Guidance for selective treatment of invasive aquatic plants in Minnesota

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The purpose of this document is to provide guidance for selective treatment of invasive aquatic plants in Minnesota. Control of invasive aquatic plants with herbicide can be complicated because efficacy and selectivity are affected by a number of factors. These include choice of herbicide and timing of application, as well as concentration of herbicide and duration of exposure of plants to herbicide (Gettys et al. 2009). Development of plans to treat specific sites in specific Minnesota lakes may require consultation among various parties, including the Minnesota Department of Natural Resources (MnDNR), commercial applicators, manufacturers, experts from research groups in institutions like universities or government agencies, consultants, members of lake associations, local units of government, and perhaps others. Flexibility in development of a treatment plan is important.

Treatment done under an Invasive Aquatic Plant Permit is required to be selective (Minnesota Statute 103G.615). Selective control affects certain plants, but not others (Hoyer and Canfield 1997:62). Selective control of aquatic plants with herbicide is difficult and is the subject of continuing research. Six types of selective control of invasive aquatic plants are described below:

1) **Selective herbicides:** These compounds will control only those groups of plants that have the biological pathways that are affected by the herbicide (Gettys et al. 2009:70) and are susceptible to the herbicide. For example, Eurasian watermilfoil is quite susceptible to low to moderate concentrations of auxin-mimic herbicides, i.e., 2,4-D and triclopyr. A number of non-target native submersed plants, especially monocots, tolerate exposures for a short period of time to low to moderate concentrations of auxin-mimic herbicides.
2) **Selective Timing:** Selective control may result from treatments that are done at a time when the target non-native invasive plant is growing and susceptible to herbicide, but non-target native plants are dormant and not susceptible.

3) **Reclamation:** A third type of selective control may result some time after treatments that are not particularly selective by reducing all aquatic plants with the expectation that native plants will reestablish faster than invasive plants. For example, fluridone herbicide may be applied to lakes to reduce Eurasian watermilfoil and also reduce native plants during the year of treatment. In the subsequent years after treatment, native submersed plants may be more widely distributed and abundant in the lake than invasive species (Crowell et al. 2006). This affect usually temporary due to reestablishment of invasive species.

4) **Areas dominated by invasive aquatic plants**: Treatment of such areas is considered a type of selective control because non-target, native plants are minimally affected by such control. The resulting decrease in invasive aquatic plants may be followed by an increase in native plants.

5) **Selective Mechanical Control:** Control may also be achieved by targeting individual invasive species and removing them mechanically such as hand removal of the invasive plant.

6) **Integrated Management:** Use of a combination of the aforementioned methods.

Below are types of treatments that the DNR may approve. This list is not exhaustive; other types of treatment may be proposed and allowed.

Treatment of curly-leaf pondweed

Most treatments of curly-leaf pondweed are done with endothall, the active ingredient in Aquathol® products. Treatment of large areas usually is done with a target concentration of 0.75 to 1.5 ppm endothall. For small areas, target concentrations may be increased to 1.5 to 2.0 ppm or more. Split applications may be needed on spot treatments rather than one application to assure product has sufficient contact time. For example, for a small three (3) acre shoreline treatment, apply 1.5 ppm in the first part of the treatment, and 1.5 ppm in the second part of the treatment. The second treatment may be done either hours later or during the following day, depending on the likely rate of dissipation. When applying herbicide on spot treatments, treatment size must be sufficient to counter dilution effects. Spot treatments may need to be expanded to minimum five (5) acre treatment polygons when target species are sporadically located. For lakes where the cumulative area of spot treatments exceeds five percent of the total lake area, whole-lake herbicide concentrations should be calculated. If non-target species are

present, then endothall should not be applied at a rate that would produce a whole-lake concentration higher than the suggested concentrations for control of these species (see the label for the product). Our goal is to have treatments done when water temperatures are between 50 and 60°F, and are increasing. Water temperature should be measured at a depth of two to three feet beneath the surface.

Proposals for treatment with other herbicides may be considered.

Treatment of both curly-leaf pondweed and Eurasian watermilfoil early in the season with a combination of endothall and triclopyr or 2,4-D

These treatments usually involve application to areas in a lake or bay where curly-leaf or Eurasian watermilfoil or both are found and delineated. Treatments often are done with a target concentration of 1.0 ppm endothall and 0.25 to 1.0 ppm triclopyr or 2,4-D. Treatments have been done when water temperatures are between 50 and 60 F, and are increasing.

Treatment of Eurasian watermilfoil with an auxin-mimic, usually triclopyr or 2,4-D

The greater the percentage of the bay or lake to which herbicide is applied, the more likely it is that the whole bay or lake will be treated and that the duration of exposure of plants to herbicide will be long. For this reason, where a high percentage of the area of the basin is treated and dissipation is expected to be limited, the target concentration for whole lakes or bays may be about 0.3 ppm. For lakes or bays where a low percentage of the area of the basin is treated and dissipation is expected to be high, the target concentration may be 1.5 ppm or more.

Auxin-mimic herbicides affect other dicots, such as waterlilies. Monocots may be affected by exposures to high concentrations of herbicide for a short period of time or exposure to low concentrations for a long period of time.

Treatment of whole lakes with fluridone

General comments

For deep lakes that typically stratify, measurements of temperatures over a complete depth profile are taken regularly prior to the expected date of treatment in order to determine if the lake has stratified, and the depth of the epilimnion. Fluridone herbicide will only mix into the epilimnion, so it is necessary to know the depth of the epilimnion at the time of treatment in order to determine the amount of fluridone to apply. The amount of fluridone to be applied to the lake is determined by using the volume of the epilimnion.

Samples of water for analysis of concentrations of fluridone are taken from at least four locations in the lake at 1 day, 3 days, 7 days, 14 days, and 21 days after treatment, and then again at 1 day, 3 days, 7 days, 14 days, 30 days, and 60 days following the second or "bump" treatment. Samples of water for analysis of concentrations of fluridone are taken and sent to SePro Corp for analysis. For information about the analyses, directions for collection of samples, and "Chain of Custody" forms, please go to: http://www.sepro.com/default.php?page=labservices. Results of FastTest□ immunoassays should be provided to the MnDNR as soon as they are available so that we can help determine the timing and rate of application for the second treatment.

Treatment of Eurasian watermilfoil with fluridone

Prior to planning treatment of a lake with fluridone to control milfoil, an assay of the susceptibility of the milfoil in the lake proposed for treatment should be done. SePro Corp can provide PlanTest□, which can do this assay. In general, for milfoil treatments, fluridone should be applied achieve a target concentration of 4.0 - 4.5 ppb, with a "bump" treatment at 25 - 30 days to increase the concentration to 4.0 ppb. The initial treatment should occur in the spring (mid-May). If curly-leaf pondweed is also present and causes a significant nuisance, treatment may be done earlier (mid to late April) to control that species as well as milfoil.

Treatment of curly-leaf pondweed with fluridone

In general, curly-leaf treatments should be done to achieve a target concentration of 4.0 ppb fluridone, with a similar bump treatment after 25 - 30 days, and the initial treatment should be done as soon as possible after ice out.

Herbicides not mentioned above.

The types of treatments described above are not exhaustive. Proposals for treatments with other

herbicides, e.g., imazamox, may be considered.

Literature cited

Crowell, W.J., N.A. Proulx, and C.H. Welling. 2006. Effects of repeated fluridone treatments over nine years to control Eurasian watermilfoil in a mesotrophic lake. Journal of Aquatic Plant Management 44:133-136.

Gettys, L., W.T. Haller, and M. Belaud. 2009. Biology and control of aquatic plants; a best management practices handbook. Aquatic Ecosystem Restoration Foundation, 3272 Sherman Ridge Rd., Marietta, GA 30064.

Available at: http://www.aquatics.org/aerf_handbook.pdf

Hoyer, M.V., and D.E. Canfield, eds. 1997. Aquatic Plant Management in lakes and reservoirs. Report prepared by the North American Lake Management Society and the Aquatic Plant Management Society for the U.S. Environmental Protection Agency, Office of Water, Assessment and Watershed Protection Division, Washington, D.C.

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