Lake Tides
The newsletter for people interested in Wisconsin lakes

Getting It Right

Whole-Lake Herbicide Debate Deserves a Dose of Science

If you have read the papers lately, you may have noticed that lakes are in the news! Headlines from the Wisconsin State Journal this summer read:

"Why not try magic potion on our lakes?" (7/17)
"We won't save lakes by playing it safe" (7/19)
"DNR wary of fluridone to clear lakes of weeds" (7/22)
"Lake problems defy simple solutions" (7/31)
"Board member pushes for study of lake weed herbicide" (8/11)
"Herbicide can kill lake weeds safely" (8/14)
"For lakes cleanup, think big" (8/19)

Lake Tides *asked the DNR Research Team to explain the "ins and outs" of whole-lake treatments.*

People have long been interested in managing aquatic plants in their lakes, and few plants have attracted as much concern as the invasive Eurasian watermilfoil. Recently, a new management technique is sparking intense debate.

The subject of the debate is, as you may have guessed, whole-lake herbicide treatments for Eurasian watermilfoil (EWM). The pesky plant is now present in over 400 Wisconsin lakes. Given the rising concern over its presence and distribution, debating proper control methods is important. Unfortunately, misinformation seems to abound, making the discussion less productive than it could be. Fluridone is the chemical proposed to apply to entire waterbodies to treat EWM. The active ingredient is 1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone, and is marketed under the trade names Sonar® and Avast!® As part of the DNR's Lake Research Team, we have reviewed the effects of whole-lake fluridone treatments in Wisconsin and throughout the country. To help foster a discussion that balances sound science with ecological, social, and economic value, we'd like to clarify six common assumptions:

Assumption #1. Eurasian watermilfoil has taken over our lake!

First, you should "know your plant," particularly where and how much EWM is present. The first step in choosing an appropriate aquatic plant management plan is to conduct a good quantitative aquatic plant survey. You can check out DNR's

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Photo provided by Wisconsin Department of Natural Resources

Fluridone is typically applied through subsurface injection with hoses that drag in the water.

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plant sampling protocol at: http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/APM%20Appendix.pdf. Accurate quantitative plant surveys are important because perception and memory can be inaccurate. Since EWM is often the only plant visible at the surface, it may only appear to have "taken over." EWM tends to become dominant in disturbed eutrophic lakes, but in other lakes it may be present for decades and never reach nuisance

levels. Surveys will let you know: 1) how much EWM is really there; 2) where it is present; and 3) what other species are there as well. This information will allow you to choose a tool that is appropriate for the scope of the EWM infestation while minimizing the impact on native plants. You can also track the success of any plant management actions by following the same survey protocol for multiple years.

Assumption #2. Fluridone is just another herbicide – it's "proven" to be safe for people and the environment.

There is a key difference between how fluridone and other aquatic herbicides (e.g., diquat, endothall, 2,4-D) are used – namely, the size of the area they are used to treat. Unlike conventional treatments used to deal with portions of lakes ("spot treatments," usually 10 acres or less), the liquid formulation of fluridone must be applied at the whole-lake scale. Active concentrations of fluridone (greater than four parts per billion) must be maintained for approximately 60+ days throughout the entire surface layer of the lake for it to be effective on EWM. Because of the long contact time required, it may be impractical to treat some flowages and drainages because the chemical is lost through the outlets.

So what is the problem with treating whole lakes?

Prior to issuing a permit for a chemical application, the Wisconsin DNR is required in its aquatic plant rules (NR 107) to be reasonably certain that the application will avoid: 1) a hazard to humans, animals or other non-target organisms; 2) a significant adverse effect on the body of water; 3) significant injury to fish, fish eggs, fish larvae, essential fish food organisms or wildlife, either directly or indirectly through habitat destruction; 4) areas containing threatened or endangered species; and 5) significant negative effects on native vegetation in sensitive areas. To the best of our knowledge, there are no toxic effects of fluridone to humans or animals when applied according to label instructions. [As is the case with any herbicide, it is impossible to test every life stage of every potential organism, every potential mode of exposure (consumption, skin, aerosol), and every by-product along the process of degradation, over both the short and long term. Careful consideration should include evaluating the known beneficial and negative impacts of chemicals applied to surface waters, in addition to recognizing potential undocumented effects.]

Both positive and negative ecological effects accompany an herbicide treatment of any size. Positive effects include temporary control of exotic species. Negative effects may include die-offs of native vegetation, increases in green algae and/or cyanobacteria (blue-green algae), and effects on invertebrates and fish through loss of habitat and potential changes to oxygen profiles (possibly resulting in fish kills).

With small-scale treatments, negative effects are limited to the treatment zone, allowing susceptible species to survive elsewhere in the lake. With a whole-lake treatment, however, the entire lake ecosystem is exposed to the herbicide. Because of this, it is crucial to systematically evaluate the benefits and risks associated with treatment.

Assumption #3. Fluridone is widely used and well-studied.

A scientist's best source for reliable, unbiased information is an article in a peer-reviewed scientific journal. We started there to understand the efficacy and risks associated with whole-lake fluridone treatments. Unfortunately, we found only three peer-reviewed articles that dealt with effects on EWM and plants, zero that dealt with effects on water clarity, and three that focused on select aspects of fish biology - very few, considering these treatments occur on whole lakes! There also were no long-term studies (greater than five years). Because of the limited published information, we also contacted 30 states for unpublished monitoring data.

How widespread is the use of fluridone for whole-lake treatments? Ten states confirmed using fluridone for whole-lake chemical treatments for EWM or hydrilla (another invasive aquatic plant in the southern U.S.) within the past 10 years. In two states, whole-lake treatments are relatively common; Florida allows approximately 80 per year, and Michigan allows approximately 20 per year. Most other states have allowed experimental treatments on only a limited number of lakes (e.g., Wisconsin - 4 total, Minnesota - 8, Iowa - 6, Vermont - 4, Indiana - 4, Oregon - 2, Maine - 1). Due to research that demonstrates negative effects of whole-lake treatments on native vegetation and water clarity, the Minnesota DNR generally prohibits whole-lake treatments, especially on eutrophic lakes.

Assumption #4. Whole-lake herbicide treatments eradicate EWM.

Not the case! Not a single lake in the country has ever received a whole-lake treatment that has truly eradicated EWM. Successful treatments do significantly reduce EWM for 1-3 growing seasons, often crashing to near zero the year of treatment. However, it always returns. In years following initial treatment, manual methods or small-scale chemical treatments are employed to manage EWM as it recovers. Without repeated whole-lake treatments, EWM eventually returns to pretreatment levels, often expanding rapidly during a single season. Return of EWM in treated Midwestern lakes appears to be from roots or seeds remaining in lake sediments after treatment, not from new introductions at obvious entry points like boat launches.

With a whole-lake treatment, the entire lake ecosystem is exposed to the herbicide.

Assumption #5. Whole-lake herbicide treatments are "selective" and do not affect native plants.

How fortunate we would be if that statement were true! However, many native plants are killed by fluridone. Susceptible native plants include: coontail, elodea, naiads, northern watermilfoil, certain water lilies, some duckweeds, bladderwort, seven of the *Potamogeton* pondweeds, and water stargrass. If together these species comprise a large proportion of the local plant community, fluridone's effect on native lake vegetation will be drastic. If present, fluridone-tolerant plants like chara or wild celery may increase as long as competition from EWM is absent. However, it is only a matter of time before EWM returns to again outcompete these tolerant plants. In the meantime, some susceptible species return, while others may not.

Assumption #6. Whole-lake herbicide treatments never cause algae problems.

Herbicides are intended to kill plants. By killing plants, we can open the door to other lake problems. To understand the ecological relationships that will help us predict the effects of fluridone, let's review a little lake biology. Primary production in lakes (the conversion of carbon dioxide and energy from the sun to organic carbon and oxygen) is carried out by three interacting (and competing) communities of a lake's ecosystem – plants, algae, and certain types of bacteria.

Aquatic Plants, or "weeds," are macroscopic, and usually rooted in

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