Appendix A: Rapid Response for Early Detection of Aquatic Invasive Species

Aquatic Invasive Species (AIS) are non-native to these lakes and their presence can lead to ecological and/or economic harm. The species can often lack competition from other species and result in dominating the ecosystem that they live, sometimes resulting in nuisance levels. If new AIS should be found in these lakes, it is imperative to react quickly and in an organized fashion. The following protocol should be followed to assure correct response.

1. Maintain a contingency fund for rapid response to AIS discovery (species not present now and response is needed) in Minocqua Lake and Kawaguesaga Lake.

2. If a suspected AIS is found, contact Oneida County AIS Coordinator (or other volunteer AIS coordinator if available).

3. Direct lake residents and visitors to contact the Oneida County AIS Coordinator (or other volunteer AIS coordinator if available) if they find a suspected AIS. Signs at the public boat landings, web pages, handouts at annual meeting, and newsletter articles can provide plant photos and descriptions, contact information and instructions.

4. If the suspected plant is likely AIS, the volunteer AIS coordinator will confirm the identification with Oneida County AIS and the Wisconsin DNR and inform the rest of the MKLPA Board.

    a. Take a digital photo of the plant in the setting where it was found (if possible). Collect 5-10 intact specimens, attempting to get the root system, all leaves, seed heads/and flowers if present. Place into a sealable plastic bag with no water. Place on ice and transport to refrigerator.
    b. Fill out plant incident form at http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf
    c. Contact Wisconsin DNR staff, then deliver collected plants to the Wisconsin DNR office nearest Minocqua (DNR SERVICE CENTER 8770 HWY J WOODRUFF WI 54568) as soon as possible. Wisconsin DNR may confirm identification with the herbarium at University of Wisconsin-Stevens Point or University of Wisconsin-Madison.

5. Mark the location of the suspected AIS (Oneida County AIS Coordinator or volunteer AIS coordinator). Use GPS in decimal degrees and WGS 84 datum if possible, or mark the location with a small float marker.

6. If identification is positive:

    a. Inform the person who reported the AIS and the board, who will then inform Oneida County AIS and management consultant.
    b. Mark the location of the AIS with a more permanent marker.
    c. Post a notice at the public landings (Wisconsin DNR has signs available) and include the notice in the next newsletter. Notices will inform residents and visitors of the approximate location of the AIS and provide appropriate means to avoid its spread.

7. Use volunteer professional assistance, or hire a consultant to determine the extent of the AIS introduction (MKLPA Board will direct this step). A diver may be used. If small amounts of AIS are found during this assessment, the consultant will be directed to identify locations with GPS and hand pull plants found. Whole plants will be pulled and efforts made to reduce fragmentation. All plant fragments will be removed from the lake when hand pulling.

8. Select a control plan in cooperation with the Wisconsin DNR and consultant. Control methods may include hand pulling, use of divers to manually or mechanically remove the AIS from the lake bottom, herbicide application, other effective and approved control methods.

9. Implement the control plan which includes applying for necessary permits. The implementation will be by persons who are qualified and experienced in the technique(s) selected.

10. MKLPA funds may be used to pay for reasonable expenses incurred during the control plan implementation and will not be delayed by waiting for funding from Wisconsin DNR grant (rapid response grant).

11. MKLPA will apply for Rapid Response AIS Control Grant and work with the Wisconsin DNR for the start date.

12. The area of the AIS will be inspected frequently to determine effectiveness of control and determine if additional treatment is necessary.

13. The procedures and parties responsibilities for this rapid response protocol should be reviewed bi-annually.

Minocqua and Kawaguesaga Lake Protection Association

Board President	Sally Murwin 715-356-1149 niwrum@charter.net

Oneida County Land and Water Conservation Dept.

AIS Coordinator	Michele Sadauskas 715-369-7835 msadauskas@co.oneida.wi.us
County Conservationist	Jean Hansen 715-369-7835 jhansen@co.oneida.wi.us

Wisconsin Dept. of Natural Resources

Grants, AIS identification and Notification	Kevin Gauthier (715) 356-5211 EXT 214 Kevin.GauthierSr@wisconsin.gov
Permits	Alex Bauch Alexander.Bauch@wisconsin.gov

AIS Monitoring

MKLPA Lead	Kevin McFerrin
Consultant (Ecological Integrity Service)	Steve Schieffer 715-554-1168 ecointegservice@gmail.com

Herbicide Contractor

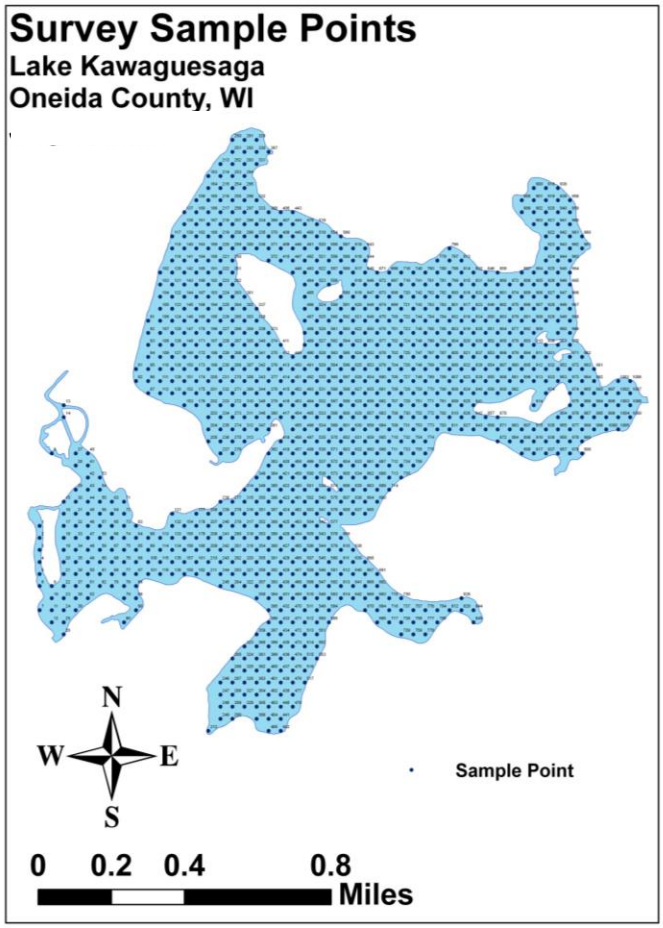
Schmidt's Aquatic	Hamilton Harvey 920-980-9190 hdhiii@schmidtsaquatic.com

Appendix B-Point Intercept Survey Methods

Field Methods

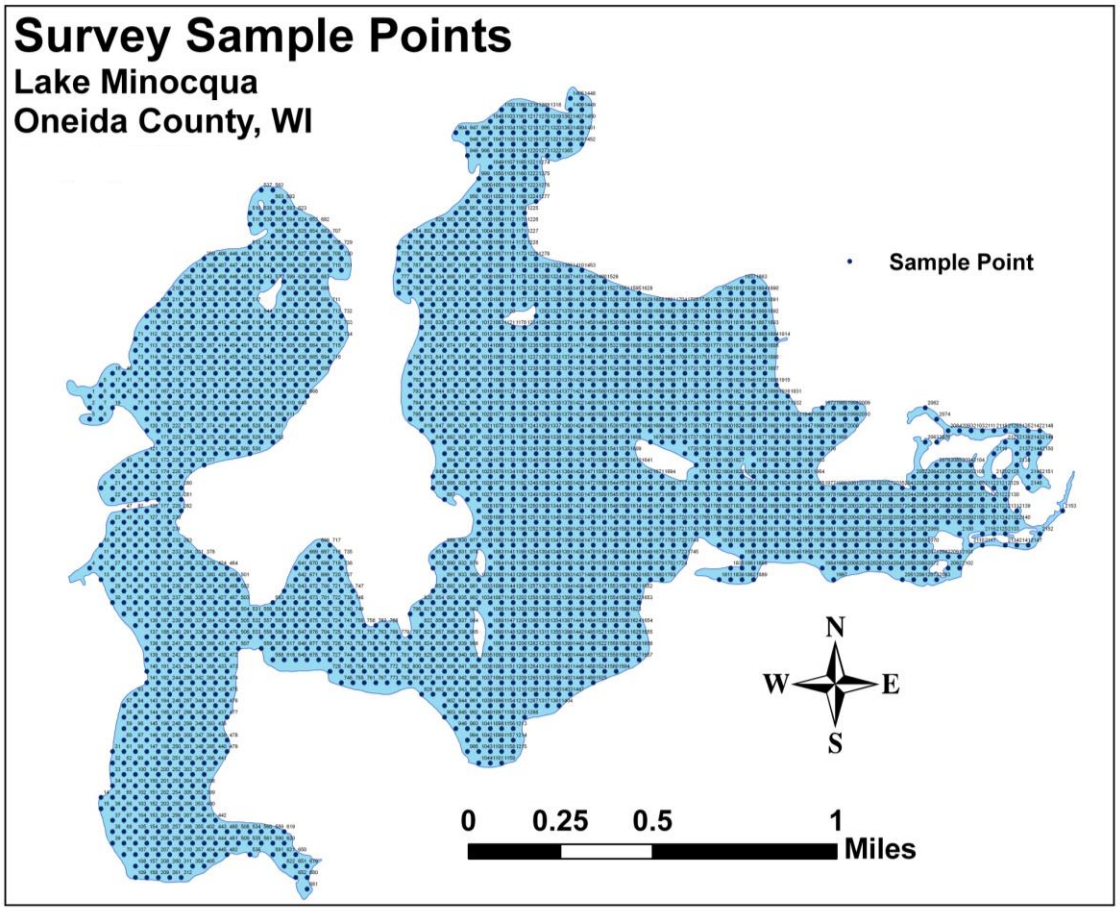
A point intercept method was employed for the aquatic macrophyte sampling. The Wisconsin Department of Natural Resources (Wisconsin DNR) generated the sampling point grids for each lake. All points were initially sampled for depth only. Once the maximum depth of plant growth was established, only sample points at that depth (or less) were sampled. If no plants were sampled, one sample point beyond that was sampled for plants. In areas such as bays that appear to be under-sampled, a boat or shoreline survey was conducted to record plants that may have otherwise been missed. This involved surveying that area for plants and recording the species viewed and/or sampled. The type of habitat is also recorded. These data are not used in the statistical analysis nor is the density recorded. Only plants sampled at predetermined sampled points were used in the statistical analysis. In addition, any plant within six feet of the boat was recorded as "viewed." A handheld Global Positioning System (GPS) located the sampling points in the field. The Wisconsin DNR guidelines for point location accuracy were followed with an 80 feet resolution window and the location arrow touching the point. A June 2014 survey was conducted to determine if *Potamogeton crispus* was present.

Point intercept sample grid for Kawauguesaga Lake



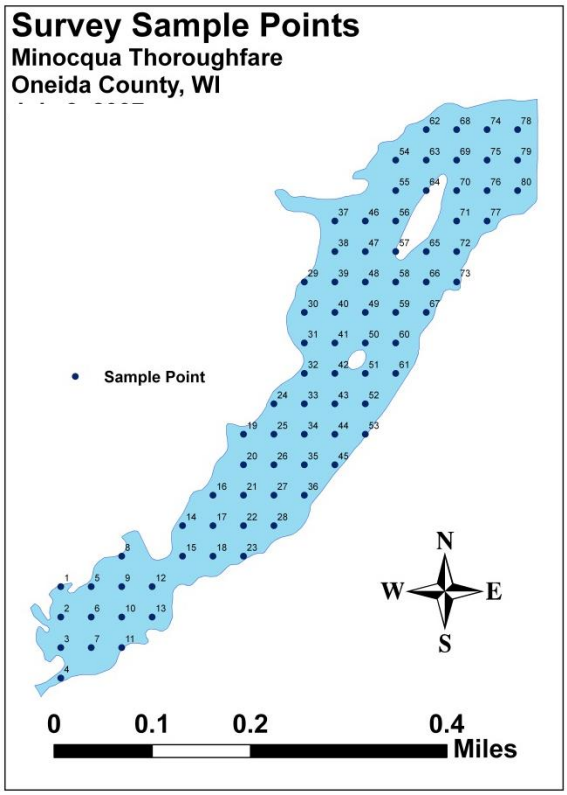
Appendix B-Point Intercept Survey Methods

Point intercept sample grid for Minocqua Lake.

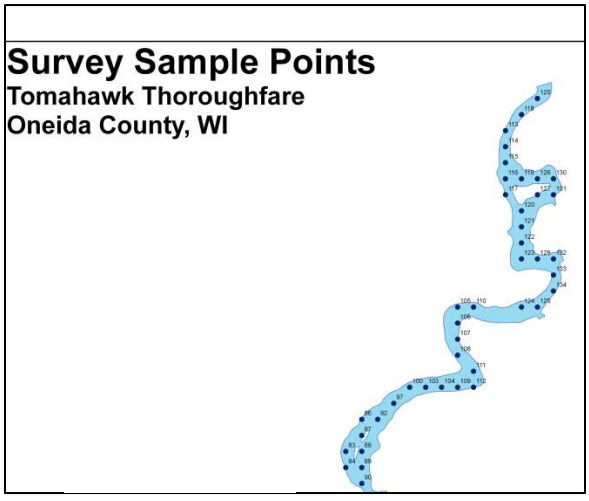


Appendix B-Point Intercept Survey Methods

Point intercept sample grid for Minocqua Thoroughfare.

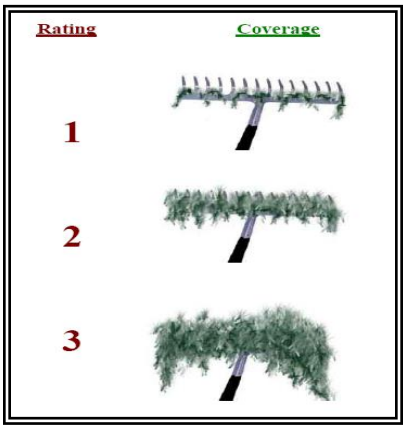


Point intercept sample grid for Tomahawk Thoroughfare.



At each sample location, a double-sided fourteen-tine rake was used to rake a 1m tow off the bow of the boat. All plants present on the rake and those that fell off the rake were identified and rated for rake fullness. The rake fullness value was used based on the criteria contained in the diagram and table below. Those plants that were within six feet were recorded as "viewed," but no rake fullness rating was given. Any under-surveyed areas such as bays and/or areas with unique habitats were monitored. These areas are referred to as a "boat survey or shoreline survey."

The rake density criteria used:



Rake fullness rating	Criteria for rake fullness rating
1	Plant present, occupies less than ½ of tine space
2	Plant present, occupies more than ½ tine space
3	Plant present, occupies all or more than tine space
v	Plant not sampled but observed within 6 feet of boat

The depth and predominant sediment type was also recorded for each sample point. Caution must be used in determining the sediment type in deeper water as it is difficult to discern between muck and sand with a rope rake. All plants needing verification were bagged and cooled for later examination. Each species was mounted and pressed for a voucher collection and submitted to the Freckmann

Herbarium (UW-Stevens Point) for review. On rare occasions a single plant may be needed for verification, not allowing it to be used as a voucher specimen and may be missing from the collection.

An early season, aquatic invasive species (AIS) (emphasis on *Potamogeton crispsus*-curly leaf pondweed) survey is completed to pick up any potential growth before native plants are robust. Curly leaf pondweed grows in the spring, only to senesce in early July before the main survey is typically conducted.

Data analysis methods

Data collected was entered into a spreadsheet for analysis. The following statistics were generated from the spreadsheet:

- Frequency of occurrence in sample points with vegetation (littoral zone)
- Relative frequency
- Total points in sample grid
- Total points sampled
- Sample points with vegetation
- Simpson's diversity index
- Maximum plant depth
- Species richness
- Floristic Quality Index

An explanation of each of these data is provided below.

Frequency of occurrence for each species- Frequency is expressed as a percentage by dividing the number of sites the plant is sampled by the total number of sites. There can be two values calculated for this. The first value is the percentage of all sample points that a particular plant was sampled at depths less then maximum depth plants (littoral zone), regardless if vegetation was present. The second is the percentage of sample points that a particular plant was sampled at only points containing vegetation. The first value shows how often the plant would be encountered in the defined littoral zone (by depth), while the second value shows how frequent the plant is where plants grow. In either case, the greater this value, the more frequent the plant is present in the lake. When comparing frequency in the littoral zone, we look at the frequency of all points below maximum depth with plants. This frequency value allows the analysis of how common plants are and where they could grow based upon depth. When focusing only where plants are actually present, we look at frequency at points in which plants were found. Frequency of occurrence is usually reported using sample points where vegetation was present.

Frequency of occurrence example:

Plant A sampled at 35 of 150 littoral points = 35/150 = 0.23 = 23%

Plant A's frequency of occurrence = 23% considering littoral zone depths.

Plant A sampled at 12 of 40 vegetated points = 12/40 = 0.3 = 30%

Relative frequency-This value shows, as a percentage, the frequency of a particular plant relative to other plants. This is not dependent on the number of points sampled. The relative frequency of all plants will add to 100%. This means that if plant A had a relative frequency of 30%, it occurred 30% of the time compared to all plants sampled or makes up 30% of all plants sampled. This value allows us to see which plants are the dominant species in the lake. The higher the relative frequency, the more common the plant is compared to the other plants and therefore, more frequent in the plant community.

Relative frequency example:

Suppose we were sampling 10 points in a very small lake and got the following results:

	Frequency sampled
Plant A present at 3 sites	3 of 10 sites
Plant B present at 5 sites	5 of 10 sites
Plant C present at 2 sites	2 of 10 sites
Plant D present at 6 sites	6 of 10 sites

So one can see that Plant D is the most frequent sampled at all points with 60% (6/10) of the sites having plant D. However, the relative frequency allows us to see what the frequency is compared the other plants, without taking into account the number of sites. It is calculated by dividing the number of times a plant is sampled by the total of all plants sampled. If we add all frequencies (3+5+2+6), we get a sum of 16. We can calculate the relative frequency by dividing by the individual frequency.

Plant A = 3/16 = 0.1875 or 18.75%

Plant B = 5/16 = 0.3125 or 31.25%

Plant C = 2/16 = 0.125 or 12.5%

Plant D = 6/16 = 0.375 or 37.5%

Now we can compare the plants to one another. Plant D is still the most frequent, but the relative frequency tells us that of all plants sampled at those 10 sites, 37.5% of them are Plant D. This is much lower than the frequency of occurrence (60%) because although we sampled Plant D at 6 of 10 sites, we were sampling many other plants too, thereby giving a lower frequency when compared to those other plants. This then gives a true measure of the dominant plants present.

Appendix B-Point Intercept Survey Methods

Total points in sample grid- The Wisconsin DNR establishes a sample point grid that covers the entire lake. Each GPS coordinate is mapped and used to locate the points.

Sample sites less than maximum depth of plants-The maximum depth at which a plant is sampled is recorded. This defines the depth plants can grow (potential littoral zone). Any sample point with a depth less than, or equal to this depth is recorded as a sample point less than the maximum depth of plants. This depth is used to determine the potential littoral zone and is referred to as the littoral zone.

Sample sites with vegetation- This is the number of sites where plants were actually sampled. This gives a good projection of plant coverage on the lake. If 10% of all sample points had vegetation, it implies about 10% coverage of plants in the whole lake, assuming an adequate number of sample points have been established. We also observe the number of sample sites with vegetation in the littoral zone. If 10% of the littoral zone had sample points with vegetation, then the plant coverage in the littoral zone would be estimated at 10%.

Simpson's diversity index-To measure the diversity of the plant community, Simpson's diversity index is calculated. This value can run from 0 to 1.0. The greater the value, the more diverse the plant community. In theory, the value is the chance that two species sampled are different. An index of "1" means that the two will always be different (very diverse) and a "0" would indicate that they will never be different (only one species found). The higher the diversity in the native plant community, the healthier the lake ecosystem.

Simpson's diversity example:

If one sampled a lake and found just one plant, the Simpson's diversity would be "0." This is because if we randomly sampled two plants, there would be a 0% chance of them being different, since there is only one plant.

If every plant sampled were different, then the Simpson's diversity would be "1." This is because if two plants were randomly sampled, there would be a 100% chance they would be different since every plant is different.

Maximum depth of plants-This depth indicates the deepest that plants were sampled. Generally, more clear lakes have a greater depth of plants, while lower water clarity limits light penetration and reduces the depth at which plants are found.

Species richness-The number of different individual species found in the lake. There is a number for the species richness of plants sampled, and another number that takes into account plants viewed but not actually sampled during the survey.

Appendix B-Point Intercept Survey Methods

Floristic Quality Index-The Floristic Quality Index (FQI) is an index developed by Dr. Stanley Nichols of the University of Wisconsin-Extension. This index is a measure of the plant community in response to development (and human influence) on the lake. It takes into account the species of aquatic plants sampled and their tolerance for changing water quality and habitat quality. The index uses a conservatism value assigned to various plants ranging from 1 to 10. A higher conservatism value indicates that a plant is intolerant, while a lower value indicates tolerance. Those plants with higher values are more apt to respond adversely to water quality and habitat changes, largely due to human influence (Nichols, 1999). The FQI is calculated using the number of species and the average conservatism value of all species used in the index.

The formula is: **FQI = Mean C ·√N**

Where C is the conservatism value and N is the number of species (only species sampled on rake).

Therefore, a higher FQI indicates a healthier aquatic plant community, which is an indication of better plant habitat. This value can then be compared to the median for other lakes in the assigned eco-region. There are four eco-regions used throughout Wisconsin: Northern Lakes and Forests, Northern Central Hardwood Forests, Driftless Area, and Southeastern Wisconsin Till Plain. The 2006 and 2008 values from past aquatic plant surveys will also be compared in this analysis.

Summary of Northern Lakes and Forests and Flowages Median Values for Floristic Quality Index:

(Nichols, 1999)

	Northern Lakes	Flowages
Median species richness	13	23.5
Median conservatism	6.7	6.2
Median Floristic Quality	24.3	28.3

*Floristic Quality has a significant correlation with area of lake (+), alkalinity(-), conductivity(-), pH(-) and Secchi depth(+). In a positive correlation, as that value increases so will FQI, while with a negative correlation, as a value decreases, the FQI will decrease.

Appendix C-Funding sources

Potential Funding Sources for Aquatic Invasive Species Monitoring, Planning, etc.

Grant Program: AIS Grants
Wisconsin Department of Natural Resources
Program Goals/Objectives: control aquatic invasive species
Eligible Applicants: Qualified lake and river management organizations and qualified school districts
Eligible Project Elements (more details for project scopes covered at http://dnr.wi.gov/Aid/SurfaceWater.html):
Established population control-75% cost share of total project not to exceed $200,000
Education/Prevention-75% cost share of total project cost not to exceed $150,000
Early Detection-75% cost share of total project cost not to exceed $20,000
Clean Boats/Clean Waters-75% cost share of total project cost not to exceed $4000
Application Deadline: February 1 for Established population control; December 10 for Education/Prevention and Clean Boats/Clean Waters; Year round for Rapid Response.
Contact: Kevin Gauthier 715.365.8937

Grant Program: Lake Planning
Wisconsin Department of Natural Resources
Program Goals/Objectives: collect information in order to manage lakes
Eligible Applicants: Qualified lake and local government organizations; qualified school districts
Eligible Project Elements: Monitoring and education; organization development; studies or assessments.
Funding limits and rate: Small scale-75% share costs with a cap of $3000; large scale-75% share costs with a cap of $25,000.
Application Deadline: December.
Contact: Kevin Gauthier 715.365.8937

Potential Funding Sources for Watershed Practices

SHORELINE BUFFERS AND INFILTRATION PRACTICES

Grant Program: Lake Protection
Wisconsin Department of Natural Resources
Program Goals/Objectives: lake protection and restoration
Eligible Applicants: Qualified lake and conservation organizations
Eligible Project Elements: plans and specifications, earth moving and structure removal, native plants and seeds, monitoring costs
Funding Limits and Rates: 75 % of project costs up to $200,000
Application Deadline: Feb. 1
Contact: Kevin Gauthier 715.365.8937

Grant Program: Wetland and Shoreline Restoration
Wisconsin Department of Natural Resources
Program Goals/Objectives: To protect or improve the water quality or natural ecosystem of a lake by restoring adjacent degraded wetlands or tributary to lakes. Shoreline habitat restoration grants areintended to provide financial assistance, including incentive payments, to owners of developed lake front lots to re-establish riparian habitat
Eligible Applicants: Qualified lake and conservation organizations
Funding Limits and Rates: 75 % of project costs up to $100,000

AQUATIC PLANT MANAGEMENT STRATEGY

Northern Region WDNR
Summer, 2007

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

ISSUES

- Protect desirable native aquatic plants.
- Reduce the risk that invasive species replace desirable native aquatic plants.
- Promote "whole lake" management plans
- Limit the number of permits to control native aquatic plants.

BACKGROUND

As a general rule, the Northern Region has historically taken a protective approach to allow removal of native aquatic plants by harvesting or by chemical herbicide treatment. This approach has prevented lakes in the Northern Wisconsin from large-scale loss of native aquatic plants that represent naturally occurring high quality vegetation. Naturally occurring native plants provide a *diversity of habitat* that *helps maintain water quality*, helps *sustain the fishing* quality known for Northern Wisconsin, supports common lakeshore wildlife from loons to frogs, and helps to provide the *aesthetics* that collectively create the "up-north" appeal of the northwoods lake resources.

In Northern Wisconsin lakes, an inventory of aquatic plants may often find 30 different species or more, whereas a similar survey of a Southern Wisconsin lake may often discover less than half that many species. Historically, similar species diversity was present in Southern Wisconsin, but has been lost gradually over time from stresses brought on by cultural land use changes (such as increased development, and intensive agriculture). Another point to note is that while there may be a greater variety of aquatic vegetation in Northern Wisconsin lakes, the vegetation itself is often *less dense*. This is because northern lakes have not suffered as greatly from nutrients and runoff as have many waters in Southern Wisconsin.

The newest threat to native plants in Northern Wisconsin is from invasive species of aquatic plants. The most common include Eurasian Water Milfoil (EWM) and CurlyLeaf Pondweed (CLP). These species are described as *opportunistic invaders*. This means that these "invaders" benefit where an opening occurs from removal of plants, and without competition from other plants may successfully become established in a lake. Removal of native vegetation not only diminishes the natural qualities of a lake, it *may increase the risk that an invasive species can successfully invade onto the site where native plants have been removed*. There it may more easily establish itself without the native plants to compete against. This concept is easily observed on land where bared soil is quickly taken over by replacement species (often weeds) that crowd in and establish themselves as new occupants of the site. While not a providing a certain guarantee against invasive plants, protecting and allowing the native plants to remain may reduce the success of an invasive species becoming established on a lake. Once established, the invasive species cause far more inconvenience for all lake users, riparian and others included; can change many of the natural features of a lake; and often lead to *expensive annual control plans*. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.

To the extent we can maintain the normal growth of native vegetation, Northern Wisconsin lakes can continue to offer the water resource appeal and benefits they've historically provided. A regional position on removal of aquatic plants that carefully recognizes how native aquatic plants benefit lakes in Northern Region can help prevent a gradual decline in the overall quality and recreational benefits that make these lakes attractive to people and still provide abundant fish, wildlife, and northwoods appeal.

GOALS OF STRATEGY:

1. Preserve native species diversity which, in turn, fosters natural habitat for fish and other aquatic species, from frogs to birds.
2. Prevent openings for invasive species to become established in the absence of the native species.
3. Concentrate on a" whole-lake approach" for control of aquatic plants, thereby fostering systematic documentation of conditions and specific targeting of invasive species as they exist.
4. Prohibit removal of wild rice. WDNR – Northern Region will not issue permits to remove wild rice unless a request is subjected to the full consultation process via the Voigt Tribal Task Force. We intend to discourage applications for removal of this ecologically and culturally important native plant.
5. To be consistent with our WDNR Water Division Goals (work reduction/disinvestment), established in 2005, to "not issue permits for chemical or large scale mechanical control of native aquatic plants – develop general permits as appropriate or inform applicants of exempted activities." This process is similar to work done in other WDNR Regions, although not formalized as such.

BASIS OF STRATEGY IN STATE STATUTE AND ADMINISTRATIVE CODE

State Statute 23.24 (2)(c) states:

"The requirements promulgated under par. (a) 4. may specify any of the following:

1. The **quantity** of aquatic plants that may be managed under an aquatic plant management permit.
2. The **species** of aquatic plants that may be managed under an aquatic plant management permit.
3. The **areas** in which aquatic plants may be managed under an aquatic plant management permit.
4. The **methods** that may be used to manage aquatic plants under an aquatic plant management permit.
5. The **times** during which aquatic plants may be managed under an aquatic plant management permit.
6. The **allowable methods** for disposing or using aquatic

plants that are removed or controlled under an aquatic plant management permit.

7. The requirements for plans that the department may require under sub. (3) (b). “

State Statute 23.24(3)(b) states:
“The department may require that an application for an aquatic plant management permit contain a plan for the department’s approval as to how the aquatic plants will be introduced, removed, or controlled.“

Wisconsin Administrative Code NR 109.04(3)(a) states:
“The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long-term sustainability of beneficial water use activities.”

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

APPROACH

1. After January 1, 2009* no individual permits for control of native aquatic plants will be issued. Treatment of native species may be allowed under the auspices of an approved lake management plan, and only if the plan clearly documents "impairment of navigation" and/or "nuisance conditions". Until January 1, 2009, individual permits will be issued to previous permit holders, only with adequate documentation of "impairment of navigation" and/or "nuisance conditions". No new individual permits will be issued during the interim.

2. Control of aquatic plants (if allowed) in documented sensitive areas will follow the conditions specified in the report.

3. Invasive species must be controlled under an approved lake management plan, with two exceptions (these exceptions are designed to allow sufficient time for lake associations to form and subsequently submit an approved lake management plan):
   a. Newly-discovered infestations. If found on a lake with an approved lake management plan, the invasive species can be controlled via an amendment to the approved plan. If found on a lake without an approved management plan, the invasive species can be controlled under the WDNR's Rapid Response protocol (see definition), and the lake owners will be encouraged to form a lake association and subsequently submit a lake management plan for WNDR review and approval.
   b. Individuals holding past permits for control of *invasive* aquatic plants and/or "mixed stands" of native and invasive species will be allowed to treat via individual permit until January 1, 2009 if "impairment of navigation" and/or "nuisance conditions" is adequately documented, unless there is an approved lake management plan for the lake in question.

4. Control of invasive species or "mixed stands" of invasive and native plants will follow current best management practices approved by the Department and contain an explanation of the strategy to be used. Established stands of invasive plants will generally use a control strategy based on Spring treatment. (typically, a water temperature of less than 60 degrees Fahrenheit, or approximately May 31st, annually).

5. Manual removal (see attached definition) is allowed (Admin. Code NR 109.06).

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* *Exceptions to the Jan. 1, 2009 deadline will be considered only on a very limited basis and will be intended to address unique situations that do not fall within the intent of this approach.*

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DOCUMENTATION OF IMPAIRED NAVIGATION AND/OR NUISANCE CONDITIONS

Navigation channels can be of two types:

- Common use navigation channel. This is a common navigation route for the general lake user. It often is off shore and connects areas that boaters commonly would navigate to or across, and should be of public benefit.

- Individual riparian access lane. This is an access lane to shore that normally is used by an individual riparian shore owner.

Severe impairment or nuisance will generally mean vegetation grows thickly and forms mats on the water surface. Before issuance of a permit to use a regulated control method, a riparian will be asked to document the problem and show what efforts or adaptations have been made to use the site. (This is currently required in NR 107 and on the application form, but the following helps provide a specific description of what impairments exist from native plants).

Documentation of *impairment of navigation* by native plants must include:

a. Specific locations of navigation routes (preferably with GPS coordinates)
b. Specific dimensions in length, width, and depth
c. Specific times when plants cause the problem and how long the problem persists
d. Adaptations or alternatives that have been considered by the lake shore user to avoid or lessen the problem
e. The species of plant or plants creating the nuisance (documented with samples or a from a Site inspection)

Documentation of the *nuisance* must include:

a. Specific periods of time when plants cause the problem, e.g. when does the problem start and when does it go away.
b. Photos of the nuisance are encouraged to help show what uses are limited and to show the severity of the problem.
c. Examples of specific activities that would normally be done where native plants occur naturally on a site but can not occur because native plants have become a nuisance.

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DEFINITIONS

Manual removal:	Removal by hand or hand-held devices without the use or aid of external or auxiliary power. Manual removal cannot exceed 30 ft. in width and can only be done where the shore is being used for a dock or swim raft. The 30 ft. wide removal zone cannot be moved, relocated, or expanded with the intent to gradually increase the area of plants removed. Wild rice may not be removed under this waiver.
Native aquatic plants:	Aquatic plants that are indigenous to the waters of this state.
Invasive aquatic plants:	Non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
Sensitive area:	Defined under s. NR 107.05(3)(i) (sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water).
Rapid Response protocol:	This is an internal WDNR document designed to provide guidance for grants awarded under NR 198.30 (Early Detection and Rapid Response Projects). These projects are intended to control pioneer infestations of aquatic invasive species before they become established.

Minocqua/Kawaguesaga APMP Meeting #1 summary

June 17, 2015 7:00 PM

Location: Minocqua Town Hall

An overall review of the APMP process was discussed as well as guidelines and the role of committee members.

The 2014 PI survey of Kawaguesaga and Minocqua and Thoroughfare was reviewed extensively. There were very slight changes in species richness, FQI, Simpson's diversity index.

There were a few **significant** changes in the frequency of occurrence of several species. EWM has increased in both lakes since 2007. Southern naiad has increased significantly, especially in Minocqua and has replaced coontail as the dominant species (from 2007 species). Flowering rush (invasive) is increased significantly in Minocqua Lake. Examples of flowering rush and yellow iris were shared (actual specimens). Mention was made that a landscaper planted yellow iris in years past on a property (not verified but it is a concern).

The change was EWM coverage was evaluated from 2014 PI survey. The Goals from the APMP 2009 were reviewed. It was decided that goal 1 (management of EWM) would be addressed later. It was a consensus to retain the other goals, but to adjust the objectives in subsequent meetings.

Minocqua/Kawaguesaga APMP Meeting 2-Summary

Date: July 21, 2015

4:30 PM

Meeting started with a discussion of past EWM management and the need to evaluate the 2009 APMP EWM goal and objectives for possible changes.

The herbicide areas, concentrations, and effectiveness from 2008 to 2014 were discussed as well as the area and treatment concentration for 2015. Many questions were asked about effectiveness and how concentrations have increased with treatment protocol.

The weevil program was summarized and discussed. It was discussed that the weevil augmentation was unsuccessful and a recent study showed it wasn't successful so far in other lakes studied.

The diving program with data from three years were reviewed and discussed.

The group began pursuing goal/objectives for future EWM management. Kevin Gauthier (DNR) discussed the concerns over aggressive management of EWM on Minocqua/Kawaguesaga. He stated that there are some peer reviewed studies nearing publication that will shed some light on the subject. Susan Knight (DNR) shared information about Boot Lake where no treatment has taken place yet the EWM has become reduced. The annual variation of EWM was discussed and can be a contributor to what appears to be effective reduction. Kevin Gauthier suggested maybe taking some time off from herbicide application. Another possible suggestion was to increase the treatment threshold. One committee member asked how an increase in the treatment threshold would have changed the 2015 treatment. Many contributed discussions about the concerns over herbicide use and what happens if treatment is scaled back. Kevin Gauthier pointed out that AIS is a symptom of human impacts on lake and is not the demise of these lakes.

Small scale vs large scale effectiveness was discussed. Small scale appears to be "hit and miss" with wide variation of successful reduction with herbicide.

The diving program was discussed and an analysis of the effectiveness difference between what is being used now vs DASH (Diver Assisted Suction Harvester).

At the end of the meeting, Steve Schieffer stated he would provide the following:

1. Examples of how the increased threshold would change the 2015 treatment area.
2. Numbers showing the amount of EWM removed and the annual cost of DASH on Tomahawk Lake.

The committee members were also asked to think about their thoughts/concerns about herbicide treatments in the future. The next meeting will address the goal(s)/objectives of EWM management and shoreline restoration if time.

Minocqua/Kawaguesaga APMP Meeting 3 Summary

Date: Aug 11, 2015

Time: 4:00

This meeting started with a discussion of the threshold to consider for using herbicide for reducing EWM. This discussion dominated much of the meeting time. Many committee members expressed concern over the adverse effects of 2,4-D on the ecosystem, but cited a lack of research that shows, in peer reviewed studies, those effects. The lack of consistent results of small bed treatments was also discussed, but no definitive size seems evident. The committee stated that residents/stakeholders have expressed concern of EWM spread. They are comfortable with the aggressive approach from the 2009 APMP, which had a small aerial threshold. With extensive discussion it was decided to have the minimum area to be 500 sq ft and a mean density of >1.5 and a frequency of occurrence >60%. The committee agreed that a specific data collection occur through many sample points within a polygon to better reflect the mean density and aerial coverage of 60%.

The diving program is popular and the committee feels very helpful. A discussion about DASH (Diver Assisted Suction Harvest) being used by neighboring Tomahawk Lake may be worth looking to as a possible alternative. It was agreed that he DASH program should be evaluated in terms of start-up cost, reduction of EWM, and annual cost of operation and compared to the present program being utilized. In the meantime, the present diving program will continue. John Gray discussed helping divers develop a better system to measure the amount of EWM (mass) removed. The objectives for diving were developed at this time.

A discussion about enhancing volunteer monitoring was discussed. Valid monitoring is paramount to the control of EWM. The lakes will be divided by region. A resident, who is better selected by board if possible, will monitor approximately 3 times in the summer…July, August and Sept. A training will take place, which will include GPS use as this has been an issue.

Other AIS, especially flowering rush are becoming a bigger concern. It was decided by the committee that flowering rush should be mapped in summer, 2016 and that purple loosestrife needs to be evaluated to see if spreading. The beetle program has been run by Oneida County and possibly DNR and should continue.

CBCW will continue as is.

Shoreline restoration was discussed. The committee stated strong support but how to motivate landowners is a concern. Some committee members felt that public education using newly created shoreline restorations was important. The goal is to have 15 restorations completed by the end of 2016. A few felt this may be tough, but want to continue to reach toward that goal over the time frame of the APMP (an AIS grant has a small cost share amount to reach these 15, but he grant is done at the end of 2016). The commitment to the number of restorations will become the objective.

Water quality issues for the future were discussed. This issue is difficult to implement within a plant management plan, but is was agreed that shoreline restoration is a key component and that this will take an integrated effort with all management issues. It was recognized that maintaining a healthy native plant community is also significant. The hope is to maintain the water clarity (secchi disk) at the 10 year mean.

Lake ecology/plant education efforts will continue as in past plan.

Appendix F-Information on other invasive species in Kawaguesaga and Minocqua Lakes

Curly leaf pondweed-*Potamogeton crispus*

The seriousness of curly leaf pondweed infestation is somewhat unclear. The lack of clarity on the issue rests on the likelihood of further spread of curly leaf pondweed throughout Kawaguesaga and Minocqua Lakes, and the resultant impacts on native plants and fish and wildlife habitat. A related question is whether treatment in the form of herbicide application is likely to be effective for long-term, whole lake control and if the result will cause more harm than good to native plant populations. Clear answers regarding these potential impacts are not available. However, it is unlikely that herbicide application will result in complete elimination of curly leaf pondweed. It is possible that management can reduce the spreading of the non-native plant, especially in the main portion of the lake. In the management area (east bay), the growth of curly leaf pondweed is so extensive that treatment would probably have minimal impact and would have adverse affects on the native plant community.

Curly leaf pondweed is specifically designated as an invasive aquatic plant (along with Eurasian water milfoil and purple loosestrife) to be the focus of a statewide program to control invasive species in Wisconsin. Invasive species are defined as a "non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health (23.22(c)."

The Wisconsin Comprehensive Management Plan for Aquatic Invasive Species describes curly leaf pondweed impacts as follows:

> It is widely distributed throughout Wisconsin lakes, but the actual number of waters infested is not known. Curly-leaf pondweed is native to northern Europe and Asia where it is especially well adapted to surviving in low temperature waters. It can actively grow under the ice while most plants are dormant, giving it a competitive advantage over native aquatic plant species. By June, curly-leaf pondweed can form dense surface mats that interfere with aquatic recreation. By mid-summer, when other aquatic plants are just reaching their peak growth for the year, it dies off. Curly-leaf pondweed provides habitat for fish and invertebrates in the winter and spring when most other plants are reduced to rhizomes and buds, but the mid-summer decay creates a sudden loss of habitat. The die-off of curly-leaf pondweed also releases a surge of nutrients into the water column that can trigger algal blooms and create turbid water conditions. In lakes where curly-leaf pondweed is the dominant plant, the summer die-off can lead to habitat disturbance and degraded water quality. In other waters where there is a diversity of aquatic plants, the breakdown of curly-leaf may not cause a problem.[1]

The state of Minnesota DNR web site explains that curly leaf pondweed often causes problems due to excessive growth. At the same time, the plant provides some cover for fish and some waterfowl species feed on the seeds and winter buds.[2]

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[1] Wisconsin's Comprehensive Management Plan To Prevent Introductions and Control Existing Populatins of Aquatic Invasive Species. Prepared by: Wisconsin Department of Natural Resource. September 2003.

[2] Information from Minnesota DNR (www.dnr.state.mn.us/aquatic_plants).

The following description is taken from a Great Lakes Indian Fish and Wildlife Commission handout.

Curly leaf pondweed (*Potamogeton crispus*)[3]

Identification:

Curly leaf pondweed is an invasive aquatic species found in a variety of aquatic habitats, including permanently flooded ditches and pools, rivers, ponds, inland lakes, and even the Great Lakes. Curly leaf pondweed prefers alkaline or high nutrient waters 1 to 3 meters deep. Its leaves are strap-shaped with rounded tips and undulating and finely toothed edges. Leaves are not modified for floating, and are generally alternate on the stem. Stems are somewhat flattened and grow to as long as 2 meters. The stems are dark reddish-green to reddish-brown, with the mid-vein typically tinged with red. Curly leaf pondweed is native to Eurasia, Africa and Australia and is now spread throughout most of the United States and southern Canada.

Characteristics:

New plants typically establish in the fall from freed turions (branch tips). The winter form is short, with narrow, flat, relatively limp, bluish-green leaves. This winter form can grow beneath the ice and is highly shade-tolerant. Rapid growth begins with warming water temperatures in early spring – well ahead of native aquatic plants.

Reproduction and dispersal:

Curly leaf pondweed reproduces primarily vegetatively. Numerous turions are produced in the spring. These turions consist of modified, hardened, thorny leaf bases interspersed with a few to several dormant buds. The turions are typically 1.0 – 1.7 cm long and 0.8 to 1.4 cm in diameter. Turions separate from the plant by midsummer, and may be carried in the water column supported by several leaves. Humans and waterfowl may also disperse turions. Stimulated by cooler water temperatures, they germinate in the fall, over-wintering as a small plant. The next summer they mature, producing reproductive tips of their own. Curly leaf pondweed rarely produces flowers.

Ecological impacts:

Rapid early season growth may form large, dense patches at the surface. This canopy overtops most native aquatic plants, shading them and significantly slowing their growth. The canopy lowers water temperature and restricts absorption of atmospheric oxygen into the water. The dense canopy formed often interferes with recreational activities such as swimming and boating.

In late spring, curly leaf pondweed dies back, releasing nutrients that may lead to algae blooms. Resulting high oxygen demand caused by decaying vegetation can adversely affect fish populations. The foliage of curly leaf pondweed is relatively high in alkaloid compounds possibly making it unpalatable to insects and other herbivores.

[3] Information from GLIFWC Plant Information Center (http://www.glifwc.org/epicenter).

Curly leaf pondweed control:
Small populations of curly leaf pondweed in otherwise un-infested water bodies should be attacked aggressively. Hand pulling, suction dredging, or spot treatments with contact herbicides are recommended. Cutting should be avoided because fragmentation of plants may encourage their re-establishment. In all cases, care should be taken to remove all roots and plant fragments, to keep them from re-establishing.

Flowering rush-*Butomus umbellatus*[4]

Flowering rush is a perennial aquatic herb that emerges each spring from winter-hardy rhizomes. Emergent leaves are stiff, narrow and sedge like and up to three feet above the water surface. In deep water, the plan can be entirely submerged. Submerged plants have limp leaves and do not flower. Often unnoticed among other wetland plants until it blossoms, flowering rush has a distinctive flower with pink, white or purple flowers. The flowers have three petals, three sepals, and red anthers when blooming in late summer to early fall.

Flowering rush resembles bur-reed (*Sporangium sp.*) and can be mistaken with this native plant.

This plant was brought from Asia as an ornamental and has escaped water gardens. It prefers shallow or slow moving water where it grows as an emergent plant in marshes, backwaters and along shorelines. Plants spread by underground rhizomes, forming dense stands and crowding out native species. Reproduction from seed is uncommon.

Accurate identification of flowering rush when not flowering is important when using control methods (due to resemblance to native plants). Plants can be cut below the surface several times during the summer. They will re-sprout, but will eventually decrease in abundance. Small populations can be dug out by hand, carefully removing all root fragments. Small reproductive structures can break off and spread to other areas when the root system is disturbed. All plants and plant parts should be composted away from the aquatic environments. Use of chemical herbicides requires a permit from the Wisconsin DNR.

[4] Information from Wisconsin DNR invasive species factsheet. http://dnr.wi.gov/invasives/fact/rush_flowering.htm 2008

Purple loosestrife-*Lythrum salicaria*[5]

Purple loosestrife is a perennial herb 3-7 feet tall with a dense bushy growth of 1-50 stems. The stems, which range from green to purple, die back each year. The flowers are showy and vary inform purple to magenta, possess 5-6 petals aggregated into numerous long spikes, and bloom from July to September. Leaves are opposite, and attached to square stems without stalks. It has a large, woody taproot with fibrous rhizomes that form a dense mat.

Purple loosestrife is a wetland herb that was introduced as a garden perennial from Europe. It is still promoted by some for use as a landscape plant and by beekeepers for its nectar producing capability. The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators also contributes to its proliferation in North America.

This plant's optimal habitat includes marshes, stream margins, alluvial flood plains, sedge meadows, and wet prairies. It is tolerant of moist soil and shallow water sites such as pastures and meadows, although established plants can tolerate drier conditions.

Purple loosestrife spreads mainly by seed, but can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%. Seeds submerged in water can live for approximately 20 months. Vegetative spread through local perturbation is also characteristic of loosestrife, clipped, trampled, or buried stems of established plants may produce shoots and roots. It is difficult to locate non-flowering plants so monitoring should be done at the beginning of the flowering period in mid-summer.

Any sunny or partially shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. Invasion usually begins with a few pioneering plants that build up a large seed bank. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland.

[5] http://dnr.wi.gove/invasives/fact/loosestife purple.htm. 2008

Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Eventually, purple loosestrife can overrun wetlands thousands of acres in size, and almost entirely eliminate the open water habitat. The plant can also be detrimental to recreation by choking waterways.

Control of purple loosestrife

Small young plant can be hand pulled, especially in loose soil. It is important to get the entire root. Older plants are generally too big for pulling and digging up. If this is the case, chemical treatment may be necessary. When pulling by hand, handle plants prior to onset of seeds (begins early August). Removed plant parts should be dried and disposed of properly.

Careful use of herbicide can be effective for large plants. Glycophosphate (Roundup or Rodeo commercially named) is the most effective active ingredient for killing purple loosestrife. It needs to be applied in late July or August. It is used as a 1% concentration. Glycophosphate is nonselective and will kill other vegetation. Therefore, care must be taken during application so as to not apply to non-target plants.

A promising long-term treatment is biological control using insects that feed on loosestrife causing death to the plants. Six different insect species has gained U.S. approval for release as biological control of purple loosestrife. *Galerucella pusilla* and *G. calmariensis* are leaf-eating beetles which seriously affect growth and seed production by feeding on the leaves and new shoot growth of purple loosestrife plants. *Hylobius transversovittatus* is a root-boring weevil that deposits its eggs in the lower stem of purple loosestrife plants. Once hatched, the larvae feed on the root tissue, destroying the plant's nutrient source for leaf development, which in turn leads to the complete destruction of mature plants. The flower-feeding weevil, *Nanophyes marmoratus*, severely reduces seed production of purple loosestrife.

Yellow iris-*Iris pseudacorus*[6]

Yellow iris leaves are broad and sword shaped. They are green with a slight blue-gray tint to them and can be difficult to distinguish from native iris (especially when not in flower). The flowers can vary from almost white to dark yellow. The fruits produced have six angled capsules that are two to four inches long. The roots are comprised of thick, pink colored rhizomes that can spread into thick, extensive mats.

Yellow flag iris can produce many seeds that can float from the parent plant or plants can spread vegetatively from rhizome fragments. Once established it forms dense clumps or floating mats that can alter wildlife habitat and species diversity.

All parts of this plant are poisonous, which results in

[6] Informaation from Wisconsin DNR AIS at http://dnr.wi.gov/topic/invasives/fact/yellowflagiris.html

lowered wildlife food sources in areas where it dominates.
This species has the ability to escape water gardens and ponds and grow in undisturbed and natural environments. It can grow in wetlands, forests, bogs, swamps, marshes, lakes, streams and ponds.

Dense areas of this plant may alter hydrology by trapping sediment.

This plant can be physically removed if there are small patches present. All portions of the plant should be removed, especially the rhizomes and transported far from any wetland area. They should be burned or disposed into a landfill.

For larger populations, herbicides (glyphosate, imazapyr) have been effective.

Appendix G-Glossary of terms

Glossary

Ecosystem-Any complex of living organisms together with all biotic and abiotic (non-living) factors which affect them.

Emergent plant-Aquatic plants that are rooted or anchored in sediment and have stems and leaves extending well above the water surface.

Floating-leafed plant-Plants with leaves floating on the water surface and are rooted or attached to sediments by long, flexible stems.

Habitat-The physical place where an organism lives.

Herbarium-A collection of plants sampled.

Littoral zone-The region of a body of water extending from the shoreline outward to the greatest depth occupied by rooted aquatic plants.

Macrophyte-Large, rooted or floating aquatic plants that may bear flowers and seeds. Some plants are free floating and are not attached to the bottom.

Nutrient-Any chemical element, ion or compound required by an organism for the continuation of growth, reproduction, and other life processes.

Photosynthesis-Production of organic matter (carbohydrate) from inorganic carbon and water in the presence of light.

Sediment-Solid material deposited in the bottom of a basin.

Submergent plant-Aquatic plant that grows with all or most of its stems and leaves below the water surface.

Voucher-A collection of specimens sampled in a particular location.

Watershed-The entire surface landscape that contributes water to a lake or river.