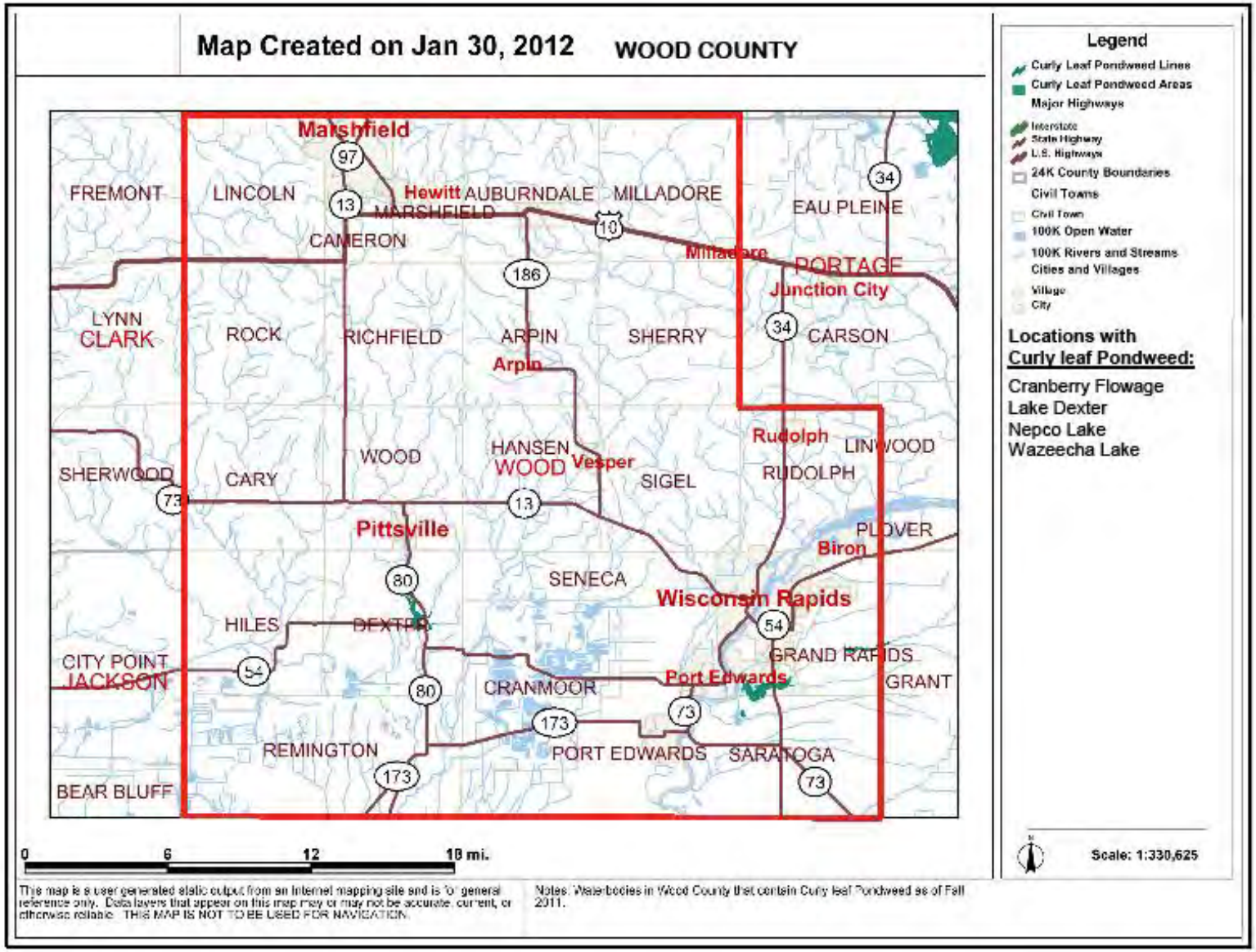
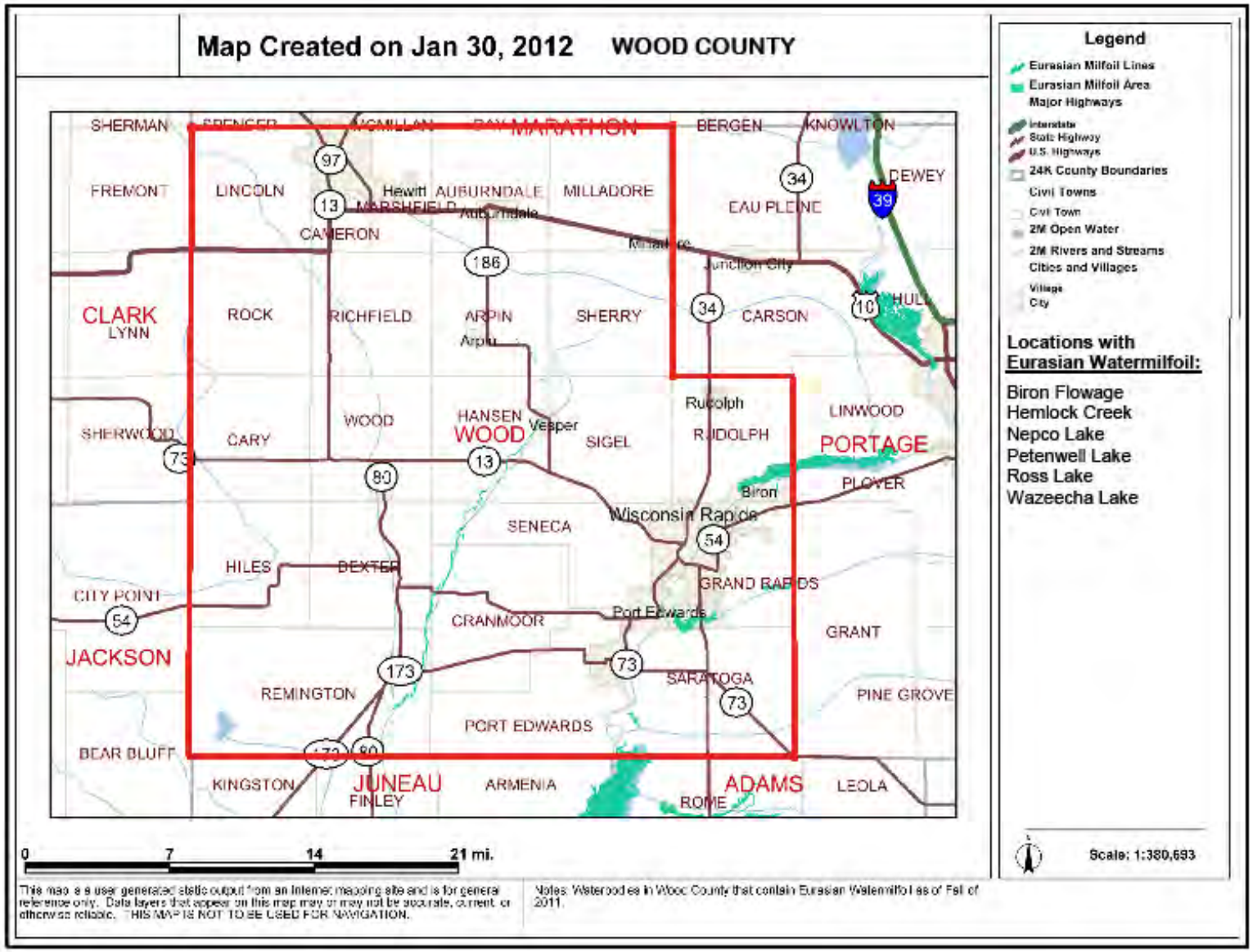
Civil Town
2M Open Water
2M Rivers and Streams
Cities and Villages
Village
City
Locations with Eurasian Watermilfoil:
Big Rib River
Eau Claire Flowage
Lake Dubay
Mission Lake
Wadley Lake
Wausau Dam Lake
(in Wisconsin River)
Wisconsin River
(above Lake Wausau)
Wisconsin River
(below Dubay Dam)
Scale: 1:498,343
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Notes: Waterbodies in Marathon County that contain Eurasian Watermilfoil as of Fall 2011


Map Created on Jan 30, 2012 PORTAGE COUNTY
GREEN VALLEY
MILLADORE
EAU PLEINE
DEWEY
ALBAN
SHARON
Junction City
HULL
ARPIN SHERRY
CARSON
NEW HOPE
Stevens Point
Rudolph
LINWOOD
Whiting
STOCKTON
Nelsonville
Vesper
HANSEN
SIGEL
WOOD
RUDOLPH
PORTAGE
Amherst Junction
AMHERST
Amherst
Plover
Biron
PLOVER
Wisconsin Rapids
SENECA
BUENA VISTA
LANARK
GRAND RAPIDS
Port Edwards
GRANT
SARATOGA
PORT EDWARDS
PINE GROVE
ALMOND
BELMONT
Almond
0
6.5
13
19.5 mi.
Legend
Eurasian Milfoil Lines
Eurasian Milfoil Area
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
100K Open Water
100K Rivers and Streams
Cities and Villages
Village
City
Locations with
Eurasian Watermilfoil:
Bear Lake
Biron Flowage
Collins Lake
Lake Emily
Joanis Lake
Lake Helen
Lime Lake
McDill Pond
Pacawa Lake
Pickerel Lake
Plover River
Springville Pond
Sunset Lake
Thomas Lake
Lake Wazeecha
Wisconsin River
Wolf Lake
Scale: 1:343,171
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION
Notes: Waterbodies in Portage County with Eurasian Watermilfoil as of Fall 2011.


Map Created on Jan 30, 2012
WOOD COUNTY
Marshfield
Hewitt
AUBURNDALE
MILLADORE
EAU PLEINE
MARSHFIELD
CAMERON
Milladore
PORTAGE
Junction City
FREMONT
LINCOLN
LYNN
CLARK
ROCK
RICHFIELD
ARPIN
SHERRY
CARSON
Arpin
Rudolph
LINWOOD
HANSEN
WOOD
Vesper
WOOD
SHERWOOD
CARY
SIGEL
RUDOLPH
Pittsville
PLOVER
Biron
SENECA
Wisconsin Rapids
HILES
DEXTER
GRAND RAPIDS
CITY POINT
JACKSON
Port Edwards
GRANT
CRANMOOR
REMINGTON
PORT EDWARDS
SARATOGA
BEAR BLUFF
0
6
12
18 mi.
Legend
Curly Leaf Pondweed Lines
Curly Leaf Pondweed Areas
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
100K Open Water
100K Rivers and Streams
Cities and Villages
Village
City
Locations with
Curly leaf Pondweed:
Cranberry Flowage
Lake Dexter
Nepco Lake
Wazeecha Lake
Scale: 1:330,625
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Notes: Waterbodies in Wood County that contain Curly leaf Pondweed as of Fall 2011.


Map Created on Jan 30, 2012
WOOD COUNTY
SHERMAN
MARATHON
BERGEN
KNOWLTON
FREMONT
LINCOLN
Hewitt
AUBURNDALE
MILLADORE
DEWEY
MARSHFIELD
EAU PLEINE
CAMERON
Junction City
CLARK
LYNN
ROCK
RICHFIELD
ARPIN
SHERRY
CARSON
HULL
Rudolph
LINWOOD
SHERWOOD
CARY
WOOD
HANSEN
WOOD
Vesper
SIGEL
RUDOLPH
PORTAGE
PLOVER
Biron
Wisconsin Rapids
SENECA
HILES
DEXTER
GRAND RAPIDS
CITY POINT
CRANMOOR
Port Edwards
GRANT
JACKSON
SARATOGA
REMINGTON
PINE GROVE
PORT EDWARDS
BEAR BLUFF
KINGSTON
JUNEAU
FINLEY
ARMENIA
ADAMS
ROME
LEOLA
0
7
14
21 mi.
Legend
Eurasian Milfoil Lines
Eurasian Milfoil Area
Major Highways
Interstate
State Highway
U.S. Highways
24K County Boundaries
Civil Towns
Civil Town
2M Open Water
2M Rivers and Streams
Cities and Villages
Village
City
Locations with Eurasian Watermilfoil:
Biron Flowage
Hemlock Creek
Nepco Lake
Petenwell Lake
Ross Lake
Wazeecha Lake
Scale: 1:380,693
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Notes: Waterbodies in Wood County that contain Eurasian Watermilfoil as of Fall of 2011.

**Appendix E**

AIS Web Pages

(www.goldensandsrcd.org*)

*Original AIS web pages from the original RC&D website are attached. The RC&D website was rebuilt and re-released on 3/19/12, and the new AIS pages look somewhat different that what is attached, although the content is similar.

### *AIS main page*



Welcome
Golden Sands RC&D

Home | General Info | Projects | Fundraising | Events | Contact Us | Other Resources

**Regional Aquatic Invasive Species Program**

Golden Sands RC&D is collaborating with several counties in Central Wisconsin to work on the prevention and management of aquatic invasive species on a regionally-coordinated level.

Check for **AIS Workshops** near you.

**Like us on Facebook** and have AIS workshop and volunteer work party opportunities sent directly to your Facebook news feed!

For county-specific AIS information, click on the button below:

Portage County | Marathon County | Waupaca County | Waushara County | Wood County

**Aquatic Invasive Species in Central Wisconsin**

Numerous invasive plants and animals are already present in some of our lakes in Central Wisconsin. Some of the most common species are pictured below.



Eurasian watermilfoil (*Myriophyllum spicatum*)
**Tell me more!**


Curly-leaf pondweed (*Potamogeton crispus*)
**Tell me more!**


Purple loosestrife (*Lythrum salicaria*)
**Tell me more!**

***AIS main page (cont'd)***




Japanese knotweed (*Polygonum cuspidatum*)
**Tell me more!**


Rusty crayfish (*Orconectes rusticus*)
**Tell me more!**


Zebra mussels (*Dreissena polymorpha*)
**Tell me more!**


Banded mystery snail (*Viviparus georgianus*)
**Tell me more!**

### *AIS main page (cont'd)*



Chinese mystery snail (*Bellamya chinensis*)
**Tell me more!**

Home | Anti-discrimination Statement | Contact Us

### *Portage County AIS page*




## Portage County Aquatic Invasive Species

Portage County AIS Plan - Coming soon!

**Upcoming AIS workshops**

**DNR AIS list for Portage County**

**Link** to the Portage County Planning & Zoning Deparment for information on Portage County Lakes, technical assistance with shoreline restoration projects, and information on cost-sharing fund availability.

**Link** to Portage County Parks Department for maps and information on boat launches, parks, and other public access to lakes and rivers.

Home | Anti-discrimination Statement | Contact Us

### *Marathon County AIS page*




## Marathon County Aquatic Invasive Species

**Marathon County AIS Plan**

**Upcoming AIS workshops**

**DNR AIS list for Marathon County**

**Link** to the Marathon County Conservation, Planning & Zoning Deparment for information on Marathon County Lakes, technical assistance with shoreline restoration projects, and information on cost-sharing fund availability.

**Link** to Marathon County Parks Department for maps and information boat launches, parks, and other public access to lakes and rivers.

Home | Anti-discrimination Statement | Contact Us

### *Waushara County AIS page*




## Waushara County Aquatic Invasive Species

**Waushara County AIS Plan**

**Upcoming AIS workshops**

**DNR AIS list for Waushara County**

**Link** to the Waushara County Land Conservation & Zoning Deparment for information on Waushara County lake levels, technical assistance with shoreline restoration projects, and information on cost-sharing fund availability.

**Link** to Waushara County Parks, Recreation, & Solid Waste Department for information on Waushara County Lakes, such as boat launches, parks, and other public access points.

***Waushara County Watershed and Lakes Council*** is a network of lake groups and associations in Waushara County. Connect with them by email at **wcwlc34@gmail.com**, or by mail:

WCWLC
PO Box 634
Wautoma, WI 54982

Home | Anti-discrimination Statement | Contact Us

### *Wood County AIS page*




## Wood County Aquatic Invasive Species

**Wood County AIS Plan**

**Upcoming AIS workshops**

**DNR AIS list for Wood County**

**Link** to the Wood County Land Conservation Deparment for information on technical assistance with shoreline restoration projects, and information on cost-sharing fund availability.

**Link** to Wood County Parks & Forestry Department for information on parks, boat launches, and other public access points to lakes and rivers.

Home | Anti-discrimination Statement | Contact Us

## Appendix F

Marathon County AIS Plan

# Marathon County Aquatic Invasive Species Plan

## A guide for Proactive AIS Management

Paul Skawinski

Eurasian watermilfoil (*Myriophyllum spicatum*) in Mission Lake


**2011**

**By**

Paul Skawinski

Regional AIS Education Specialist

Golden Sands Resource Conservation & Development Council, Inc.

**In partnership with**

Marathon County Conservation, Planning, and Zoning

## *Acknowledgements*

This county-wide aquatic invasive species (AIS) plan was developed using *Aquatic Invasive Species: A Guide to Proactive and Reactive Management, 2006*, written by Carolyn Scholl, Vilas County Land & Water Conservation Department. Thanks to Carolyn for her permission to use her guide in the development on this AIS plan.

Further input was provided by:
Andy Johnson, County Conservationist, Marathon County Conservation, Planning, and Zoning
Shawn Esser, Conservation Specialist, Marathon County Conservation, Planning, and Zoning
Amy Thorstenson, Regional AIS Coordinator, Golden Sands RC&D
Scott Provost, Water Resources Specialist, Wisconsin Department of Natural Resources
Buzz Sorge, Regional Lakes Coordinator, Wisconsin Department of Natural Resources

## *Project Funding*

Funding for this project was made possible by an AIS grant from the WDNR Lakes Grant Program (project AEPP-249-10).

*Table of Contents*

## *Introduction*

Marathon County has twelve public access lakes, many streams, and several large flowages including Lake Wausau, Lake Dubay, Eau Pleine Flowage, and Eau Claire Flowage. There are also many small lakes contained within the Mead Wildlife Area. These lakes are used primarily for waterfowl hunting.

A few of the lakes in Marathon County have established lake associations to help with management of the lakes. Lake districts and lake associations can help to monitor the lakes, disseminate information quickly and efficiently, and create a collaborative effort through hosting meetings and workshops. In 2010, Marathon County Conservation, Planning and Zoning Dept. collaborated with Portage, Wood, and Waushara Counties and Golden Sands Resource Conservation & Development Council, Inc. (RC&D) to acquire grant funding from the Department of Natural Resources (DNR) to support a Regional AIS program.

Through the Regional AIS Coordination Program, information was gathered about the status of AIS infestations in Marathon County, volunteer activity levels, training and education needs, and other information regarding AIS in Marathon County.

The purpose of this AIS plan is to identify short-term and long-term goals toward establishing a coordinated, county-wide approach to protecting Marathon County's lakes.

**This AIS plan is meant to be a dynamic document**, to be updated annually and changed as new goals and challenges are identified.

## *Proactive Management Steps*

It is in the best interest of any citizen organization or community to initiate actions today in order to avoid AIS problems tomorrow. Take a proactive management approach to lake protection. Proactive management activities need not be costly, but they can make a world of difference.

As the old saying goes—an ounce of prevention is worth a pound of cure. The same is true for preventing an invasion of AIS in your favorite lake. If efforts are kept at a "prevention" level, the costs to your group (in time, money, and frustration) will be far lower than the costs involved with dealing with AIS at a "control" level.

*Take action today to avoid AIS problems tomorrow. Be prepared and be proactive!*

## *Step 1: Gather Information about Aquatic Invasive Species*

In Marathon County, aquatic invasive species data was gathered from Wisconsin DNR files. Prior to 2010, very little information was known about the aquatic invasive species distribution in Marathon County. In response to this, visual AIS surveys were completed in 2010 by Paul Skawinski, Golden Sands RC&D. These surveys were conducted from kayaks or a fishing boat, and consisted of a trip around the littoral zone of the lake to look in the water and on the shoreline for the following species:

> Eurasian watermilfoil (*Myriophyllum spicatum*)
> Curly-leaf pondweed (*Potamogeton crispus*)
> Zebra mussels (*Dreissena polymorpha*)
> Rusty crayfish (*Orconectes rusticus*)
> Banded mystery snail (*Viviparus georgianus*)
> Chinese mystery snail (*Bellamya chinensis*)
> Japanese knotweed (*Polygonum cuspidatum*)
> Purple loosestrife (*Lythrum salicaria*)

Early detection of these invasive species is essential to minimize effort and cost associated with management. Established populations of Eurasian watermilfoil or zebra mussels may never be eradicated, even with years of effort. It is impossible to overemphasize the importance of monitoring for aquatic invasive species, whether on a citizen level or local government level.

**Eurasian watermilfoil (*Myriophyllum spicatum*)**

Introduced to Wisconsin in the 1960s as an aquarium plant, this species has quickly spread around the lakes and streams of the state. Small fragments of the plant can produce adventitious roots, and create new plants wherever the wind or currents take them. These fragments can be caused by boats, motors, paddles, large fish, waves, or other sources of disturbance. Eurasian watermilfoil tends to grow earlier in the year than most native plant species, so it tends to shade out the native species. In addition to reducing biodiversity in the ecosystem, EWM also reduces the recreational value of the water body by reducing water flow, increasing temperature, and encouraging stunted fish populations.

Control of EWM is easy and inexpensive if the population is caught early. Hand-removal with a small garden rake, or via snorkeling and hand-pulling by the roots, can be very effective on small populations of EWM. This is why early detection is so crucial for inexpensive management. If the population is allowed to expand for several seasons before it is detected, management options are reduced, and costs rise sharply.

For larger populations, chemical herbicide applications are typically used. 2,4-D formulations are most common, which are most effective in spring or early summer, when the plant is actively growing. As 2,4-D is a systemic herbicide, it requires the plant to be actively growing in order to absorb enough of the chemical to destroy the plant.

Biological control is an emerging option that may hold some promise for naturally controlling EWM without chemicals. *Euhrychiopsis* weevils are aquatic insects that are native to many Wisconsin lakes, and feed on native northern watermilfoil (*Myriophyllum sibiricum*). The adult weevils feed on the leaves and stems of the plant, while the larvae bore into the stem and feed on the vascular tissues within. These activities often stress the plants enough to kill them, or at least prevent flowering. More research is needed on this topic before it will be employed on a widespread basis.

There are seven native watermilfoils in Wisconsin, and at least four of those occur in Marathon County lakes (*Myriophyllum sibiricum*, *M. verticillatum*, *M. tenellum*, and *M. farwellii*). Only two of those are likely to be confused with EWM.

Paul Skawinski

*Eurasian watermilfoil*

Northern watermilfoil (*Myriophyllum sibiricum*) typically has whitish stems, whorled leaves with 12 or fewer pairs of leaflets, and a fairly rigid growth form. EWM has pinkish stems, whorled leaves with more than 12 pairs of leaflets, and a very limp growth form. Whorled watermilfoil (*Myriophyllum verticillatum*) typically has dark green to brown stems, tightly-packed whorls of leaves, and highly divided floral bracts above the water late in the season.

**Curly-leaf pondweed (*Potamogeton crispus*)**

Curly-leaf pondweed (CLP) arrived in Wisconsin as early as the late 1800s, brought here as an aquarium plant, and possibly introduced accidentally during stocking of the common carp (*Cyprinus carpio*). CLP is still occasionally sold by some internet-based aquarium supply stores.

CLP has a non-typical life cycle, growing to peak biomass in mid-June. At this time, the foliage dies back to the rhizome, and all of the nutrients in the plant tissues are released into the water column. This nutrient release often results in an algae bloom, sometimes containing blue-green algae (cyanobacteria) like *Microcystis*. Blue-green algae release a neurotoxin that can harm humans and pets that come in contact with the water.

CLP spreads by rhizomes, seeds, and turions, which makes it very difficult to control. Turions are known to remain viable for more than five years, so herbicide applications need to be re-applied for at least five consecutive years to deplete the storage of turions in the substrate. Harvesting of CLP can be done in May, before turion production occurs. This can remove the biomass of the CLP and possibly prevent turion and seed accumulation for that season.

Paul Skawinski

*Curly-leaf pondweed leaf*

There are over thirty species of pondweeds (*Potamogeton* spp.) in Wisconsin, and two of them are commonly confused with CLP. Clasping-leaf pondweed (*Potamogeton richardsonii*) has wavy leaves with a smooth margin. Fern pondweed (*Potamogeton robbinsii*) may have very fine serrations on the leaf margins, but the leaves are typically straight, and the plant tends to be dark green to brown. CLP has very wavy leaves with serrations on the margins.

**Zebra mussels (*Dreissena polymorpha*)**

Zebra mussels are small mollusks that are native to the Black and Caspian Seas of western Asia. They are filter-feeders, straining tiny plankton out of the water column, and therefore remove the base of the aquatic food web. Large zooplankton and small fishes depend on this same food source, so Dreissenid mussels like zebra mussels and the related quagga mussel (*Dreissena rostriformis*) can have detrimental effects on fish populations in affected lakes.

Paul Skawinski

*Zebra mussel shell (actual size)*

Control of zebra mussels is very difficult and expensive. Power plants and other near-shore businesses often pipe water out of large lakes and rivers to cool their machinery, and these pipes can quickly become clogged with zebra mussels, causing reduced flow and reduced cooling ability. These businesses often inject low doses of chlorine into the pipes to kill the mussels, or they shut off the pumps and send divers into the pipes to manually scrape the walls clean. There is currently no good option to remove zebra mussels on a large scale. A biological control option using a bacterium is currently being researched and evaluated, so this could become an option in the future if it is deemed safe and effective.

Zebra mussels and quagga mussels are usually less than one inch long, with white and black striping across the shell. Zebra mussels tend to be D-shaped, while quaggas are more rounded on both the dorsal and ventral sides. A simple test to differentiate the two species is to stand the entire closed shell on its side–if it can remain standing, it is a zebra mussel. If it falls over, it is a quagga mussel.

**Rusty crayfish (*Orconectes rusticus*)**

Native to the Ohio River Basin, rusty crayfish were probably introduced here as fishing bait. Rusty crayfish prefer well-oxygenated, flowing water with a rocky substrate for shelter. They are omnivorous, feeding on everything from fish eggs to invertebrates to aquatic plants. When native crayfish are present in the same ecosystem, rusty crayfish will often kill them or simply push them out of the prime habitats, making the native crayfish more susceptible to predation, or less likely to have adequate resources for survival. Rusty crayfish are easily recognized by the rust-colored spot on each side of their carapace ("shell").

Paul Skawinski

*Rusty crayfish*

Trapping rusty crayfish can have a localized reduction effect, but nearby crayfish populations in the same body of water are likely to immigrate to the trapping area soon after efforts cease. Natural predation of rusty crayfish occurs by otters, shorebirds, turtles, large fish, raccoons, and other creatures. Despite substantial natural predation, the rusty crayfish's high reproductive rate and tendency to hide under large rocks enable it to easily establish large populations in many waters.

**Chinese mystery snail (*Bellamya chinensis*) and Banded mystery snail (*Viviparus georgianus*)**

Chinese mystery snails were brought to the United States in the late 1800s as a food source of oriental markets. Both snails have also been sold as algae-eating pets for water gardens, aquaria, and backyard ponds. A likely method of introduction to the natural environment is through this ornamental trade vector.

Little research has been done on the impact of these snails. Both banded and Chinese mystery snails are known to compete with native snail populations for resources, and may cause decreases in native snail diversity or abundance. Large die-offs have been observed, which can cause foul-smelling messes along shorelines.

*Above: Banded mystery snail*
*Right: Chinese mystery snail*

Control of mystery snails is currently limited to manual removal with small hand tools. Mystery snails have a tough operculum at the opening of the shell, which is able to create a watertight seal. If a chemical pesticide is applied, the mystery snails can close up their shells and wait for the toxic substance to dissipate. Most native snails do not have this ability, and will be subjected to the chemical.

Chinese mystery snails can grow up to nearly 7cm tall (2.9 inches), which is larger than any of our native snail species. They are typically dark brown, and may have several vertical ridges on the shell near the opening.

Banded mystery snails are commonly about 2cm long, with dark brown bands running horizontally along the shell.

Unlike most snails, which lay gelatinous egg masses on rocks, logs, or vegetation, mystery snails give birth to live young with complete shells.

**Japanese knotweed (*Polygonum cuspidatum*)**

Japanese knotweed has been planted as an ornamental shrub for decades, due to its tendency to grow in thick, straight rows about 10ft high. The plants light up with bright white flowers in the mid-summer, which originate from the base of each heart-shaped leaf. It can grow in dry sites, but does exceptionally well in moist soils like riverbanks or roadside ditches. Although sold as Japanese bamboo or Mexican bamboo in garden centers, Japanese knotweed is actually a member of the *Polygonaceae* family, totally unrelated to the true bamboos. A related species, giant knotweed (*Polygonum sachalinense*), is also invasive and present in Wisconsin.

Controlling Japanese knotweed is very difficult once it is established. The rhizome network is very deep and very extensive. Foliar herbicide applications can be effective, but typically require multiple applications to have any measurable effect on the colony. Since Japanese knotweed often occurs near water, care should be taken to ensure that the herbicide is safe for use in aquatic habitats. Certain herbicides can be toxic to amphibians, and should be avoided. A stem injector can be used to inject a small puddle of herbicide into the hollow stem, which is continuously absorbed by the plant over a short period of time. This can be very effective at killing the plant, sometimes with just one or two applications.

Paul Skawinski

*Japanese knotweed leaf and flowers*

**Purple loosestrife (*Lythrum salicaria*)**

Purple loosestrife was imported to the United States as an ornamental species, and continued to be sold until recently. It is a wetland perennial with woody stems, and commonly reaches a height of 6 feet or more. Leaves are generally opposite, but may be in whorls of threes on older plants. Stems are typically square, but may be six-sided on older plants.

Paul Skawinski

*Purple loosestrife*

The Purple Loosestrife Biocontrol Program has been very successful in Wisconsin. This program utilizes volunteers to raise *Galerucella* beetles, which feed on the foliage of purple loosestrife. These beetles often stress the

plant enough to stunt them, or even prevent flowering. These beetles are native to the same area of Eurasia as purple loosestrife, and were imported here as a natural predator. Testing results suggest that no other plants will be affected by the *Galerucella* beetles.

Herbicide application can be effective to manage purple loosestrife. Systemic herbicides work best, as they affect the shoots as well as the roots. Applying herbicide in late summer to fall allows the herbicide to be carried down into the roots along with the general downward flow of nutrients for underground storage.

Paul Skawinski

*Galerucella beetle on purple loosestrife*

The following aquatic invasive species have been confirmed in Marathon County:

*AIS presence in Marathon County (Excerpted from Wisconsin DNR [www.dnr.wi.gov])*

| Waterbody Name | Waterbody ID Code (WBIC) | Species |
|---|---|---|
| Big Bass Lake | 1405200 | Banded Mystery Snail |
| Big Rib River | 1451800 | Eurasian Water-Milfoil, Rusty Crayfish |
| Eau Claire Flowage | 1437800 | Eurasian Water-Milfoil |
| Flume Creek | 286600 | Rusty Crayfish |
| Johnson Creek | 1424900 | Rusty Crayfish |
| Lake Du Bay | 1412200 | Chinese Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil, Rusty Crayfish |
| Lake Wausau | 1437500 | Curly-Leaf Pondweed |
| Little Rib River | 1451900 | Rusty Crayfish |
| Little Trappe River | 1470800 | Rusty Crayfish |
| Lost Lake | 1407000 | Chinese Mystery Snail |
| Mayflower Lake | 310500 | Chinese Mystery Snail, Curly-Leaf Pondweed |
| Mission Lake | 1005400 | Banded Mystery Snail, Eurasian Water-Milfoil |
| Pike Lake | 1406300 | Banded Mystery Snail, Curly-Leaf Pondweed |
| Plover River | 1402800 | Rusty Crayfish |
| Rice Lake | 1406500 | Banded Mystery Snail, Chinese Mystery Snail, Curly-Leaf Pondweed |
| South Branch Embarrass River | 305600 | Rusty Crayfish |
| Spring Brook | 1440800 | Rusty Crayfish |
| Trappe River | 1470700 | Rusty Crayfish |
| Wadley Lake | 1177600 | Banded Mystery Snail, Chinese Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil |
| Wausau Dam Lake | 1469700 | Eurasian Water-Milfoil |
| Wisconsin River | 1179900 | Eurasian Water-Milfoil, Rusty Crayfish |

## *Recommended Actions*

1. **Continue AIS monitoring county-wide, and complete AIS surveys for any lakes that have not yet had AIS surveys completed**
   a. Use CLMN-AIS monitoring protocol.

2. **Continue to update official AIS occurrences records for all lakes within Marathon County**

3. **Update official AIS volunteer activity records – DNR**
   a. Clean Boats, Clean Waters
   b. Citizen Lake Monitoring Network
   c. Develop a visual map of this record

## *Step 2: Gather Information about Lake Ecosystems*

Every lake has physical, chemical, and biological characteristics that make it a unique ecosystem. All lakes are different, so it is very important to understand what is "normal" for a particular lake under everyday circumstances.

AIS management is only one component of holistic lake management. Updated background data about the lake ecosystem, such as water chemistry, water clarity, and aquatic plant surveys would be helpful to lake groups and DNR lake managers. Portage, Adams, and Waushara Counties have been able to complete county-wide lake studies with funding support from DNR's Lake Grants Program. These surveys have provided valuable information to citizen groups and local governments in those counties.

### *Recommended Actions*

1. **Conduct a county-wide lakes survey**
   a. Work with UW-Stevens Point to plan a county-wide lakes survey, similar to that of Portage, Adams, or Waushara Counties.
   b. Apply for funding assistance from the WDNR Lake Grant Program.

**Why is a lake inventory important for proactive AIS management?**

1. A lake inventory tells you what is "normal" for a given lake system, and makes it easier to detect changes, such as new AIS infestations, early. The earlier the detection and response, the better your chances of controlling the problem. Treatments for pioneer populations are much more likely to have a successful outcome than if the population is well-established.

2. In order to receive approval to treat a lake chemically, an aquatic plant management plan (APM plan) is normally required. If a baseline aquatic plant inventory has already been completed as part of a lake inventory, management options to control invasive species may move forward more quickly. Consult the "Guide to an Aquatic Plant Management Plan" for complete information about Wisconsin's APM plan requirements.
   http://www.uwsp.edu/cnr/uwexlakes/ecology/APMguide.asp

## *Step 3: Protect and Restore Native Vegetation*

Terrestrial and emergent vegetation that grows along the banks of a water body is also known as the "shoreline buffer". In many ways, this buffer indirectly helps to prevent invasive plant establishment in a lake:

1) The buffer protects the lake by reducing soil erosion and diverting nutrients that would otherwise enter the lake and provide fuel for nuisance-level aquatic plant growth.

2) A healthy shoreline buffer also provides biologically diverse and healthy habitats that are important to wildlife, including the native *Euhrychiopsis* weevils that are used for biological control of Eurasian watermilfoil.

3) Dense vegetative cover occupies areas that would otherwise be open and available to colonization by invasive species, and provides a degree of privacy to shoreline property owners.

**Native vegetation is the lake's "immune system"**

Marathon County regulations are the same as the state standard. These regulations require a 35-foot shoreline buffer zone above the ordinary high water mark. Within this 35-foot line, no more than 30 feet per 100 feet can be clear-cut. The remaining 70% serves to screen human activity, runoff, and erosion. These regulations are in place to protect water quality by reducing sedimentation and erosion.

Counties have the option to create local ordinances that go beyond the state standard if they choose. The shoreline buffer serves as the lake's "immune system", fending off new invaders. Encouraging landowners to follow this ordinance, or even go beyond the requirement, would be beneficial to the health of Marathon County's lakes.

Local government can protect shoreline buffers through policy and education. Marathon County Conservation, Planning and Zoning protects lake health with strong enforcement of shoreland zoning ordinances. In Marathon County, the shoreland zoning ordinance is routinely enforced, and with enforcement comes education. The county Conservation, Planning and Zoning Dept. also provides technical assistance with shoreland restoration or enhancement, and can assist landowners in locating cost-sharing options.

Use of newsletters, informational packets, news articles, and videos can be valuable tools to introduce the concept of shoreland restoration to landowners in Marathon County. These tools can help to illustrate what a healthy shoreline looks like, why it's beneficial to their property and the lake, and how a restoration project can be utilized to produce a healthy shoreline.

Tom Littwin, Waushara Co. LCD)

*Shoreline in need of restoration*

Tom Littwin, Waushara Co. LCD)

*Restored shoreline (same location as previous photo)*

Educational campaigns can also play a role in promoting healthy shoreline buffers. It would be in the best interest of the County to provide a packet of information to new lakeshore property owners regarding aquatic invasive species and the importance of healthy shoreline buffers. The costs associated with producing this type of informational packet may be eligible for grant funding from the WDNR's Lakes Grant Program.

**Native Aquatic Vegetation**

Although aquatic plants are commonly thought of as "weeds", a healthy and diverse population of native aquatic plants is a *vital* component in the prevention of aquatic invasive species. Research has shown that the abundance of EWM in a lake is inversely related to cumulative native plant cover (Madsen, 1998). For this reason, it is important to maintain healthy and diverse stands of vegetation. A thriving native plant population will compete for nutrients and living space, making it difficult for invasive species to become established. Other benefits to maintaining native plant populations include:

- Improved health of the sport fishery
- Protection against bank erosion
- Stabilization of the bottom sediment
- Decreased likelihood of algae blooms
- Increased water clarity
- Increased value to desirable wildlife species

*Recommended Actions*

1. **County-wide promotion of native vegetation**
   a. Enforce shoreland zoning ordinances
   b. Annual review of shoreland zoning ordinances
   c. Annual review of funding for cost-sharing incentive programs
   d. Create or expand county ordinances to also address native *aquatic* vegetation
      1. Develop mechanism for enforcement of the new ordinance
   e. Create and distribute informational packets to new lakeshore property owners
   f. Promote native vegetation in quarterly "Community Connection" newsletter
   g. Promote native vegetation in citizen organization newsletters
   h. Promote native vegetation in news articles and press releases

## *Step 4: Conduct AIS Monitoring*

With the growing concern over the spread of aquatic invasive species to Wisconsin's inland lakes, many concerned citizens are looking for ways to get involved. AIS monitoring and volunteer boat inspection programs are opportunities to take a front-line defense against the spread of AIS.

*Volunteers and lake organizations are essential for early detection of AIS and maintenance of healthy lake*

There are currently citizen volunteer groups on Big Bass Lake, Pike Lake, Mayflower Lake, Norrie Lake, Lake Dubay, Big Eau Pleine Flowage, and Lake Wausau. Volunteer monitors are extremely beneficial to the lakes of the county. These volunteers are often lake residents, or just interested citizens of the county. **Free** training workshops are available to train volunteers on protocols of the Clean Boats, Clean Waters program, and also the Citizen Lake Monitoring Network program.

**Clean Boats, Clean Waters**

Clean Boats, Clean Waters (CBCW) is a watercraft inspection volunteer training program sponsored by DNR, UW-Extension, and the Wisconsin Association of Lakes (WAL). Upon completion of the three-hour workshop, CBCW participants are equipped with the tools, knowledge, and confidence needed to educate lake users and perform watercraft inspections at boat landings, potentially preventing a new infestation from coming into their lake. An additional benefit of the CBCW program is that the data collected by volunteers is used to support requests for more funding and legislative support for AIS issues.

**Citizen Lake Monitoring Network**

The Citizen Lake Monitoring Network is a well-established program designed to involve citizens in collection of pertinent lake management data. The program has historically included the collection of water chemistry and Secchi readings, a measure of water clarity.

Recent research has developed solid correlations between Secchi readings and many other water quality parameters. Therefore, this one inexpensive, easy-to-operate sampling tool can tell our lake managers a great deal about a lake's condition. To have Secchi monitors on every lake in Wisconsin would be a terrific advantage for managing our state's lakes.

*A Secchi disc, which is lowered into the water to measure water clarity*

A component of the CLMN program trains volunteers to monitor for ten aquatic invasive species. The data collected by volunteers in the CLMN-AIS program is used to support requests for more funding and legislative support for AIS issues. Citizens can monitor for any or all of the species included in the program. Monitoring means early detection of new AIS infestations, and can result in huge savings in treatment expenses and a reduction of impacts to the lake. Ideally, every lake would have trained AIS monitors.

The Marathon County Parks Department is also a valuable group that could serve as monitors. Parks staff work throughout the county, frequently at waterfront locations. These staff have been trained to identify and report new AIS sightings, and they could provide valuable assistance with early detection. Annual "refresher" training is recommended for Parks Dept staff.

*Recommended Actions*

1. **Promote CLMN-AIS monitoring activity on all Marathon County lakes**
   a. Promote the CLMN-AIS monitoring program county-wide, with frequent news articles to promote awareness of the program and the importance of it.
   b. Offer CLMN-AIS training workshops county-wide
2. **Promote CLMN-Secchi monitoring activity on all Marathon County lakes**
   a. Promote the CLMN-Secchi monitoring

**To Report an Infestation**

1) **Collect a sample, if possible**
   a. Roots, stems, flowers
   b. Place in plastic bag with water
   c. Keep it in the freezer
2) **Contact DNR**
   Scott Provost, Water Resource Management Specialist
   715-421-7881

program county-wide, with frequent news articles to promote awareness of the program and the importance of it.
b. Offer CLMN-Secchi training workshops county-wide

3. **Encourage watercraft inspections on all Marathon County lakes**
   a. Promote the Clean Boats, Clean Waters program county-wide, with frequent news articles to promote awareness of the program and the importance of it.
   b. Offer CBCW training workshops county-wide

4. **Train County Parks staff to identify and report AIS sightings**

## *Step 5: Spread the Word about AIS*

Increasing public awareness of AIS is an important strategy in minimizing their spread. To facilitate proactive efforts from the general public regarding AIS prevention, people need to be made aware of the problems that AIS can cause.

Students and youth organizations can get involved in AIS issues through purple loosestrife beetle rearing programs for biological control. This program includes an instructional manual for utilizing the beetle-rearing project as an educational tool. Interested individuals can contact Marathon County Conservation, Planning and Zoning or Golden Sands RC&D for information.

Rusty crayfish are very abundant in many streams in central Wisconsin, and this is reflected in the records in Table 1. A trapping study was completed in Wood County in 2009, which removed nearly 15,000 rusty crayfish from the Yellow River. Catch rates went from over 125/trap/night at the beginning of the study, to less than 10/trap/night. Pittsville High School is planning to add a lesson on invasive species to the curriculum, and kids will get to trap rusty crayfish in the Yellow River as part of this lesson. Marathon County should see if there is interest for a similar project to be initiated at a local school.

How else can youth get involved? Kids have a great time at volunteer EWM "pulling parties", performing watercraft inspections at boat landings, helping with purple loosestrife rearing projects, or participating in the CLMN-AIS monitoring program. These are all great ways for lake groups to include youth in their AIS activities.

Attending workshops and conferences on lake issues and AIS issues is a great way for lake residents to learn about protecting the health of their lake. Citizens county-wide are encouraged to attend events like this. Nearby Adams County hosts an annual Lake Fair, and the Wisconsin Association of Lakes (WAL) hosts an annual statewide Lakes Convention, which provides valuable training for both citizens and professionals alike.

*Volunteers collecting plant samples for a plant ID workshop*

*Identifying each plant species that the volunteers collected*

Other methods of public education and outreach may include the distribution of written materials, such as AIS pamphlets, videos, brochures, and "watchcards" developed by DNR and UW-Extension. These can be ordered free or at a minimal cost at http://dnr.wi.gov/invasives/aquatic/pdfs/PubCatalogue.pdf

These publications can be distributed through local bait shops, dive shops, boat rental and sales shops, local chambers of commerce, resorts, restaurants, and other local businesses.

News articles in local papers can also be very effective ways to reach lake users. Articles can discuss specific AIS species, laws and ordinances, or volunteer programs. Some counties have also printed AIS placemats to distribute to restaurants near water bodies.

Signs at the boat landings can be another tool for education and outreach. The DNR has posted all public landings in the state with "Exotic Species Advisory" signs (if the lake has confirmed AIS), or with "Prevent the Spread" signs (if the lake has no confirmed AIS). New AIS signs are being posted at all Marathon County public boat landings, which are intended to replace the old signs with one comprehensive sign. If any signs are seen to be damaged or missing, this should be reported to DNR immediately.


*"Prevent the Spread" sign*


*"Stop and Remove" sign*


*"Exotic Species Advisory" sign*


*New 2011 AIS sign*

The three previous DNR boat landing signs relating to AIS are being replaced with one comprehensive sign

Some citizen groups have created additional boat landing signage to reinforce the AIS message to lake users. These projects are eligible for funding assistance from the DNR AIS Grant Program.

A common method for aquatic invasive species to be introduced is through water gardening and aquarium practices. Many of the plants that are desirable for water gardens are fast growers, can tolerate a wide range of conditions, and are extremely strong competitors. These are exactly the characteristics that describe an invasive species. If these plants are released, they can quickly destroy the balance of our native ecosystems. A possible solution to this important issue would be to work with distributors of water garden plants, and encourage them to insert a "Do not release to waterways" stake into each pot. These stakes might also have a website printed on them for the consumer to visit if they wish to learn more about AIS and the dangers of releasing non-native species. WDNR has some of these stakes available at no cost.

## *Recommended Actions*

1. **Promote beetle-rearing projects for biological control of purple loosestrife**
   a. Promote to schools
   b. Promote to citizen groups to partner with youth groups
   c. Target lakes with reported purple loosestrife infestations

2. **Promote lake fairs, workshops, and conferences to lakeshore residents county-wide**
   a. Newsletter notices
   b. Email notices

3. **Print AIS placemats for distribution in restaurants that are near lakes**

4. **Submit news articles**
   a. New AIS species to watch for
   b. AIS prevention
   c. Updates in AIS laws
   d. Volunteer programs available

5. **Offer to assist local schools with AIS-related curriculum projects**

6. **Maintain AIS signage at boat landings**
   a. Include reporting procedures for damaged boat landing signs in AIS training to Parks Department staff

7. **Staff AIS education table at public outreach events**

8. **Encourage water garden suppliers to insert "Do not release to waterways" stakes into pots containing a known AIS**

## *Step 6: Distribute the Workload*

Managing invasive species, even on a proactive level, can be a tremendous workload. By distributing the workload and allocating tasks per individual interest, a great deal can be accomplished.

In Marathon County, various tasks are being accomplished by the County Conservation, Planning and Zoning Dept. and individuals. The Regional AIS Coordinator's role has been to begin to collect information about those activities, and to begin coordinating them together and filling in the gaps. Since the AIS workload is not expected to disappear, this position should be considered a permanent need, and funding secured to keep the position filled.

Marathon County has many streams in addition to its lakes, so it would be in the best interest of the County to involve local stream volunteers and groups in their AIS efforts. Rivers can be a major source of AIS just as lakes can. The River Alliance of Wisconsin can be a great source of information and assistance for citizen stream organizations.

### *Recommended Actions*

1. **Secure funding to continue the AIS coordinator position in Marathon County**
2. **Involve local volunteer stream groups or "river alliances" in AIS activities.**
    a. Conduct stream AIS monitoring training as requested

## *Step 7: Involve Local Government*

Local town or county governments can be wonderful resources to tap into for AIS matters. Below are a few creative ways that local government actions have been beneficial in community AIS efforts.

**Town Government**
Boat patrols—town boat patrols are an important resource for volunteers regarding the "Illegal to Transport" law. CBCW volunteers active in the County may need to submit violation report forms to the local boat patrol for enforcement. Good cooperation between local boat patrols and CBCW volunteers is important.

Grant sponsorship—many town governments in Wisconsin have recognized an increasing need and inherent responsibility to support local lake and stream management efforts. Town governments can take an active role in the sponsorship of state lake grants. Because of their grant eligibility status of

local governments, local lake or stream associations can work directly with their town boards to support grant applications on AIS-focused lake projects or other lake projects. To learn more about the state lake grant programs, log on to http://www.dnr.wi.gov/lakes/grants .

**County Government**

*Community AIS partnerships*–County governments can offer a unique community support system pertaining to AIS efforts. Counties can coordinate and encourage townships to work together in unified lake protection efforts. One method of accomplishing this is by supporting an AIS Coordinator position to coordinate AIS activities within the county.

*Grant sponsorship*–County government can take an active role in the sponsorship of state-administered AIS grants. Counties can help local lake associations seek grants for many types of lake protection projects, including projects focused on AIS issues. County governments can also initiate AIS projects to be completed by County personnel. The AIS Coordinator position can be funded through the AIS grant program with the DNR to accomplish such projects as AIS partnership coordination, volunteer monitoring support, educational campaigns, and more.

*Conservation departments*–the actions of Land Conservation Departments (LCDs) are directed by elected county board supervisors. LCD (Conservation, Planning and Zoning Dept. in Marathon County) personnel are natural resource management professionals and are often well-versed in all aspects of AIS matters. The LCD is a natural home for county-wide lake protection and AIS initiatives, such as supporting an AIS Coordinator position, enforcing and promoting shoreline buffers, and assisting with shoreland restoration or enhancement projects.

*Recommended Actions*

1. **Town boat patrol support of volunteer activities coordinated by AIS Coordinator**
2. **County Conservation, Planning and Zoning Dept. continue AIS involvement through support of AIS Coordinator position**

## *Step 8: Plug in to the Lakes Community Network*

Wisconsin is proud of its lake-rich heritage, and is host to hundreds of lake organizations. It is important for lake groups and lake managers to stay well connected with the "lakes community" and to stay up-to-date on local and state lake stewardship issues.

Below are suggestions on networking within the lakes community.

**Statewide Lake Organizations**

Wisconsin Lakes (formerly Wisconsin Association of Lakes) is a nonprofit statewide lake group working to protect Wisconsin's lakes through public policy, education, and local lake group

assistance. Through Wisconsin Lakes, the lakes community can stay updated on current public policies that may ultimately affect the health of lakes throughout Wisconsin, they can attend annual regional workshops that target key lake issues, and they can gain the support they need for individual lake group projects. For more information about Wisconsin Lakes, log onto their website at http://www.wisconsinlakes.org.

Lake managers with the DNR and UW-Extension come together quarterly at Lake Team meetings to keep up-to-date with emerging lake issues, policies, and science. County AIS Coordinators have been invited to join this circle to stay in tune with DNR and UW-Extension initiatives. This is a highly recommended network for Marathon County's AIS Coordinator to stay in touch with.

DNR and UW-Extension AIS staff have begun holding semi-annual meetings for county AIS Coordinators, to update coordinators with regard to state initiatives, new available resources, policy changes, and to give coordinators around the state a chance to network. This is another highly recommended network for the Marathon County AIS Coordinator to stay in touch with.

**Statewide Lakes Convention**

The Wisconsin Lakes Convention is an outstanding educational event that has brought hundreds of lake groups, state leaders, and natural resource professionals together in a celebration of Wisconsin's lakes. The convention is an excellent opportunity for learning, sharing, and discussing issues important to lake management. For more information about the annual Wisconsin Lakes Convention, log onto the UW-Extension Lakes Program website at http://www.uwsp.edu/cnr/uwexlakes. This convention is a highly recommended opportunity for the Marathon County AIS Coordinator and representatives of the County Conservation, Planning and Zoning Dept. or individual lake groups.

**County-wide Citizen Organizations**

County-wide citizen organizations provide an excellent opportunity to stay connected with the local lakes community. These organizations provide a network for communication and sharing resources between and amongst citizen organizations in the county. Membership in a county-wide citizen organization offers a collective voice for advocating for regulatory changes, influencing public policy discussions, and discussions regarding the future growth of the community. Marathon County lake groups might want to consider forming one of these organizations in the future to discuss lake issues such as AIS prevention and management.

**Individual Citizen Organizations**

Citizen groups range from informal social groups to formalized lake associations or districts. An organized, functional citizen group can make a big difference in lake health protection. Citizen groups can be twice as effective when networking with other lake organizations who have struggled with similar issues–lack of funding, lack of volunteer interest or commitment, or lack of information, to give a few examples.

*Recommended Actions*

1. **Keep AIS Coordinator networked with the "lakes community"**
   a. Wisconsin Lakes
   b. Statewide Lake Team
   c. AIS Coordinators' meetings
2. **Promote attendance at the Wisconsin Lakes Convention**
   a. AIS Coordinator
   b. Local governments
   c. Lake groups or other citizen groups
3. **100% inclusive county lake and stream network, with a contact person to disseminate news and information through, even on lakes/streams without organized citizen groups**

*Creative Kids*

"Milfoil Masters" was a creative school project that kids from Minocqua-Hazelhurst-Lake Tomahawk Middle School came up with. Working off of a $25,000 start-up grant, their idea evolved into the Clean Boats, Clean Waters program, and is now the statewide protocol for slowing the spread of AIS.

## *Step 9: Be Creative!*

Just as each lake is unique, so are the individuals that make up lake organizations. There is no "one size fits all" management criteria made to fit all lake situations.

The important similarity between lake organizations is that they all need to create and follow a plan of action that is conducive to a healthy lake ecosystem and is realistic in time, money, and commitment. Consider using several of the proactive management steps for the best results.

If the proactive management section has not spurred any thoughts to fit your unique group situation, sit down with your membership and brainstorm ideas that will work for you. The important thing is that you DO talk about it.

Wisconsin waterways will always be vulnerable to invasions of aquatic invasive plants and animals. Proactive management is the best way of avoiding future AIS infestations.

| *Implementation Schedule: Recommended Actions* | | | | | |
|---|---|---|---|---|---|
| **Proactive Step** | **Recommended Action** | **Who** | **How** | **When** | **Progress** |
| **1) Gather info about AIS** | Continue AIS monitoring county-wide, assist lakes without recent AIS surveys | AIS Coord. with support of CP&Z, Parks | Letters, emails, phone calls | Ongoing | √+ |
| | Update official AIS records in SWIMS | AIS Coord. | Confirm reports with vouchers, enter into WDNR's SWIMS database | Ongoing | √+ |
| | Update AIS volunteer activity record | AIS Coord. | Confirm activity from database, create table | Ongoing | √+ |
| **2) Gather info about lake ecosystems** | Conduct county-wide lakes survey | UWSP, CP&Z | CP&Z work with UWSP under DNR Lakes Planning Grant | 2011+ | IP |
| **3) Protect and Restore Native Vegetation** | Enforce shoreline zoning ordinances, annual review of zoning ordinances | CP&Z | Established process | ongoing | √+ |
| | Annual review of cost-sharing funding | CP&Z | Established review process | annually | √+ |
| | Create/expand county ordinances to address native aquatic vegetation | CP&Z | Through ordinance process | 2011+ | |
| | Create/distrib. Info to property owners | CP&Z | Emails, mailings | 2011 | |
| | Promote native veg. in County newsletter | CP&Z, AIS Coord. | AIS Coord will write articles, CP&Z produces newsletter | ongoing | √+ |
| | Promote native veg. in articles and press rel. | AIS Coord. | Write and submit press releases | ongoing | √+ |
| **4) Conduct AIS Monitoring** | CLMN-AIS monitoring activity on ALL lakes | Citizen groups | AIS Coord. will train volunteers | 2011+ | IP |
| | CLMN-Secchi monitoring activity on ALL lakes | Citizen groups | AIS Coord. will train volunteers | 2011+ | IP |
| | Watercraft inspectors at ALL landings | AIS Coord., citizen groups | AIS Coord. will train/hire inspectors | 2011+ | IP |
| | Train County Parks staff to identify and report AIS sightings | AIS Coordinator | AIS Coord. will train Parks staff | 2011+ | √+ |
| **5) Spread the word about AIS** | Promote beetle-rearing projects for biological control of purple loosestrife | CP&Z, AIS Coord. | Contact schools and groups, and offer supplies | 2011+ | IP |

| | | | | | |
|---|---|---|---|---|---|
| | Promote lake fairs, workshops, and conferences to County lakeshore residents | AIS Coord. | Emails through network maintained by UWSP – CWSE | ongoing | √+ |
| | Print AIS placemats | Citizen groups | AIS Coord. can assist with text/photos | 2011+ | |
| | Assist local schools with AIS-related curriculum | AIS Coord. | Take AIS lesson plan into classrooms upon request | 2011 | IP |
| | News articles | CP&Z, AIS Coord. | Write and distribute press releases | ongoing | √+ |
| | Maintain AIS signage at boat landings | AIS Coord. | Keep record of boat landing signage, train others to collect signage info | 2011+ | √+ |
| | Staff AIS education table at public outreach venues | AIS Coord. | Staff table and offer information to public | 2011+ | √+ |
| **6) Distribute the workload** | Secure funding to continue the AIS Coordinator position in Marathon County | AIS Coord. | Apply for DNR grant to continue program | 2011+ | √+ |
| | Involve local volunteer stream groups in AIS activities | CP&Z | Encourage creation of "Friends" groups to assist with local AIS activities | 2011+ | |
| **7) Involve local government** | Water Guard and town boat patrol support of volunteer activities coordinated as needed by AIS Coordinator | AIS Coord. | Keep in touch with DNR water guards and boat patrols to enforce AIS violations | 2011+ | √+ |
| | County CP&Z continue AIS involvement through support of AIS Coordinator position | CP&Z | Continue to place AIS in high priority, and provide County match on AIS grant | 2011+ | √+ |
| **8) Plug into the lakes community network** | Keep AIS Coordinator networked with the lakes community | AIS Coord. | Attend WAL, Lake Team, and AIS Coordinator meetings | 2011+ | √+ |
| | Promote attendance at the Wisconsin Lakes Convention | AIS Coord. | Email notices to contacts | 2011+ | √+ |
| | 100% inclusive county lake/stream network | AIS Coord. | Send emails through distribution list maintained by UWSP - CWSE | 2011+ | |

**Symbol Key**

**√** Complete **√+** Complete and ongoing **IP** In Progress

# Appendix A – Contacts List

## County

Marathon County Conservation,
Planning & Zoning
210 River Dr.
Wausau, WI 54403
715-261-6000

Marathon Co Parks
212 River Dr.
Wausau, WI
715-261-1550

Marathon Co Sheriff's Dept.
Courthouse, 500 Forest St.
Wausau, WI
715-261-1200

## Region

Amy Thorstenson, Regional AIS Coordinator
Golden Sands Resource Conservation & Development Council, Inc
1462 Strongs Ave, Stevens Point, WI 54481
thorstea@co.portage.wi.us 715-346-1264

Paul Skawinski, Regional AIS Education Specialist
Golden Sands Resource Conservation & Development Council, Inc
1462 Strongs Ave, Stevens Point, WI 54481
skawinsp@co.portage.wi.us 715-343-6278

## State

Wisconsin Department of Natural Resources
473 Griffith Avenue
Wisconsin Rapids, WI 54494
715-421-7800 Fax 715-421-7830

5301 Rib Mountain Drive
Wausau, WI 54401
715-359-4522 Fax 715-355-5253

University of Wisconsin Extension – Lakes Program
College of Natural Resources, University of WI – Stevens Point
800 Reserve St., Stevens Point, WI 54481
715-346-2116 http://www.uwsp.edu/cnr/uwexlakes

Laura Herman
Citizen Lake Monitoring Network Coordinator
715-346-3989 Laura.herman@uwsp.edu

Erin McFarlane
Clean Boats, Clean Waters Volunteer Coordinator
715-346-4978 Erin.McFarlane@uwsp.edu

Wisconsin Association of Lakes
One Point Place, Suite 101, Madison, WI 53719
608-662-0923 or toll-free (WI only) 800-542-5253 http://www.wisconsinlakes.org

# Appendix B - Aquatic Plant Management Laws & Regulations

Regulated and Unregulated Aquatic Plant Management Activities in Waters of Wisconsin

| Activities | Water Bodies | | | | | |
|---|---|---|---|---|---|---|
| | Wetlands (non-navigable)[1] | Streams | Flowages | Lakes <10 acres entirely confined on one property | Lakes | Fish farms (s. 95.96) |
| Manual removal of native plants | No Permit | No Permit | 109 Permit required if > 30ft wide | No Permit | 109 Permit required if > 30ft wide | No Permit |
| Manual removal of exotic plants | No Permit | No Permit | No Permit | No Permit | No Permit | No Permit |
| Mechanical harvesting | No Permit | 109 Permit required | 109 Permit required | No Permit | 109 Permit required | No Permit |
| Chemical control | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | No Permit |
| Biological control[2] | Stocking permit required | Stocking permit required | Stocking permit required | Stocking permit required | Stocking permit required | No Permit |
| Burning | No Permit | Permit required | Permit required | Permit required | Permit required | No Permit |
| Purple loosestrife control[3] | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | No Permit |
| Native planting/stocking | No Permit | No Permit | No Permit | No Permit | Approval of Project | No Permit |
| Non-native planting/stocking | 109 Permit required | 109 Permit required | 109 Permit required | 109 Permit required | 109 Permit required | No Permit |
| Incidental or scientific removal | No Permit | No Permit | No Permit | No Permit | No Permit | No Permit |

- All activities must be conducted in an environmentally sound manner.
- All activities on privately owned land or land adjacent to privately owned lakefront property, or lakes confined on the property of one person must have the permission of that property owner.

[1]Confirm with DNR Water Management Specialist that wetland is non-navigable to be exempt of permit.

[2]Use stocking permit for Eurasian watermilfoil weevils, form 9400-60, pursuant to s. 29.753 and NR 19.05.

[3]Must be a state cooperator if using purple loosestrife beetles for biocontrol.

Exerpted from "Aquatic Invasive Species: A Guide to Proactive and Reactive Management", Carolyn Scholl, Vilas County LWCD, May 2006

## Appendix G

Portage County AIS Plan

# Portage County Aquatic Invasive Species Plan

## *A guide for Proactive AIS Management*

Paul Skawinski

Purple loosestrife (*Lythrum salicaria*) along the Wisconsin River


**2011**

Paul Skawinski

*Regional AIS Education Specialist*

Golden Sands Resource Conservation & Development Council, Inc.

**In partnership with**

Portage County Land Conservation Department

## *Acknowledgments*

This county-wide aquatic invasive species (AIS) plan was developed using *Aquatic Invasive Species: A Guide to Proactive and Reactive Management, 2006*, written by Carolyn Scholl, Vilas County Land & Water Conservation Department. Thanks to Carolyn for her permission to use her guide as a template in the development on this AIS plan.

Further input was provided by:
Steve Bradley, County Conservationist, Portage County Land Conservation Department
Randy Slagg, Conservation Technician, Portage County Land Conservation Department
Gary Speckmann, Portage County Parks Department
Amy Thorstenson, Regional AIS Coordinator, Golden Sands RC&D
Scott Provost, Water Resources Specialist, Wisconsin Department of Natural Resources
Buzz Sorge, Regional Lakes Coordinator, Wisconsin Department of Natural Resources

## *Project Funding*

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*Table of Contents*

## *Introduction*

Portage County has 31 public access lakes, and several large impoundments along the Wisconsin River and Plover River. Many streams also exist, which are equally susceptible to harm from invasive species, though the species of primary concern may differ.

Some of the lakes in Portage County have established lake associations or lake districts to help with management of the lakes. Lake districts and lake associations can help to monitor the lakes, disseminate information quickly and efficiently, and create a collaborative effort through hosting meetings and workshops. Many lakes in Portage County do not have organized lake groups, and this can present a challenge in AIS management. Since 2008, Portage County LCD has collaborated with Wood and Waushara Counties (and Marathon in 2010) and Golden Sands Resource Conservation & Development Council, Inc. (RC&D) to acquire grant funding from the Department of Natural Resources (DNR) to support a Regional AIS program.

Through the Regional AIS Program, information was gathered about the status of AIS infestations in Portage County, volunteer activity levels, training and education needs, and other information regarding AIS in Portage County.

The purpose of this AIS plan is to identify short-term and long-term goals toward establishing a coordinated, county-wide approach to protecting Portage County's lakes.

**This AIS plan is meant to be a dynamic document**, to be updated annually and changed as new goals and challenges are identified.

## *Proactive Management Steps*

It is in the best interest of any citizen organization or community to initiate actions today in order to avoid AIS problems tomorrow. Take a proactive management approach to lake protection. Proactive management activities need not be costly, but they can make a world of difference.

As the old saying goes—an ounce of prevention is worth a pound of cure. The same is true for preventing an invasion of AIS in your favorite lake. If efforts are kept at a "prevention" level, the costs to your group (in time, money, and frustration) will be far lower than the costs involved with dealing with AIS at a "control" level.

*Take action today to avoid AIS problems tomorrow. Be prepared and be proactive!*

## *Step 1: Gather Information about AIS and lake ecosystems*

In Portage County, aquatic invasive species data was initially gathered from Wisconsin DNR files. Over the past several years, available data regarding the aquatic invasive species distribution in Portage County has been updated through on-site AIS surveys at many of the lakes. AIS surveys were conducted with kayaks or canoes by Golden Sands RC&D AIS Program staff, and consisted of a trip around the littoral zone of the lake to look in the water and on the shoreline for the following species:

> Eurasian watermilfoil (*Myriophyllum spicatum*)
> Curly-leaf pondweed (*Potamogeton crispus*)
> Zebra mussels (*Dreissena polymorpha*)
> Rusty crayfish (*Orconectes rusticus*)
> Banded mystery snail (*Viviparus georgianus*)
> Chinese mystery snail (*Bellamya chinensis*)
> Japanese knotweed (*Polygonum cuspidatum*)
> Purple loosestrife (*Lythrum salicaria*)

Early detection of these invasive species is essential to minimize effort and cost associated with management. Established populations of Eurasian watermilfoil or zebra mussels may never be eradicated, even with years of effort. It is impossible to overemphasize the importance of monitoring for aquatic invasive species, whether on a citizen level or local government level.

**Eurasian watermilfoil (*Myriophyllum spicatum*)**

Introduced to Wisconsin in the 1960s as an aquarium plant from Europe and Asia (as its name implies), this species has quickly spread around the lakes and streams of the state. Small fragments of the plant can produce adventitious roots, and create new plants wherever the wind or currents take them. These fragments can be caused by boats, motors, paddles, large fish, waves, or other sources of disturbance. Eurasian watermilfoil tends to grow earlier in the year than most native plant species, so it tends to shade out the native species. In addition to reducing biodiversity in the ecosystem, EWM also reduces the recreational value of the water body by reducing water flow, increasing temperature, and encouraging stunted fish populations.

Control of EWM is easy and inexpensive if the population is caught early. Hand-removal with a small garden rake, or via snorkeling and hand-pulling by the roots, can be very effective on small populations of EWM. This is why early detection is so crucial for inexpensive management. If the population is allowed to expand for several seasons before it is detected, management options are reduced, and costs rise sharply.

For larger populations, chemical herbicide applications are typically used. 2,4-D formulations are most common, which are most effective in spring or early summer, when the plant is actively growing. As 2,4-D is a systemic herbicide, it requires the plant to be actively growing in order to absorb enough of the chemical to destroy the plant.

Biological control is an emerging option that may hold some promise for naturally controlling EWM without chemicals. *Euhrychiopsis* weevils are aquatic insects that are native to many Wisconsin lakes, and feed on native northern watermilfoil (*Myriophyllum sibiricum*). The adult weevils feed on the leaves and stems of the plant, while the larvae bore into the stem and feed on the vascular tissues within. These activities often stress the plants enough to kill them, or at least prevent flowering. More research is needed on this topic before it will be employed on a widespread basis.

There are seven native watermilfoils in Wisconsin, and at least three of these occur in Portage County lakes (*Myriophyllum sibiricum*, *M. tenellum*, and *M. farwellii*). Only two of those are likely to be confused with EWM. Two additional watermilfoil species, *M. heterophyllum* and *M. verticillatum*, have been found in Waupaca and Marathon Counties, and therefore may be present in Portage County as well.

Paul Skawinski

*Eurasian watermilfoil*

EWM has pinkish stems, whorled leaves with more than 12 pairs of leaflets, and a very limp growth form. Northern watermilfoil (*Myriophyllum sibiricum*) typically has whitish stems, whorled leaves with 12 or fewer pairs of leaflets, and a fairly rigid growth form. Farwell's watermilfoil (*Myriophyllum farwellii*) typically has extremely delicate stems and leaves, collapsing into a nearly unidentifiable mass when removed from water. The fruits are formed directly in the submerged leaf axils, unlike the emergent spike that both EWM and northern watermilfoil produce.

**Curly-leaf pondweed (*Potamogeton crispus*)**

Curly-leaf pondweed (CLP) arrived in Wisconsin as early as the late 1800s, brought here as an aquarium plant from Europe, and may have also been introduced accidentally during stocking of the common carp (*Cyprinus carpio*). CLP is still occasionally sold by some internet-based aquarium supply stores.

CLP has a non-typical life cycle, growing to peak biomass in mid-June. At this time, the foliage dies back to the rhizome, and all of the nutrients in the plant tissues are released into the water column. This nutrient release often results in an algae bloom, sometimes containing blue-green algae (cyanobacteria) like *Microcytis*. Blue-green algae release a neurotoxin that can harm humans and pets that come in contact with the water.

CLP spreads by rhizomes, seeds, and turions, which makes it very difficult to control. Turions are known to remain viable for more than five years, so herbicide applications need to be re-applied for at least five consecutive years to deplete the storage of turions in the substrate. Harvesting of CLP can be done in May, before turion production occurs. This can remove the biomass of the CLP and possibly prevent turion and seed accumulation for that season.

Paul Skawinski

*Curly-leaf pondweed leaf*

There are over about thirty species of pondweeds (*Potamogeton* and *Stuckenia* spp.) in Wisconsin, and two of them are commonly confused with CLP. Mature CLP has very wavy leaves with obvious serrations on the margins. Clasping-leaf pondweed (*Potamogeton richardsonii*) has wavy leaves with a smooth margin. Fern pondweed (*Potamogeton robbinsii*) may have very fine serrations on the leaf margins, but the leaves are typically straight, and the plant tends to be dark green to brown.

**Zebra mussels (*Dreissena polymorpha*)**

Zebra mussels are small mollusks that are native to the Black and Caspian Seas of western Asia. They are filter-feeders, straining tiny plankton out of the water column, and therefore remove the base of the aquatic food web. Large zooplankton and small fishes depend on this same food source, so Dreissenid mussels like zebra mussels and the related quagga mussel (*Dreissena rostriformis*) can have detrimental effects on fish populations in affected lakes.

Paul Skawinski

*Zebra mussel shell (actual size)*

Control of zebra mussels is very difficult and expensive. Power plants and other near-shore businesses often pipe water out of large lakes and rivers to cool their machinery, and these pipes can quickly become clogged with zebra mussels, causing reduced flow and reduced cooling ability. These businesses often inject low doses of chlorine into the pipes to kill the mussels, or they shut off the pumps and send divers into the pipes to manually scrape the walls clean. There is currently no good option to remove zebra mussels on a large scale. A biological control option using a bacterium is currently being researched and evaluated, so this could become an option in the future if it is deemed safe and effective.

Zebra mussels and quagga mussels are usually less than one inch long, with white and black striping across the shell. Zebra mussels tend to be D-shaped, while quaggas are more rounded on both the dorsal and ventral sides. A simple test to differentiate the two species is to stand the entire closed shell on its side–if it can remain standing, it is a zebra mussel. If it falls over, it is a quagga mussel.

**Rusty crayfish (*Orconectes rusticus*)**

Native to the Ohio River Basin, rusty crayfish were probably introduced here as fishing bait. Rusty crayfish prefer well-oxygenated, flowing water with a rocky substrate for shelter. They are omnivorous, feeding on everything from fish eggs to invertebrates to aquatic plants. When native crayfish are present in the same ecosystem, rusty crayfish will often kill them or simply push them out of the prime habitats, making the native crayfish more susceptible to predation, or less likely to have adequate resources for survival. Rusty crayfish are easily recognized by the rust-colored spot on each side of their carapace ("shell").

Paul Skawinski

*Rusty crayfish*

Trapping rusty crayfish can have a localized reduction effect, but nearby crayfish populations in the same body of water are likely to immigrate to the trapping area soon after efforts cease. Natural predation of rusty crayfish occurs by otters, shorebirds, turtles, large fish, raccoons, and other creatures. Despite substantial natural predation, the rusty crayfish's high reproductive rate and tendency to hide under large rocks enable it to easily establish large populations in many waters.

**Chinese mystery snail (*Bellamya chinensis*) and banded mystery snail (*Viviparus georgianus*)**

Chinese mystery snails were brought to the United States in the late 1800s as a food source of oriental markets. Both snails have also been sold as algae-eating pets for water gardens, aquaria, and backyard ponds. A likely method of introduction to the natural environment is through this ornamental trade vector.

Little research has been done on the impact of these snails. Both banded and Chinese mystery snails are known to compete with native snail populations for resources, and may cause decreases in native snail diversity or abundance. Large die-offs have been observed, which can cause foul-smelling messes along shorelines.

*Above: Banded mystery snail*
*Right: Chinese mystery snail*

Control of mystery snails is currently limited to manual removal with small hand tools. Mystery snails have a tough operculum at the opening of the shell, which is able to create a watertight seal. If a chemical pesticide is applied, the mystery snails can close up their shells and wait for the toxic substance to dissipate. Most native snails do not have this ability, and will be subjected to the chemical.

Chinese mystery snails can grow up to nearly 7cm tall (2.9 inches), which is larger than any of our native snail species. They are typically dark brown, and may have several vertical ridges on the shell near the opening.

Banded mystery snails are commonly about 2cm long, with dark brown bands running horizontally along the shell. Unlike most snails, which lay gelatinous egg masses on rocks, logs, or vegetation, mystery snails give birth to live young with complete shells.

Banded mystery snails are abundant in Portage County, occurring in nearly all of the hard-water lakes within the county.

**Japanese knotweed (*Polygonum cuspidatum*)**

Japanese knotweed has been planted as an ornamental shrub for decades, due to its tendency to grow in thick, straight rows about 10ft high. The plants light up with bright white flowers in the mid-summer, which originate from the base of each heart-shaped leaf. It can grow in dry sites, but does exceptionally well in moist soils like riverbanks or roadside ditches. Although sold as Japanese bamboo or Mexican bamboo in garden centers, Japanese knotweed is actually a member of the *Polygonaceae* family, totally unrelated to the true bamboos. A related species, giant knotweed (*Polygonum sachalinense*), is also invasive and present in Wisconsin.

Controlling Japanese knotweed is very difficult once it is established. The rhizome network is very deep and very extensive. Foliar herbicide applications can be effective, but typically require multiple applications to have any measurable effect on the colony. Since Japanese knotweed often occurs near water, care should be taken to ensure that the herbicide is safe for use in aquatic habitats. Certain herbicides can be toxic to amphibians, and should be avoided. A stem injector can be used to inject a small puddle of herbicide into the hollow stem, which is continuously absorbed by the plant over a short period of time. This can be very effective at killing the plant, sometimes with just one or two applications.

Paul Skawinski

*Japanese knotweed leaf and flowers*

**Purple loosestrife (*Lythrum salicaria*)**

Paul Skawinski

*Purple loosestrife*

Purple loosestrife was imported to the United States as an ornamental species, and continued to be sold until recently. It is a wetland perennial with woody stems, and commonly reaches a height of 6 feet or more. Leaves are generally opposite, but may be in whorls of threes on older plants. Stems are typically square, but may be six-sided on older plants.

The Purple Loosestrife Biocontrol Program has been very successful in Wisconsin. This program utilizes volunteers to raise *Galerucella* beetles,

which feed on the foliage of purple loosestrife. These beetles often stress the plant enough to stunt them, or even prevent flowering. These beetles are native to the same area of Eurasia as purple loosestrife, and were imported here as a natural predator. Testing results suggest that no other plants will be affected by the *Galerucella* beetles.

Paul Skawinski

*Galerucella beetle on purple loosestrife*

Herbicide application can be effective to manage purple loosestrife. Systemic herbicides work best, as they affect the shoots as well as the roots. Applying herbicide in late summer to fall allows the herbicide to be carried down into the roots along with the general downward flow of nutrients for underground storage.

**AIS information for Portage County lakes**

Every lake has physical, chemical, and biological characteristics that make it a unique ecosystem. All lakes are different, so it is very important to understand what is "normal" for a particular lake under everyday circumstances.

AIS management is only one component of holistic lake management. Updated background data about the lake ecosystem, such as water chemistry, water clarity, and aquatic plant surveys would be helpful to lake groups and DNR lake managers. Portage County is ahead of the game after completing the Portage County Lakes Study in 2003. A lot of lake water quality data was collected, which is valuable for lake management decisions. The Portage County Lakes study is now going a step further by writing comprehensive lake management plans for each public access lake in the county. These plans will include an AIS prevention and management component.

**Why is a lake inventory important for proactive AIS management?**

1. A lake inventory tells you what is "normal" for a given lake system, and makes it easier to detect changes, such as new AIS infestations, early. The earlier the detection and response, the better your chances of controlling the problem. Treatments for pioneer populations are much more likely to have a successful outcome than if the population is well-established.

2. In order to receive approval to treat a lake chemically, an aquatic plant management plan (APM plan) is normally required. If a baseline aquatic plant inventory has already been completed as part of a lake inventory, management options to control invasive species may move forward more quickly. Consult the "Guide to an Aquatic Plant Management Plan" for complete information about Wisconsin's APM plan requirements. http://www.uwsp.edu/cnr/uwexlakes/ecology/APMguide.asp

The following aquatic invasive species have been confirmed in Portage County:

*AIS presence in Portage County (Excerpted from Wisconsin DNR records [www.dnr.wi.gov])*

| | | |
|---|---|---|
| Adams Lake | 267800 | Banded Mystery Snail |
| Amherst Millpond | 268200 | Banded Mystery Snail, Curly-Leaf Pondweed, Rusty Crayfish |
| Bear Lake | 181900 | Chinese Mystery Snail, Eurasian Water-Milfoil |
| Biron Flowage | 1396900 | Eurasian Water-Milfoil |
| Collins Lake | 270200 | Chinese Mystery Snail, Eurasian Water-Milfoil |
| Ebert Lake | 267700 | Banded Mystery Snail |
| Flume Creek | 286600 | Rusty Crayfish |
| Fountain Lake | 262200 | Banded Mystery Snail |
| Jordan Pond | 1403600 | Banded Mystery Snail, Curly-Leaf Pondweed |
| Lake Du Bay | 1412200 | Chinese Mystery Snail, Curly-Leaf Pondweed, Rusty Crayfish |
| Lake Emily | 189800 | Banded Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil, Hybrid Eurasian-Northern Water Milfoil, Rusty Crayfish |
| Lake Helen | 287200 | Eurasian Water-Milfoil |
| Lake Joanis | 3000096 | Chinese Mystery Snail, Eurasian Water-Milfoil |
| Lake Lime | 190100 | Banded Mystery Snail, Chinese Mystery Snail, Eurasian Water-Milfoil |
| McDill Pond | 1403200 | Banded Mystery Snail, Chinese Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil |
| Mosquito Creek | 1396600 | Rusty Crayfish |
| Onland Lake | 195100 | Banded Mystery Snail |
| Pac-A-Wa Lake | 1009300 | Eurasian Water-Milfoil |
| Pickerel Lake | 195900 | Banded Mystery Snail, Eurasian Water-Milfoil |
| Plover River | 1402800 | Curly-Leaf Pondweed, Rusty Crayfish |
| Plover River Flowage | 1403000 | Curly-Leaf Pondweed, Eurasian Water-Milfoil |
| Rinehart Lake | 278600 | Banded Mystery Snail |

| | | |
|---|---|---|
| Spring Lake | 267200 | Banded Mystery Snail, Curly-Leaf Pondweed |
| Springville Pond | 1402300 | Curly-Leaf Pondweed, Eurasian Water-Milfoil, Rusty Crayfish, Water Lettuce |
| Stoltenburg Lake | 199400 | Banded Mystery Snail |
| Sunset Lake | 199700 | Banded Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil |
| Thomas Lake | 200300 | Banded Mystery Snail, Eurasian Water-Milfoil |
| Tree Lake | 289400 | Banded Mystery Snail, Chinese Mystery Snail, Curly-Leaf Pondweed |
| Unnamed | 267600 | Banded Mystery Snail |
| Waupaca River | 257400 | Rusty Crayfish |
| Wazeecha Lake | 1391200 | Banded Mystery Snail, Curly-Leaf Pondweed, Eurasian Water-Milfoil, Rusty Crayfish, Zebra Mussels |
| Wisconsin R Flowage C3-Stevens Pt | 1409400 | Curly-Leaf Pondweed, Eurasian Water-Milfoil |
| Wisconsin River Flowage Number 1 51 | 1402700 | Curly-Leaf Pondweed |
| Wolf Lake | 241100 | Banded Mystery Snail, Eurasian Water-Milfoil |

Several other invasive species have been reported in Portage County in the last two years: flowering rush (*Butomus umbellatus*), Brazilian waterweed (*Egeria densa*), and water lettuce (*Pistia stratioides*).

Flowering rush is an emergent species that forms dense monocultures along the shoreline. It is a common ornamental species for water gardens. Flowering rush is a restricted species under NR40. It was reported on Springville Pond, but no samples were vouchered in an herbarium. During surveys by Golden Sands RC&D in 2010, Paul Skawinski paddled along the shoreline with a kayak to search for flowering rush during its optimal blooming time, and no plants were discovered. Further monitoring will occur in 2011 to be sure that it is not present.

Brazilian waterweed was found during the summer of 2009. Scott Provost (WDNR) and Paul Skawinski (Golden Sands RC&D) visited the private pond near Almond to confirm this species. Brazilian waterweed is an NR40-prohibited species that is native to South America. It was brought into the Portage County pond as a contaminant plant in an order of water lilies that the owner placed on the Internet. Herbicide application has been completed on the pond, but some of the Brazilian waterweed is believed to have survived, and will require subsequent herbicide treatment.

Water lettuce was discovered on Springville Pond by a student at UW-Stevens Point. The plants were removed, and the AIS Education Specialist (Paul Skawinski) was contacted. Paul visited the pond the next day and confirmed that no water lettuce plants remained. He also returned about a week later to check once more. Water lettuce was of particular concern to Springville Pond, because as a floating plant, it could easily float down to the dam and be spilled into the Wisconsin River system.

### *Recommended Actions*

1. **Continue to support AIS monitoring county-wide, and complete AIS surveys for any lakes that have not yet had AIS surveys completed**
   a. Use CLMN-AIS monitoring protocol.
2. **Continue to update official AIS occurrences records for all lakes within Portage County**
3. **Continue to update official AIS volunteer activity records**
   a. Clean Boats, Clean Waters
   b. Citizen Lake Monitoring Network
4. **Continue to network with the Portage County Lakes Study to implement the AIS-related elements outlined in each lake plan.**

## *Step 2: Protect and Restore Native Vegetation*

Terrestrial and emergent vegetation that grows along the banks of a water body is also known as the "shoreline buffer". In many ways, this buffer indirectly helps to prevent invasive plant establishment in a lake:

1) The buffer protects the lake by reducing soil erosion and diverting nutrients that would otherwise enter the lake and provide fuel for nuisance-level aquatic plant growth.

2) A healthy shoreline buffer also provides biologically diverse and healthy habitats that are important to wildlife, including the native *Euhrychiopsis* weevils that are used for biological control of Eurasian watermilfoil.

3) Dense vegetative cover occupies areas that would otherwise be open and available to colonization by invasive species, and provides a degree of privacy to shoreline property owners.

**Native vegetation is the lake's "immune system"**

Portage County regulations are the same as the state standard. These regulations require a 35-foot shoreline buffer zone above the ordinary high water mark. Within this 35-foot line, no more than 30 feet per 100 feet of frontage can be clear-cut. This is often referred to the "viewing corridor" or "access corridor", since it often runs from a house to the water. The remaining 70% serves to screen human activity, runoff, and erosion. These regulations are in place to protect water quality by reducing sedimentation and erosion.

Counties have the option to create local ordinances that go beyond the state standard if they choose. The shoreline buffer serves as the lake's "immune system", fending off new invaders. Encouraging landowners to follow this ordinance, or even go beyond the requirement, would be beneficial to the health of Portage County's lakes.

Local government can protect shoreline buffers through policy and education. Portage County Planning and Zoning can protect lake health with strong enforcement of shoreland zoning ordinances. In Portage County, the shoreland zoning ordinance is routinely enforced, and with enforcement comes education. The county LCD also provides technical assistance with shoreland restoration or enhancement, and can assist landowners in locating cost-sharing options.

Use of newsletters, informational packets, news articles, and videos can be valuable tools to introduce the concept of shoreland restoration to landowners in Portage County. These tools can help to illustrate what a healthy shoreline looks like, why it's beneficial to their property and the lake, and how a restoration project can be utilized to produce a healthy shoreline.

*Tom Littwin, Waushara Co. LCD)*

*Shoreline in need of restoration*

*Tom Littwin, Waushara Co. LCD)*

*Restored shoreline (same location as previous photo)*

Educational campaigns can also play a role in promoting healthy shoreline buffers. It would be in the best interest of the County to provide a packet of information to new lakeshore property owners regarding aquatic invasive species and the importance of healthy shoreline buffers. The costs associated with producing this type of informational packet may be eligible for grant funding from

the WDNR's Lakes Grant Program. The Lake Helen Protection & Rehabilitation District already creates and distributes these packets for landowners on their lake. It is an easy way to ensure that new landowners are informed of pertinent regulations and ways to protect their lakeshore investment.

**Native Aquatic Vegetation**

Although aquatic plants are commonly thought of as "weeds", a healthy and diverse population of native aquatic plants is a *vital* component in the prevention of aquatic invasive species. Research has shown that the abundance of EWM in a lake is inversely related to cumulative native plant cover (Madsen, 1998). For this reason, it is important to maintain healthy and diverse stands of vegetation. A thriving native plant population will compete for nutrients and living space, making it difficult for invasive species to become established. Other benefits to maintaining native plant populations include:

- Improved health of the sport fishery
- Protection against bank erosion
- Stabilization of the bottom sediment
- Decreased likelihood of algae blooms
- Increased water clarity
- Increased value to desirable wildlife species

## *Recommended Actions*

1. **County-wide promotion of native vegetation**
   a. Enforce shoreland zoning ordinances
   b. Annual review of shoreland zoning ordinances
   c. Annual review of funding for cost-sharing incentive programs
   d. Create or expand county ordinances to also address native *aquatic* vegetation
      1. Develop mechanism for enforcement of the new ordinance
   e. Create and distribute informational packets to new lakeshore property owners
   g. Promote native vegetation in news articles, citizen organization newsletters, and press releases

## *Step 3: Conduct AIS Monitoring*

With the growing concern over the spread of aquatic invasive species to Wisconsin's inland lakes, many concerned citizens are looking for ways to get involved. AIS monitoring and volunteer boat inspection programs are opportunities to take a front-line defense against the spread of AIS.

*Volunteers and lake organizations are essential for early detection of AIS and maintenance of healthy lake*

There are currently established citizen volunteer groups on Lake Dubay, Lake Emily, Lake Helen, Lake Jacqueline, McDill Pond, Rinehart Lake, and Tree Lake. Sunset Lake also has a great group of volunteers that may soon form an official association. Volunteer monitors are extremely beneficial to the lakes of the county. These volunteers are often lake residents, or just interested citizens of the county. **Free** training workshops are available to train volunteers on protocols of the Clean Boats, Clean Waters program, and also the Citizen Lake Monitoring Network program. Golden Sands RC&D can provide these trainings by request.

### Clean Boats, Clean Waters

Clean Boats, Clean Waters (CBCW) is a watercraft inspection volunteer training program sponsored by DNR, UW-Extension, and the Wisconsin Association of Lakes (WAL). Upon completion of the three-hour workshop, CBCW participants are equipped with the tools, knowledge, and confidence needed to educate lake users and perform watercraft inspections at boat landings, potentially preventing a new infestation from coming into their lake. An additional benefit of the CBCW program is that the data collected by volunteers is used to support requests for more funding and legislative support for AIS issues.

### Citizen Lake Monitoring Network

The Citizen Lake Monitoring Network is a well-established program designed to involve citizens in collection of pertinent lake management data. The program includes the collection of water chemistry, aquatic invasive species, and water clarity data.

Recent research has developed solid correlations between Secchi readings and many other water quality parameters. Therefore, this one inexpensive, easy-to-operate sampling tool can tell our lake managers a great deal about a lake's condition. To have Secchi monitors on every lake in Wisconsin would be a terrific advantage for managing our state's lakes.

*A Secchi disc, which is lowered into the water to measure water clarity*

A component of the CLMN program trains volunteers to monitor for ten aquatic invasive species. The data collected by volunteers in the CLMN-AIS program is used to support requests for more funding and legislative support for AIS issues. Citizens can monitor for any or all of the species included in the program. Monitoring means early detection of new AIS infestations, and can result in huge savings in treatment expenses and a reduction of impacts to the lake. Ideally, every lake would have trained AIS monitors.

The Portage County Parks Department is also a valuable group that could serve as monitors. Parks staff work throughout the county, frequently at waterfront locations. The Portage County Parks Department manages lands adjacent to Amherst Mill Pond, Bear Lake, Becker Lake, Collins Lake, Lake Dubay, Lake Emily, Lake Helen, Lake Jacqueline, Jordan Pond, Meyers Lake, Mill Creek, Rinehart Lake, Rocky Run Wetland, Sunset Lake, Tree Lake, Wolf Lake, the Plover River, the Tomorrow River, and the Wisconsin River. Parks staff should be trained to identify and report new AIS sightings, and they could provide valuable assistance with early detection. An annual "refresher" training on AIS is recommended for Parks Department staff each year.

## *Recommended Actions*

1. **Promote CLMN-AIS monitoring activity on all Portage County lakes**
   a. Promote the CLMN-AIS monitoring program county-wide, with frequent news articles to promote awareness of the program and the importance of it.
   b. Offer CLMN-AIS training workshops county-wide through the Regional AIS Program.

2. **Promote CLMN-Secchi and CLMN-Chemistry monitoring activity on all Portage County lakes**
   a. Promote the CLMN-Secchi and CLMN-Chemistry monitoring programs county-wide, with news articles to promote awareness of the program and the importance of it.
   b. Offer CLMN-Secchi and CLMN-Chemistry training workshops county-wide through UWSP- CWSE.

**To Report an Infestation**

1) **Collect a sample, if possible**
   a. Roots, stems, flowers
   b. Place in plastic bag with water
   c. Keep it in the freezer

2) **Contact DNR**
   Scott Provost, Water Resource Management Specialist
   715-421-7881

3. **Encourage watercraft inspections on all Portage County lakes**
   a. Promote the Clean Boats, Clean Waters program county-wide, with frequent news articles to promote awareness of the program and the importance of it.
   b. Offer CBCW training workshops county-wide through Regional AIS Program.

4. **Train County Parks staff to identify and report AIS sightings**

## *Step 4: Spread the Word about AIS*

Increasing public awareness of AIS is an important strategy in minimizing their spread. To facilitate proactive efforts from the general public regarding AIS prevention, people need to be made aware of the problems that AIS can cause.

### Youth involvement in AIS management

Students and youth organizations can get involved in AIS issues through purple loosestrife beetle rearing programs for biological control. This program includes an instructional manual for utilizing the beetle-rearing project as an educational tool. Interested individuals can contact Portage County LCD or Golden Sands RC&D for information.

Rusty crayfish are very abundant in many streams in central Wisconsin, and this is reflected in the records in Table 1. A trapping study was completed in Wood County in 2009, which removed nearly 15,000 rusty crayfish from the Yellow River. Catch rates went from over 125/trap/night at the beginning of the study, to less than 10/trap/night. Pittsville High School is planning to add a lesson on invasive species to the curriculum, and kids will get to trap rusty crayfish in the Yellow River as part of this lesson. Portage County should see if there is interest for a similar invasive species-related project to be initiated at a local school. Golden Sands RC&D will be teaching an AIS lesson in Portage County schools beginning in spring 2011.

How else can youth get involved? Kids have a great time at volunteer EWM "pulling parties", performing watercraft inspections at boat landings, helping with purple loosestrife rearing projects, or participating in the CLMN-AIS monitoring program. These are all great ways for lake groups to include youth in their AIS activities.

### Citizen Involvement

Attending workshops and conferences on lake issues and AIS issues is a great way for lake residents to learn about protecting the health of their lake.
Citizens county-wide are encouraged to attend events like this. Nearby Adams County hosts an annual Lake Fair, and the Wisconsin Association of Lakes (WAL) hosts an

*Volunteers collecting aquatic plant samples for a plant ID workshop at Lake Helen*

annual statewide Lakes Convention, which provides valuable training for both citizens and professionals alike.

*Identifying each plant species that the Lake Helen volunteers collected*

**Outreach materials**

Other methods of public education and outreach include the distribution of written materials, such as AIS pamphlets, videos, brochures, and "watchcards" developed by DNR and UW-Extension. These can be ordered free or at a minimal cost at http://dnr.wi.gov/invasives/aquatic/pdfs/PubCatalogue.pdf

These publications can be distributed through local bait shops, dive shops, boat rental and sales shops, local chambers of commerce, resorts, restaurants, and other local businesses.

News articles in local papers can also be very effective ways to reach lake users. Articles can discuss specific AIS species, laws and ordinances, or volunteer programs. Some counties have also printed AIS placemats or bar coasters to distribute to restaurants near water bodies.

Signs at the boat landings can be another tool for education and outreach. The DNR has posted all public landings in the state with "Exotic Species Advisory" signs (if the lake has confirmed AIS), or with "Prevent the Spread" signs (if the lake has no confirmed AIS). New AIS signs are being posted at all Portage County public boat landings, which are intended to replace the old signs with one comprehensive sign. If any signs are seen to be damaged or missing, this should be reported to DNR immediately.

*"Prevent the Spread" sign*


*"Stop and Remove" sign*


*"Exotic Species Advisory" sign*


The three previous DNR boat landing signs relating to AIS are being replaced with one comprehensive sign

Some citizen groups have created additional boat landing signage to reinforce the AIS message to lake users. These projects are eligible for funding assistance from the DNR AIS Grants Program. Portage County has posted large AIS billboards at the public access lakes across the county.


A common method for aquatic invasive species to be introduced to water bodies is through water gardening and aquarium practices. Many of the plants that are desirable for water gardens and aquaria are fast growers, can tolerate a wide range of conditions, and are extremely strong competitors. These are exactly the characteristics that describe an invasive species. If these plants are released, they can quickly destroy the balance of our native ecosystems. A possible solution to this important issue would be to work with distributors of water garden plants, and encourage them to insert a "Do not release to waterways" stake into each pot. These stakes could also have a website printed on them for the consumer to visit if they wish to learn more about AIS and the dangers of releasing non-native species. WDNR has some of these stakes available at no cost.

## *Recommended Actions*

1. **Promote beetle-rearing projects for biological control of purple loosestrife**
   a. Promote to schools
   b. Promote to citizen groups and youth groups
   c. Target lakes with reported purple loosestrife infestations

2. **Promote lake fairs, workshops, and conferences to lakeshore residents county-wide**
   a. Newsletter notices
   b. Email notices
   c. Website – Portage County or Golden Sands RC&D

3. **Print AIS placemats or coasters for distribution in restaurants that are near lakes**

4. **Submit news articles**
   a. New AIS species to watch for
   b. AIS prevention
   c. Updates in AIS laws
   d. Volunteer programs available

5. **Offer to assist local schools with AIS-related curriculum projects**

6. **Maintain AIS signage at boat landings**
   a. Include reporting procedures for damaged boat landing signs in AIS training to Parks Department staff
7. **Staff AIS education table at public outreach events**
8. **Encourage water garden suppliers to insert "Do not release to waterways" stakes into pots containing a known AIS**

## *Step 5: Distribute the Workload*

Managing invasive species, even on a proactive level, can be a tremendous workload. By distributing the workload and allocating tasks per individual interest, a great deal can be accomplished.

In Portage County, various tasks are being accomplished by the County LCD and individuals. The Regional AIS Program's role has been to collect information about those activities, to coordinate them, and fill in the gaps. Since the AIS workload is not expected to disappear, this program should be considered a permanent need, and funding secured to keep the position filled.

### *Recommended Actions*

1. **Secure funding to continue the Regional AIS Program in Portage County**

## *Step 6: Involve Local Government*

Local town or county governments can be wonderful resources to tap into for AIS matters. Below are a few creative ways that local government actions have been beneficial in community AIS efforts.

**Town Government**
*Grant sponsorship*–many town governments in Wisconsin have recognized an increasing need and inherent responsibility to support local lake and stream management efforts. Town governments can take an active role in the sponsorship of state lake grants. Lake or stream associations can work directly with their town boards to support grant applications on AIS-focused projects or other lake management projects. To learn more about the state lake grant programs, visit http://www.dnr.wi.gov/lakes/grants .

**County Government**

*Community AIS partnerships*–County governments can offer a unique community support system pertaining to AIS efforts. Counties can coordinate and encourage townships to work together in unified lake protection efforts. One method of accomplishing this is by supporting an AIS program to coordinate AIS activities within the county.

*Boat patrols*–local boat patrols are an important resource for volunteers regarding the "Illegal to Transport" law. This law makes it illegal for anyone to transport aquatic vegetation or animals like zebra mussels on a watercraft or associated equipment. CBCW volunteers active in the county may need to submit violation report forms to the local boat patrol for enforcement. Good cooperation between local boat patrols and CBCW volunteers is important.

*Grant sponsorship*–County government can take an active role in the sponsorship of state-administered AIS grants. Counties can help local lake associations seek grants for many types of lake protection projects, including projects focused on AIS issues. County governments can also initiate AIS projects to be completed by County personnel. The AIS program can be funded through the AIS grant program with the DNR to accomplish such projects as AIS partnership coordination, volunteer monitoring support, educational campaigns, and more.

*Conservation departments*–the actions of Land Conservation Departments (LCDs) are directed by elected county board supervisors. LCD personnel are natural resource management professionals and are often well-versed in all aspects of AIS matters. The LCD is a natural home for county-wide lake protection and AIS initiatives, such as supporting an AIS program, enforcing and promoting shoreline buffers, and assisting with shoreland restoration or enhancement projects.

### *Recommended Actions*

1. **DNR Water guard and local boat patrol support of AIS program boat inspectors and volunteer boat inspectors**
2. **County LCD continue AIS involvement through support of AIS program**

## *Step 7: Plug in to the Lakes Community Network*

Wisconsin is proud of its lake-rich heritage, and is host to hundreds of lake organizations. It is important for lake groups and lake managers to stay well connected with the "lakes community" and to stay up-to-date on local and state lake stewardship issues.

Below are suggestions on networking within the lakes community.

**Statewide Lake Organizations**

Wisconsin Lakes (formerly Wisconsin Association of Lakes) is a non-profit statewide lake group

working to protect Wisconsin's lakes through public policy, education, and local lake group assistance. Through Wisconsin Lakes, the lakes community can stay updated on current public policies that may ultimately affect the health of lakes throughout Wisconsin. They can also attend annual regional workshops that target key lake issues, and gain the support they need for individual lake group projects. For more information about Wisconsin Lakes, log onto their website at http://www.wisconsinlakes.org.

Lake managers with the DNR and UW-Extension come together at monthly Lake Team meetings to keep up-to-date with emerging lake issues, policies, and science. County AIS Coordinators have been invited to join this circle to stay in tune with DNR and UW-Extension initiatives. This is a highly recommended network for Portage County's AIS program staff to stay in touch with.

DNR and UW-Extension AIS staff have begun holding semi-annual meetings for county AIS Coordinators, to update coordinators with regard to state initiatives, new available resources, policy changes, and to give coordinators around the state a chance to network. This is another highly recommended network for the Portage County AIS program staff to stay in touch with.

**Statewide Lakes Convention**

The Wisconsin Lakes Convention is an outstanding educational event that has brought hundreds of lake groups, state leaders, and natural resource professionals together in a celebration of Wisconsin's lakes. The convention is an excellent opportunity for learning, sharing, and discussing issues important to lake management. For more information about the annual Wisconsin Lakes Convention, log onto the UW-Extension Lakes Program website at http://www.uwsp.edu/cnr/uwexlakes. This convention is a highly recommended opportunity for the Portage County AIS Coordinator and representatives of the County LCD or individual lake groups.

**County-wide Citizen Organizations**

County-wide citizen organizations provide an excellent opportunity to stay connected with the local lakes community, and share resources between citizen organizations in the county. Membership in a county-wide citizen organization offers a collective voice for advocating for regulatory changes, influencing public policy discussions, and discussions regarding the future growth of the community. Portage County lake groups might want to consider forming one of these organizations in the future.

**Individual Citizen Organizations**

Citizen groups range from informal social groups to formalized lake associations or districts. An organized, functional citizen group can make a big difference in lake health protection. Citizen groups can be twice as effective when networking with other lake organizations who have struggled with similar issues–lack of funding, lack of volunteer interest or commitment, or lack of information, to give a few examples.

### *Recommended Actions*

1. **Keep AIS program staff networked with the "lakes community"**
    a. Wisconsin Lakes
    b. Statewide Lake Team
    c. AIS Coordinators' meetings
2. **Promote attendance at the Wisconsin Lakes Convention**
    a. AIS program staff
    b. Local governments
    c. Lake groups or other citizen groups
3. **100% inclusive county lakes network, with a contact person to disseminate news and information through, even on lakes/streams without organized citizen groups**

## *Step 8: Be Creative!*

Just as each lake is unique, so are the individuals that make up lake organizations. There is no "one size fits all" management criteria made to fit all lake or county situations.

The important similarity between lakes is that they all need a plan of action that is conducive to a healthy lake ecosystem and is realistic in time, money, and commitment. Consider using several of the proactive management steps for the best results.

### *Creative Kids*

"Milfoil Masters" was a creative school project that kids from Minocqua-Hazelhurst-Lake Tomahawk Middle School came up with. Working off of a $25,000 start-up grant, their idea evolved into the Clean Boats, Clean Waters program, and is now the statewide protocol for slowing the spread of AIS.

This plan's proactive management steps are ideas to help spur thoughts that fit Portage County's lake management situation, but sitting down with lake residents to brainstorm ideas can be very valuable. The important thing is that the County and the residents DO talk about it. Wisconsin waterways will always be vulnerable to invasions of aquatic invasive plants and animals. Proactive management is the best way of avoiding future AIS infestations.

| *Implementation Schedule: Recommended Actions* | | | | | |
|---|---|---|---|---|---|
| **Proactive Step** | **Recommended Action** | **Who** | **How** | **When** | **Progress** |
| **1) Gather info about AIS** | Continue AIS monitoring county-wide, assist lakes without recent AIS surveys | AIS program with support of LCD, Parks | Letters, emails, phone calls | ongoing | √+ |
| | Update official AIS records in SWIMS | AIS Program | Confirm reports with vouchers, enter into WDNR's SWIMS database | ongoing | √+ |
| | Update AIS volunteer activity record | AIS Program | Confirm activity from database, create table in SWIMS | ongoing | √+ |
| **2) Protect and Restore Native Vegetation** | Enforce shoreline zoning ordinances | P&Z | Established process | ongoing | √+ |
| | Annual review of zoning ordinances | P&Z | Established process | ongoing | √+ |
| | Annual review of cost-sharing funding | P&Z | Established review process | annually | √+ |
| | Create/expand county ordinances to address native aquatic vegetation | P&Z | Through ordinance process | 2011+ | |
| | Create/distrib. info to property owners | LCD, citizen groups | Emails, mailings, hand-deliver to lake residents (citizen groups) | 2011 | |
| | Promote native veg. in articles and press rel. | AIS Program | Write and submit press releases | ongoing | √+ |
| **3) Conduct AIS Monitoring** | CLMN-AIS monitoring activity on ALL lakes | Citizen groups | AIS Program will train volunteers | 2011+ | IP |
| | CLMN-Secchi monitoring activity on ALL lakes | Citizen groups | UWSP-CWSE will train volunteers | 2011+ | IP |
| | Watercraft inspectors at ALL landings | AIS Program, citizen groups | AIS Program will train volunteers and hire inspectors | 2011+ | IP |
| | Train County Parks staff to identify and report AIS sightings | AIS Program | AIS Program will train Parks staff | annually | √+ |
| **4) Spread the word about AIS** | Promote beetle-rearing projects for biological control of purple loosestrife | LCD, AIS Program | Contact schools and groups, and offer supplies and training | 2011+ | √+ |
| | Promote lake fairs, workshops, and conferences to County lakeshore residents | AIS Program, LCD | Emails through network maintained by UWSP – CWSE, county or RC&D website | ongoing | √+ |
| | Print AIS placemats or coasters | AIS Program, Citizen groups | AIS Program can assist with text/photos | 2011+ | |
| | News articles | LCD, AIS Program | Write and distribute press releases | ongoing | √+ |
| | Assist local schools with AIS-related curriculum | AIS Program | Take AIS lesson plan into classrooms upon request, assist with projects as requested | 2011 | √+ |

| | | | | | |
|---|---|---|---|---|---|
| | Maintain AIS signage at boat landings | AIS Program | Keep record of boat landing signage, train others to collect signage info | ongoing | √+ |
| | Work with water garden suppliers | AIS Program | Offer AIS posters, stakes to suppliers | ongoing | |
| | Staff AIS education table at public outreach venues | AIS Program | Staff table and offer information to public | ongoing | √+ |
| **5) Distribute the workload** | Secure funding to continue the AIS Program in Portage County | AIS Program | Apply for DNR grant to continue program | ongoing | √+ |
| **6) Involve local government** | Water Guard and local boat patrol support of AIS program boat inspectors and volunteers | AIS Program | Coordinate with DNR water guards and boat patrols to enforce AIS violations | ongoing | √+ |
| | County LCD continue AIS involvement through support of AIS Program | LCD | Continue to place AIS in high priority, and provide County match on AIS grant | ongoing | √+ |
| **7) Plug into the lakes community network** | Keep AIS Program staff networked with the lakes community | AIS Program | Attend WI Lakes Convention, Lake Team meetings, and AIS Coordinator meetings | ongoing | √+ |
| | Promote attendance at the Wisconsin Lakes Convention | AIS Program | Email notices to contacts through UWSP-CWSE | ongoing | √+ |
| | 100% inclusive county lakes network | AIS Program | Send emails through distribution list maintained by UWSP - CWSE | ongoing | √+ |

**Symbol Key**

**√** Complete **√+** Complete and ongoing **IP** In Progress **LCD** Land Conservation Department **P&Z** Planning and Zoning Dept.

# Appendix A – Contacts List

## County

Portage County Land Conservation Dept.
1462 Strongs Avenue
Stevens Point, WI 54481
715-346-1216

Portage Co Parks
1903 Cty. Hwy Y
Stevens Point, WI 54482
715-346-1433

## Region

Amy Thorstenson, Regional AIS Coordinator
Golden Sands Resource Conservation & Development Council, Inc
1462 Strongs Ave, Stevens Point, WI 54481
thorstea@co.portage.wi.us 715-346-1264

Paul Skawinski, Regional AIS Education Specialist
Golden Sands Resource Conservation & Development Council, Inc
1462 Strongs Ave, Stevens Point, WI 54481
skawinsp@co.portage.wi.us 715-343-6278

## State

Wisconsin Department of Natural Resources
473 Griffith Avenue
Wisconsin Rapids, WI 54494
715-421-7800 Fax 715-421-7830

University of Wisconsin Extension – Lakes Program
College of Natural Resources, University of WI – Stevens Point
800 Reserve St., Stevens Point, WI 54481
715-346-2116 http://www.uwsp.edu/cnr/uwexlakes

Laura Herman
Citizen Lake Monitoring Network Coordinator
715-346-3989 Laura.herman@uwsp.edu

Erin McFarlane
Clean Boats, Clean Waters Volunteer Coordinator
715-346-4978 Erin.McFarlane@uwsp.edu

Wisconsin Association of Lakes
One Point Place, Suite 101, Madison, WI 53719
608-662-0923 or toll-free (WI only) 800-542-5253 http://www.wisconsinlakes.org

# Appendix B - Aquatic Plant Management Laws & Regulations

Regulated and Unregulated Aquatic Plant Management Activities in Waters of Wisconsin

| Activities | Water Bodies | | | | | |
|---|---|---|---|---|---|---|
| | Wetlands (non-navigable)[1] | Streams | Flowages | Lakes <10 acres entirely confined on one property | Lakes | Fish farms (s. 95.96) |
| Manual removal of native plants | No Permit | No Permit | 109 Permit required if > 30ft wide | No Permit | 109 Permit required if > 30ft wide | No Permit |
| Manual removal of exotic plants | No Permit | No Permit | No Permit | No Permit | No Permit | No Permit |
| Mechanical harvesting | No Permit | 109 Permit required | 109 Permit required | No Permit | 109 Permit required | No Permit |
| Chemical control | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | No Permit |
| Biological control[2] | Stocking permit required | Stocking permit required | Stocking permit required | Stocking permit required | Stocking permit required | No Permit |
| Burning | No Permit | Permit required | Permit required | Permit required | Permit required | No Permit |
| Purple loosestrife control[3] | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | 107 Permit required | No Permit |
| Native planting/stocking | No Permit | No Permit | No Permit | No Permit | Approval of Project | No Permit |
| Non-native planting/stocking | 109 Permit required | 109 Permit required | 109 Permit required | 109 Permit required | 109 Permit required | No Permit |
| Incidental or scientific removal | No Permit | No Permit | No Permit | No Permit | No Permit | No Permit |

- All activities must be conducted in an environmentally sound manner.
- All activities on privately owned land or land adjacent to privately owned lakefront property, or lakes confined on the property of one person must have the permission of that property owner.

[1]Confirm with DNR Water Management Specialist that wetland is non-navigable to be exempt of permit.

[2]Use stocking permit for Eurasian watermilfoil weevils, form 9400-60, pursuant to s. 29.753 and NR 19.05.

[3]Must be a state cooperator if using purple loosestrife beetles for biocontrol.

Exerpted from "Aquatic Invasive Species: A Guide to Proactive and Reactive Management", Carolyn Scholl, Vilas County LWCD, May 2006