

## Pre and Post Treatment Evaluation of Aquatic Plant Communities (April 2008)

### Purpose

This protocol is used to determine the need for, and evaluate the results of herbicide application or any other manipulation (but from here on called a chemical application or treatment) to reduce aquatic invasive plant species. The following protocol is applicable for introducing new treatments to lakes where the treatment size is greater than 10 acres or greater than 10% of the lake littoral area and more than 150 feet from shore\*. It is designed to satisfy AIS grant-funded treatment conditions where restoration is a goal or where performance results are needed (i.e. for scientific or financial accountability). This protocol is written for Eurasian water-milfoil (EWM) but can be adapted for Curly-leaf Pondweed and other AIS. This protocol may be appropriately adapted to evaluate non-herbicide controls.

This protocol assumes that the lake group has an Aquatic Plant Management (APM) Plan in place with specific goals for the native and invasive species in the lake. The first step of the pre- and post-treatment protocol is to collect data on where EWM is found and where treatment is proposed in order to secure an APM permit. The second step is to perform a point intercept (P/I) survey within the proposed treatment areas to assess the presence of all species. The third step is to return to the same P/I sampling points just before a spring treatment to assess the presence of the target species in the defined treatment areas. Following treatment, all species are again assessed using the same treatment P/I points. If another treatment (the next spring) is deemed necessary, the sponsor will repeat this process until either the treatable area falls to less than 10 acres or less than 10% of the littoral zone or the goals of the APM plan change.

We are aware that this approach necessitates several visits to the lake per year. This work is necessary to assess the overall success of chemical treatments at reducing invasive species and enhancing native species. After we learn how each lake responds to the treatment, we hope and expect that we will be able to cut back on the annual evaluations. For now, we need rigorous data collection that will help best deal with invasive aquatic plants.

**\*Note that whole-lake scale treatment projects (those involving  $\geq 160$  acres or  $\geq 50\%$  of the lake littoral area) may follow a slightly different protocol, as described in the text. For newly discovered or pioneer populations of EWM (defined as a localized bed that has been present less than 5 years and is less than 5 acres in size or less than 5% of lake area which ever is greater), consult *Response for Early Detection of Eurasian Water Milfoil Field Protocol* available from the WDNR (<http://dnr.wi.gov/org/water/fhp/lakes/EarlyDetectionFieldProtocol.pdf>).**

### Protocol

#### Year 1 Season before treatment

1. *Establish baseline information about plant community.*
  - a. In the season prior to a chemical treatment, perform a whole-lake summer point/intercept (P/I) survey to characterize the entire plant community if it has not been done within 5 years.
  - b. Details on the protocol for conducting plant surveys can be found in *Appendix B. Protocol of Aquatic Plant Survey – Collecting, Mapping, Preserving and Data*

Entry on the UW Extension Lakes APM in Wisconsin website:  
<http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-B.pdf> .

2. *Identify and map proposed treatment polygons.*

- a. During the summer or early fall growing season prior to the chemical treatment, map the proposed treatment areas of EWM and identify these polygons using GPS to outline the beds.
  - i. The initial P/I survey is unlikely to identify every stand of EWM. Map the invasive beds using a number of strategies such as:
    1. Use a meander search (boat out from shore to the maximum rooting zone and then head back to shore, a short ways down the shore from where you started) to find beds.
    2. If clarity is good (to the depth of rooted plants) and the EWM bed is topped out, identification can be visual but must be augmented with rake tosses to verify species identification and find the edges of the bed. Under glare conditions, brown polarized sun glasses are helpful.
    3. If visibility is limited, SCUBA, underwater video and an Aqua-View Scope are all highly recommended to make a complete assessment of the beds.
    4. Look for plant fragments wind-rowed on shore as an indication that plants may be growing off shore from this point.
  - ii. Note that in order to secure a chemical treatment permit, the applicant must know the acreage and location of the treatment areas.

3. *Confirm EWM identification.*

- a. Collect one EWM plant from each large (> 5 acres) treatment polygon where these exist, but collect at least 3 plants per lake.
- b. These EWM plants may be collected in the summer/fall before the treatment year or spring just before treatment, but the identification of the fresh plants must be confirmed by the DNR or appropriate university personnel before treatment takes place. The DNR may ask to see a specimen from the spring survey.

4. *Conduct Proposed Treatment Polygon Survey.*

- a. In order to assess the effect of chemical treatment on natives, there must be a survey of all plant species in the treatment polygons before treatment. However, since natives will be largely absent at the time of the spring pre-treatment survey, the natives must be assessed the summer before treatment. Therefore, after defining the proposed treatment polygons (2a above), perform a presence/absence and rake fullness assessment of all plants at a sub-sample of points within and near the polygons as follows (see Table 1):
  - i. Sample at least 100 points per lake among the beds
  - ii. Sample a minimum of 4 points (to ensure enough detail of the plant beds) but a maximum of 10 points (the maximum resolution of many GPS units) per treated acre.

- iii. The points needn't be spread evenly across all treatment polygons, but it will be most informative to distribute the points among the largest polygons.
- iv. Record the point locations as they will be used again the following year.

**Table 1. Recommended number of points to sample in proposed treatment polygons, based on total acreage of treatments to be evaluated.**

		4 pts/acre (minimum)	10 pts/acre (maximum)	
Area to be treated (acres)	Minimum points/lake	Points/lake	Points/lake	Recommended # of Points to sample
10	100	40	100	100
20	100	80	200	100
30	100	120	300	120
40	100	160	400	160
50	100	200	500	200

- b. If the proposed treatment area consists of more than 50% of the lake littoral area, or whole-lake scale treatment methods are being used (i.e. liquid applications), then this step is omitted.
    - i. Instead, whole-lake P/I surveys should be conducted each year following treatment for the purposes of post-treatment evaluation.
    - ii. More intensive monitoring in some polygons may be warranted for evaluating treatment effectiveness or fine-tuning treatment regimes.
5. *Evaluate the treatment plan.*
- a. Once the acreage for treatment is established, be sure everyone involved agrees that a chemical treatment is the best method for solving the lake's EWM problems.
  - b. Evaluate the cost of treatment to be sure everyone involved understands the cost of chemical treatment.

Year 2 First treatment

1. *Pre-treatment Survey - Spring just before treatment*
  - a. Using the established proposed treatment polygons from YR 1, repeat the methods in the proposed treatment survey area sampling **only for EWM**. Adjust the delineation of the treatment area, if necessary. Plants may be small, and may be sparse this time of year. Underwater visual/video of the middle and edges of the proposed polygon is highly recommended.
  - b. This step may be omitted for whole-lake scale treatments (i.e. where it is not necessary to define individual treatment polygons, e.g. when liquid herbicide is applied over large areas).
2. *Conduct Treatment.*

- a. It is best to conduct the treatment as close to ice-out as possible for several reasons.
  - i. Many studies have shown that the chemical herbicides are effective at temperatures normally found in lakes just after ice-off.
    1. One exception is endothall products, which are not as effective at temperatures below 50° F.
  - ii. The best results are obtained when the biomass of the invasive is still low, so that there is less decomposing plant material and consequently less demand for oxygen that could rob other living organisms of oxygen.
  - iii. Also, it is best to treat before the natives are growing fast, so that they are minimally affected by the chemical.
- b. Therefore, treatment should occur in early spring (after ice-out), when EWM is actively growing throughout the proposed treatment areas (optimally around 6 inches tall).
- c. If optimal conditions for treatment have not occurred prior to May 31, consult with the DNR to confirm if treatments may go forward. It is possible that treatments are unnecessary or would be detrimental to the native plant community if conducted too late in the season. .

### 3. *Post-treatment Survey*

- a. A post-treatment survey should be scheduled when native plants are well established, generally mid-July through mid-August.
- b. If treating curly-leaf pondweed (CLP), a post treatment survey needs to be completed before CLP seasonal growth ends, possibly before many natives are easily visible (i.e. mid-June). Consult with the DNR to determine the optimal time to do a post-treatment survey for CLP.
- c. For the post-treatment survey, repeat the P/I for all species in the treatment polygons, as was done the previous summer
  - i. Use the results from this survey to compare with the results from the pre-treatment survey to
    1. evaluate the effectiveness on target plants,
    2. evaluate any harm or benefit to native plants
    3. identify next year's potential treatment areas for target plants.
  - ii. For whole-lake scale treatments, a full lake-wide P/I survey should be conducted.
- d. To compute the significance of results from the pre- and post-treatment surveys (pre-treatment survey in summer of Year 1 and post-treatment survey in summer of Year 2) see *Appendix I. ComputePre&PostData.xls* on the UW Extension Lakes APM in Wisconsin website (<http://www.uwsp.edu/cnr/uwexlakes/ecology/APMguide.asp>) or the DNR website (<http://dnr.wi.gov/org/water/fhp/lakes/ComputePrePostData.xls>).

### 4. *Redefine proposed treatment polygons (if further treatments are planned).*

- a. If the polygon boundaries have shifted or new colonies have emerged, new treatment polygons must be mapped and surveyed before the end of Year 2 in preparation for treatment in Year 3.

- i. Follow all instructions for Year 1 steps 2-5 above.
    - ii. If only targeted polygons are to be treated in years following a whole-lake scale treatment, then sub-sampling should occur in these polygons as described in Year 1 steps 2-5.
  - b. If the exact same polygons treated in Year 2 will be treated again in Year 3 the post-treatment survey in Year 2 can serve as the proposed treatment survey for the treatment to be done in Year 3.
    - i. If a whole-lake P/I survey is conducted as part of a whole-lake scale treatment, this serves as the pre-treatment survey for Year 3.
  - c. Mapping of the new areas could be done immediately after the post-treatment survey or in late summer or fall, but would be separate from the post-treatment survey.
  - d. If, after completing the first treatment, more treatments are needed, all areas that have ever been treated must be included in subsequent pre- and post-treatment surveys. By doing this, we can assess longer-term impacts of treatments on the plant community.
- 5. *Measuring success or the need to change course.*
  - a. Choose a percent decrease in the target plant area coverage or frequency of occurrence for an annual goal of at least 50% for restoration projects.
    - i. If you have sampled 100 points for the pre- and post-treatment survey, you will be able to detect a 20% or larger change in species frequency (of both natives and the target species).
    - ii. You must sample many more points (approximately 350 points) to see a 10% change in a species frequency.
  - b. For an overall long term goal, a reduction to less than large scale treatment (less than 10 acres or 10% of lake littoral area) where annual spot treatments can sustain low level occurrences is reasonable. Alternatively, a goal of reducing dense beds to scattered plants using a density measurement might be appropriate.
  - c. An acceptable native response is no net loss and ideally some gain. However, some loss may be purely sampling variance or inter-annual variation.

#### Year 3 and Year 4 (if additional treatments are planned)

- 1. *Repeat Year 2 procedure.*
  - a. Be sure to resample all areas treated in all years even if treatment area declines in size over time so that an accurate record of control can be established.

#### Year 5

- 1. *Repeat Year 2 procedure if necessary.*
- 2. *Conduct a lake wide P/I survey (repeat base year) to gauge overall lake community response.*
  - a. Use the P/I results to update the management plan.
  - b. Consult with a DNR lake coordinator to adjust your APM plan goals.