

Eurasian Watermilfoil Solution Comparison Chart

It should be noted that Eurasian watermilfoil is considered a noxious weed in Idaho and as such, treatment is considered mandatory per Idaho Weed Law (2007).

Eurasian Watermilfoil Control	Description	Pros	Cons
Physical Methods			
Water level drawdown	A drawdown involves exposing plants and roots to prolonged freezing and drying. It is generally performed in winter months. The use of drawdown as an aquatic plant management tool is more common in reservoirs and ponds rather than in natural lakes. A water control structure or high capacity pumps are needed to draw the water down.	Natural control mechanism.	Not suitable for Pine Lake The success or failure of drawdowns in controlling Eurasian watermilfoil can be highly variable from water body to water body and from year to year within the same water body
Mechanical Methods - Because this plant spreads readily through fragmentation, mechanical controls such as cutting, harvesting, and rotovation should be avoided			
Manual Rake	2 step process: 1. Rake-like tool with water jet holes that looses roots as it is dragged through the water bottom 2. Plants float to the surface and are remove with a net.	Used in very shallow water to control all weed growth.	Limited to shallow areas and labor intensive
Rotovation	The British Columbia Ministry of Environment developed a barge mounted rototilling machine called a rotovator to remove Eurasian watermilfoil roots. Underwater tiller blades churn up to 8 inches into the sediment and dislodge buoyant Eurasian watermilfoil roots. Floating roots may then be collected from the water. Control with rotovation, generally extends 2 or more growing seasons.		Rotovation is not advised where bottom sediments have excessive nutrients and/or metals because of their potential release into the water column. Rotovation is not species selective. Plant fragments are produced and the machine does not collect plants. The process is very labor intensive and expensive
Harvesting	Harvesting can be compared to underwater lawn mowing. Plants are cut generally 5 feet below the water's surface, collected by conveyor, and stored until disposal on land. Harvesting removes surfacing mats and creates open areas of water. However because of its rapid growth rate Eurasian watermilfoil generally needs to be harvested twice during the growing season. Any effects on the control of Eurasian watermilfoil are short term. Harvesting may increase the spread of Eurasian watermilfoil throughout the water body	Immediately creates open water. Appropriate for large bodies of water (100 acres or more) with open areas with few surface obstructions. If done early in the season can have a 2nd cutting that targets E. milfoil due to is rapid growth.	Requires at least 2 cuttings due to rapid growth with critical time of yr specifications. Not a proven long term method for control due to fragmentation that increases spread of E. milfoil. Is not recommended as a control method by Michigan State University. Regrowth of Eurasian watermilfoil to pre-harvest levels typically occurs within 30-60 days
Hand-Pulling, esp. by Divers	Milfoil is pulled (including roots) from the water. As if weeding a garden the plants are removed from the water.	Good for shallow water around docks and shoreline with immediate clearing of water. Works best is shallow water (<3 feet). Can selectively control to only remove E. milfoil.	Water deeper than 3 ft. requires snorkeling equipment or SCUBA gear. It is time consuming option for example, divers must carry mesh bags for weed disposal. Water clarity can be problematic.
Bottom Dredging	Divers operate portable dredges with suction heads that remove plants and roots from the sediment - essentially vacuuming the bottom of the lake. The suction hoses draw the plant/sediment slurry up to a small barge or boat carrying the dredge. On the barge, plant parts are separated from the sediment slurry and retained for off-site disposal. The sediment slurry can be returned to the water column.	Suitable lightly to moderately infested sites with E. milfoil Controlled method that is site and species-specific. Minimizes the spread of fragments, important to control E milfoil. Diver dredging can cover a much larger area than is practical for hand-pulling and it can be effective in soft sediments. It can also be easily operated around obstacles. Works well to control early, low-level infestations of E. milfoil. Used as a maintenance tool following herbicide treatments.	Effectiveness depends on sediment condition, density of aquatic plants, and underwater visibility. Labor intensive and costly. Significant reduction in water clarity.
Bottom Barriers	Localized control (in swimming areas and around docks) can be achieved by covering the sediment with a opaque fabric which blocks light from the plants (bottom barriers or screens).	Good for small confined areas. Create immediate open water. Eliminated milfoil for that season used. If completely eliminated, then re-use in other area.	Expensive materials and installation for large areas. Must be secured in place. Often kill 'good' weeds along with milfoil. Barriers are most appropriately used for localized, small-scale control where exclusion of all plants is desirable.

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Biological Methods			
Weevil	<p>The milfoil weevil (<i>Euhrychiopsis lecontei</i>) is a natural plant predator and used for biological control for Eurasian watermilfoil for over two decades. They are commonly found in North American lakes having milfoil problems. Milfoil grows so fast that the natural populations of weevils cannot typically control it. The solution is to purchase weevils to sustainable levels high enough to effectively control the milfoil over the long-term. The adult weevil relies on the plant for food, seek out healthy milfoil tips to lay eggs. The larvae tunnel down through the stem creating holes in the stem the plants die due to lack of nutrient and lose buoyancy pulling them from the lake surface. This allows desirable native plants to compete more effectively, and eventually replace the milfoil beds.</p>	<p>Massive reduction in milfoil density, and in most cases elimination of nearly all milfoil beds; Maintenance of the remaining plants below the water's surface at non-annoyance levels Increase of native plant species and re-establishment of a diverse native plant community in areas once dominated by milfoil. <i>(Per Sellers Website)</i></p>	<p>It should be noted that though the potential for milfoil weevils has been studied (see Getsinger et al. 2002:16-27), their effectiveness is difficult to predict and not necessarily sustainable. There is little evidence they will ever provide any level of acceptable control in large, open water systems particularly with flowing water. Local consultants have had limited success with introduction of the Weevil as a control method for EWM. Provides no to moderate control - complete control unlikely. A lake with high sunfish density may require a different stocking strategy or may not be suitable for use of weevils. In most cases, some decline in E. milfoil can be seen within one to four years, but in other cases, stocking efforts appear to be ineffective. Weevils are stocked in increments of 1,000 individuals. The current market price is \$1,200 per thousand.</p>
Aquatic Moth	<p><i>Acentria ephemerella</i> (formerly <i>A. nivea</i>) is a species of grass moth known as the watermilfoil moth or water veneer. It girdles stems as it feeds, which causes significant damage to the plant as stems and leaves die or break off. This moth is used as a bio control agent on watermilfoil, but carefully, because it lacks host specificity and will attack other plant species, including natives. It tends to prefer <i>M. spicatum</i> over other plants. This is a European moth, but it was found in Canada in the 1920s, having been probably introduced accidentally. It is established in much of the northeastern United States, where it appears to have the ability to reduce watermilfoil infestations.</p>	<p>Not currently Available</p>	

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Aquatic Herbicide			
2,4-Dichlorophenoxyacetic Acid	<p>There are two formulations of 2,4-D approved for aquatic use. The granular formulation contains the low-volatile butoxy-ethyl-ester formulation of 2,4-D (Trade names include: AquaKleen® and Navigate®). The liquid formulation contains the dimethylamine salt of 2,4-D (Trade name - DMA*4IVM). 2,4-D is a relatively fast-acting, systemic, selective herbicide used for the control of Eurasian watermilfoil and other broad-leaved species. Perhaps the greatest consideration is that 2,4-D, as a systemic herbicide, can provide long-term control of Eurasian watermilfoil. The Environmental Protection Agency (EPA) product label for Navigate®, the only registered granular 2,4-D BEE product currently on the market, lists no water use restrictions for swimming or fish consumption following treatment. The EPA lists 2,4-D as a Class D herbicide which means there is insufficient data to classify the compound as a carcinogen or harmful to humans. The University of Michigan School of Public Health conducted a review of more than 160 toxicological and epidemiological studies on 2,4-D and concluded that there was insufficient evidence to link 2,4-D exposure to any forms of cancer (Garabrant and Philbert 2002). In addition 2,4-D from treated lakes has not been reported to contaminate well water adjacent to treated areas. A Michigan Department of Environmental Quality 4-year study found no traces of 2,4-D in drinking water wells adjacent to twelve lakes heavily treated with the herbicide.</p>	<p>Best used on lakes with partial investigations of E. milfoil. Granular formulations are applied where dilution or dissipation may be a concern. Effective for spot treatments of E. milfoil. Selective in controlling E. milfoil. 2,4-D herbicides are among the most widely used in the world. They are labeled for use on 65 agricultural crops (Burnside 1996) and have been registered by the EPA since the 1950's. 2,4-D herbicides are arguably the most widely studied products on the market. 2,4-D is considered a selective herbicide and typically only affects dicotyledonous plants. Monocotyledons, such as the pondweed (Potamogeton L.) species, are unaffected. The high degree of species selectivity documented for 2,4-D makes this herbicide an extremely valuable tool for combating Eurasian watermilfoil while protecting native plants. Eurasian watermilfoil declined by an average of 76.5% in treated lakes, while increasing by 24% in untreated lakes.</p>	<p>As with all methods it requires follow-up to ensure eradication. Some plants survive the treatment and re-grow (particularly when using the granular formulation of 2,4-D), so these plants must be removed by other means or controlled with a follow-up treatment. Results of spot treatment may be variable depending on water movement, size of treatment plot, size of the water body, density of E. milfoil, weather conditions, underwater springs, etc. locate wells and maintain a distance of 75 feet from them and/or 250 feet from any well less than 30 feet deep when using Granular 2,4-D or Granular Endothall (Hydrothol Granular or Aquathol Super K) products Public Perception</p>
Fluridone	<p>Fluridone (Trade names include: Sonar® and Avast!®) is a slow-acting systemic herbicide used to control Eurasian watermilfoil and other submersed plants. It may be applied as a pellet or as a liquid. Fluridone can offer excellent control of submersed plants where there is very little water movement and an extended time for plants to absorb the herbicide is allowed. Its use is most applicable to whole-lake or isolated bay treatments where dilution is minimized.</p>	<p>Best used in early spring or summer for whole-lake treatments on heavily infested E. milfoil. Low concentrations of 6ppb are effective in selectively treating EWM infestations.</p>	<p>Not suitable for spot treatments since it is difficult to maintain enough contact time between the plant and the herbicide to kill the weed. May not be effective in lake bottoms with springs or near inlet streams. lowing water dilutes concentration and thus making it less effective. MDEQ only allows for the top 10 feet of water column to be treated. Mat not be effective on deeper lakes like Pine. Public Perception</p>
Diquat and Endothall	<p>Diquat (active ingredient Diquat dibromide, Trade name, Reward) and Endothall (active ingredient endothall acid, 7-oxabicyclo(2,2,1)heptane-2,3-dicarboxylic acid, Trade name, Aquathol K) are contact-type herbicides; they are not translocated. Contact herbicides kill only the plant parts that they come into contact with. The entire plant is not killed when treated with Diquat or Endothall, so these herbicides are generally used for short-term control or in conjunction with other methods. Contact efficiency (duration, concentration and thoroughness) and re-growth from the unaffected root masses determine extent of control. Effective reductions in plant biomass can occur. In some circumstances, season-long control can be achieved but carryover control into the next season is not typical.</p>	<p>Good for short term control or with another control method. Rapid action. Endothall can be combined with 2,4-D for early season treatments. Endothall limited toxicity to fish at recommended doses.</p>	<p>Kills only the part of the plant they come in contact with. Ineffective in cold water (<50F) Water Use restrictions. May impact non-target plants, especially native pondweeds, coontail, elodea, naiads. Public Perception</p>
Triclopyr	<p>Triclopyr (Trade names include Renovate and Renovate OTF). There are two formulations of triclopyr. Triclopyr, applied as a liquid, is a relatively fast-acting, systemic, selective herbicide used for the control of Eurasian watermilfoil and other broad-leaved species such as purple loosestrife. Triclopyr can be effective for spot treatment of Eurasian watermilfoil and is relatively selective to many native aquatic grass species.</p>	<p>Mainly used for spot treatments of small beds of E. milfoil vs whole lake.</p>	<p>Used for spot treatment. Public Perception</p>