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A Brief Overview: What Makes Watermilfoil So Invasive?

The Problem: Watermilfoil Invasions

Lake managers throughout the United States and especially in Michigan, have been inundated with inquires on how to successfully control the growth of milfoils, which mostly includes Eurasian Watermilfoil (Myriophyllum spicatum), Hybrid Watermilfoil (Myriophyllum spicatum var. another species), and even native watermilfoils such as Northern Watermilfoil (Myriophyllum sibiricum) and Variable Watermilfoil (Myriophyllum heterophyllum). The latter species (Myriophyllum heterophyllum) is considered to be invasive by some scientists and was found to have significant negative impacts on waterfront property values in New Hampshire (Halstead et al., 2003). The relative invasiveness of each milfoil species varies among lakes, reservoirs, ponds, and rivers and depends upon a variety of environmental factors such as light availability, nutrient concentrations in the sediment and water column, existence of strong native aquatic plant communities to fight against infestations (resilience), and the presence of transfer vectors such as public boat launches and other means of introduction for the spread of the milfoil. However, the majority of exotic aquatic plants (such as milfoil) do not depend on high water column nutrients for growth, as they are well-adapted to using sunlight and minimal nutrients for successful growth. Additionally, milfoils easily colonize disturbed habitats (a pioneering species) which makes their relative abundance much higher than native aquatic plant species in many developed areas and especially in lakes with low biodiversity and neighborhood ponds. Furthermore, the degree of fragmentation varies among lakes and may actually be higher in calm waters since the fragments remain in the water column longer and are transferred to shorelines more readily in lakes with high wave activity.

Eurasian Watermilfoil: A Long-Time Nuisance

Eurasian Watermilfoil (Myriophyllum spicatum; Figures 1 and 2) is an exotic aquatic plant first documented in the United States in the 1880's (Reed 1997), although other reports (Couch and Nelson 1985) suggest it was first found in the 1940's. Eurasian Watermilfoil has since spread to thousands of inland lakes in various states through the use of boats and trailers that contain fragments, seeds, or entire plants; waterfowl that may unintentionally transfer seeds or fragments from an infested water body to another uninfected water body; seed dispersal by wind; and unintentional introduction from aquaria or water gardens (though this practice is rare). Eurasian Watermilfoil is a major threat to the ecological balance of an aquatic ecosystem through causation of significant declines in favorable native vegetation within lakes (Madsen et al. 1991), and may limit light from reaching many lower-growing native aquatic plant species (Newroth 1985; Aiken et al. 1979). Additionally, Eurasian Watermilfoil can alter the macroinvertebrate populations associated with particular native plants of certain structural architecture (Newroth 1985). The diversity of submersed aquatic macrophytes can greatly influence the diversity of macroinvertebrates associated with aquatic plants of different structural morphologies (Parsons and Matthews, 1995). Therefore, it is possible that declines in the biodiversity and abundance of various native submersed aquatic plant species and associated macroinvertebrates could negatively impact the fisheries of inland lakes.

Figure 1. Eurasian Watermilfoil stem, leaves, and seeds.

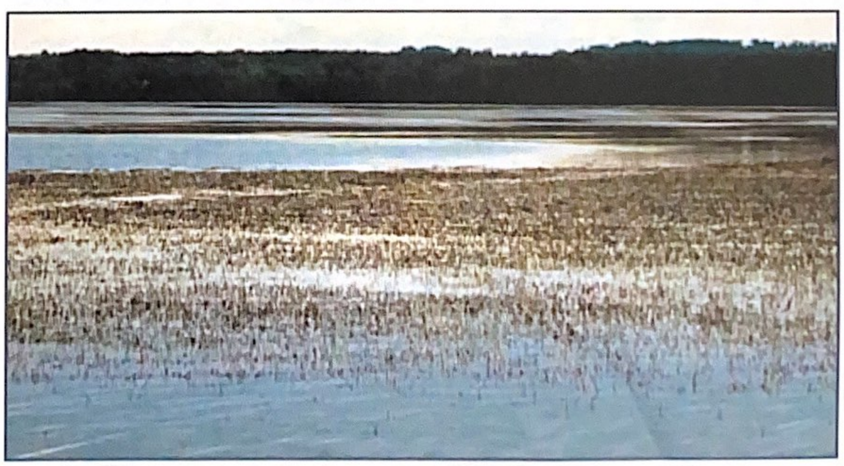

Figure 2. Eurasian Watermilfoil canopy on an inland lake.

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Figure 3. Hybrid Watermilfoil stem, leaves, and seeds.

Hybrid Watermilfoil: Our Biggest Aquatic Plant Management Challenge Yet

When a species hybridizes, it undergoes a process of genetic combination where genes from each plant strain are transferred to the new plant generation. This transfer of genes allows for a robust plant that can withstand more adverse environmental conditions than the original species. This allows the newly hybridized species to rapidly colonize most habitats and quickly out-compete other native species and even the exotic Eurasian Watermilfoil. It is commonly known that hybrid vigor is likely due to increased ecological tolerances relative to parental genotypes (Anderson 1948), which would give hybrid watermilfoil a distinct advantage to earlier growth, faster growth rates, and increased robustness in harsh environmental conditions. In regards to impacts on native vegetation, hybrid watermilfoil possesses a faster growth rate than Eurasian watermilfoil or other plants and thus may effectively displace other vegetation (Les and Philbrick 1993; Vilá et al. 2000).

Hybrid watermilfoil is a serious problem in Michigan inland lakes (Figures 3 and 4). Moody and Les (2007) were among the first to determine a means of genotypic (genes) and phenotypic (appearance) identification of the hybrid watermilfoil variant and further warned of the potential difficulties in the management of hybrids relative to the parental genotypes. This threat has been realized through intense hybrid watermilfoil control efforts throughout the U.S.

Furthermore, the required dose of 2, 4-D or other systemic aquatic herbicides for successful control of the hybrid watermilfoil is likely to be higher since there is much more water volume at greater depths it can occupy and also due to the fact that hybrid milfoil has shown increased tolerance to traditionally used doses of systemic aquatic herbicides. There has been significant scientific debate in the aquatic plant management scientific community regarding the required doses for effective control of hybrid milfoil (Glomski and Netherland, 2010; Poovey et al., 2007). To some extent, we are left with a trial-and-error approach for controlling this new invasive as the race against time continues.

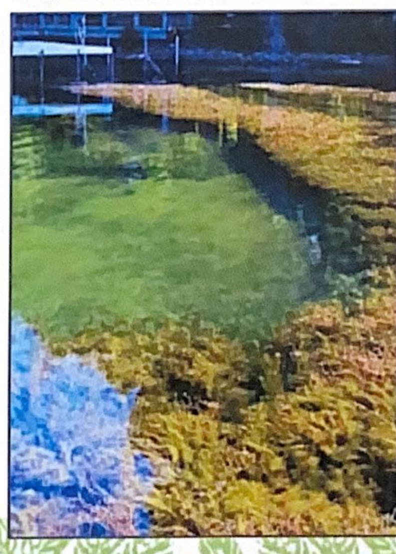

Figure 4. Hybrid Watermilfoil canopy on an inland lake.

References:

Anderson, E. 1948. Hybridization of the habitat. Evolution 2:1-9.

Couch, R., and E. Nelson 1985. Myriophyllum spicatum in North America. Pp. 8-18. In: Proc. First Int. Symp. On Eurasian Watermilfoil (Eurasian Watermilfoil) and related Haloragaceae species. July 23-24, 1985. Vancouver, BC, Canada. Aquatic Plant Management Society, Inc.

Glomski, L.M., and M.D. Netherland. 2010. Response of Eurasian and hybrid watermilfoil to low use rates and extended exposures of 2, 4-D and Triclopyr. Journal of Aquatic Plant Management 48:12-14.

Halstead, J.M., J. Michaud, S. Hallas-Burt, and J.P. Gibbs. 2003. Hedonic analysis of effects of a nonnative invader (M. heterophyllum) on New Hampshire (USA) lakefront properties. Environmental Management 32(3): 391-398.

Les, D.H., and C.T. Philbrick. 1993. Studies of hybridization and chromosome number variation in aquatic angiosperms: Evolutionary implications. Aquatic Botany 44: 181-228.

Madsen, J.D., J.W. Sutherland, J.A. Bloomfield, L.W. Eichler, and C.W. Boylen. 1991. The decline of native vegetation under dense Eurasian Watermilfoil canopies. Journal of Aquatic Plant Management 29:94-99.

Moody, M.L., and D.H. Les. 2007. Geographic distribution and genotypic composition of invasive hybrid watermilfoil (Myriophyllum spicatum x M. sibiricum) populations in North America. Biological Invasions 9: 559-570.

Newroth, P.R. 1985. A review of Eurasian Watermilfoil impacts and management in British Columbia. Pp. 139-153. In: Proc. First Int. Symp. On Eurasian Watermilfoil (Eurasian Watermilfoil) and related Haloragaceae species. July 23-24, 1985. Vancouver, BC, Canada. Aquatic Plant Management Society, Inc.

Parsons, J.K., and R.A. Matthews. 1995. Analysis of the associations between macroinvertebrates and aquatic plants in a freshwater pond. Northwest Science 69: 265-275.

Poovey, A. G., J.G. Slade, and M.D. Netherland. 2007. Susceptibility of Eurasian watermilfoil (Myriophyllum spicatum) and a milfoil hybrid (Myriophyllum spicatum x M. sibiricum) to Triclopyr and 2,4-D amine. Journal of Aquatic Plant Management 45:111-115.

Reed, C.G. 1977. History and disturbance of Eurasian Watermilfoil in the United States and Canada. Phytologia 36: 417-436.

Vilá, M., E. Weber, and C.M. D'Antonio. 2000. Conservation implications of invasion by plant hybridization. Biological Invasions 2:207-217.

SMART GARDENING FOR SHORELANDS

Smart stormwater solutions for protecting your waterfront

Bindu Bhakta, Michigan State University Extension

Jennifer Acevedo

A decorative rain barrel collects stormwater for reuse.

No matter where you live, stormwater is everyone's problem. Rain and melting snow that is unable to soak into the soil is called stormwater. When precipitation hits a hard surface such as a rooftop, roadway, concrete patio or even a compacted lawn, it is unable to naturally filter into the ground to recharge groundwater, or the supply of water stored in the cracks and spaces in and around rock and soil particles. Instead, this water travels across the landscape and picks up nutrients, pollutants, and pathogens such as:

- Nitrogen and phosphorus contained in loose soil, fertilizer and yard waste such as leaves and grass clippings.
- Pesticides, oil, gas or road salt.
- Pathogens from pet waste, effluent from failing septic systems and other sources.

Manage stormwater where it falls

Smart stormwater practices use native plants, soil and natural processes to manage stormwater where it lands. By managing precipitation to slow the flow, it can be promptly collected, filtered and absorbed into the soil. Not only can smart stormwater practices improve water quality, they can also enhance the natural beauty of your landscape, improve wildlife habitat, and conserve water.

Grab your raincoat and observe your landscape when it rains

Walk your property before, during or after it rains to see where water goes. Note the physical characteristics such as slope, soil type, soil erosion, any surface water and location of hard surfaces where water flows rather than absorbs. Look for low spots and heavy soils where water pools after it rains. Look for faster-draining sandy soil locations where water can filter into the ground so quickly that contaminants cannot be naturally filtered by the soil nor nutrients taken up by plants. Also, be sure to properly store chemicals, fertilizers and pesticides so they can be contained and easily cleaned up in case of a spill.

Create a simple sketch of your property marking the location of contamination risks and drainage issues to determine which smart stormwater practices will best address potential problems.

Divert or redirect rainwater, then put it to good use

Prevent erosion and encourage water infiltration by collecting rainwater to water plants in other garden areas. Redirect stormwater from rooftops by diverting downspouts or gutters directly into a planted area. Rain barrels, available in a variety of sizes and styles, are a creative and stylish way to capture and store stormwater for use in your gardens. For safety reasons, do not water plants you intend to eat with stormwater.

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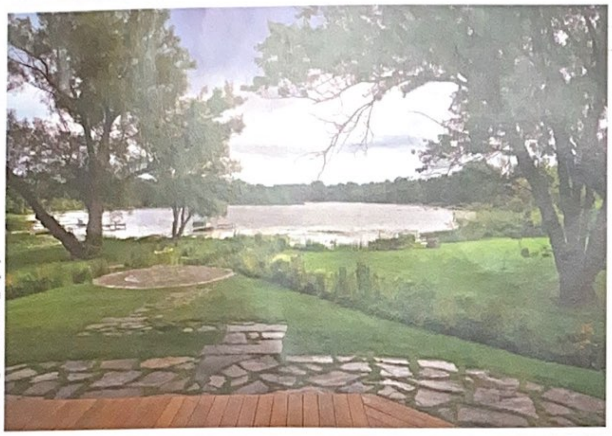
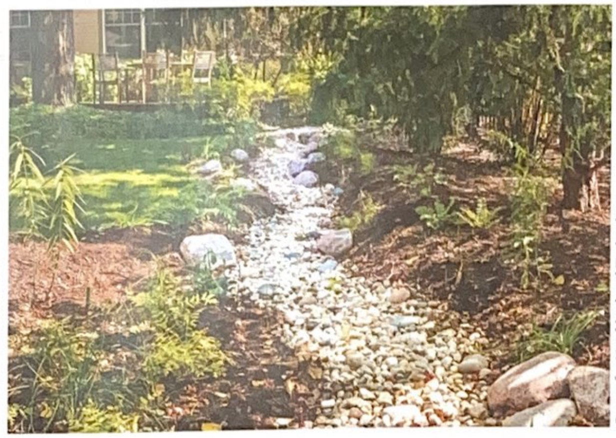
Good stormwater practices can enhance the beauty of your landscape.



Mark Bugnaski Photography

The design for these stepping stones and plants slows the flow of water toward the lake and creates opportunities for it to filter.



Center for Neighborhood Technology

Shady areas can filter stormwater with rocks and shade-loving plants.

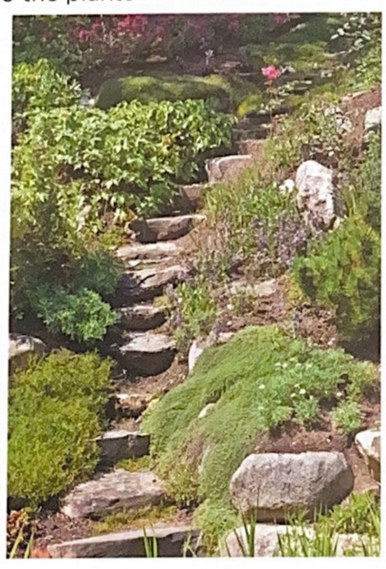
Combat stormwater and improve water quality with native plants

Add more native plants to your property. Native plants have long, dense root systems that make them both drought tolerant and cold hardy with less need for water, fertilizer and pesticides. These characteristics make them well suited for filtering stormwater and encouraging infiltration while securing the soil to prevent erosion.

Rain gardens are designed to capture stormwater in a shallow depression-shaped garden typically containing native plants and rocks. Water is held for a short period of time in the garden so the plants' deep roots can help filter the water before it adds to the groundwater.

Earth-friendly hardscape alternatives to encourage infiltration

When choosing new or replacement hardscaping, consider permeable or porous options. Traditional surfaces, like concrete and asphalt, keep water from entering the soil below. Alternatives include porous pavers, stones, gravel and wood chips. A winding path of steppingstones to a waterbody gives stormwater opportunities to be absorbed before reaching the water.



Rock steps with plants and gravel can absorb flowing water.

Let it rain on the rocks

Rock infiltration trenches and pits are a landscaping practice used to capture and soak up rainwater that runs off houses and hardscapes such as paved driveways. This technique simply involves excavating a trench or pit lined in landscaping fabric and first filled with small stones (0.75 – 2 inch) and then topped with larger stone (4-6 inch). When it rains, the spaces between the rocks fill with water, which then slowly releases into the surrounding soil.

Rock infiltration pits should be at least 10 feet away from your house to prevent flooding the structure and 50 feet away from a drinking water well. Do not place it uphill from or over a septic field. On waterfront property, place the trench in the upland portion of your landscape to prevent stormwater from entering the lake, river or stream.

Over time, sediment can accumulate in the pits. Placing landscaping fabric between the layers of small and large stone will prolong the effectiveness of rock infiltration pits. When sediment builds up, lift up the fabric and clean out the sediment.

For more information on how you can protect, lakes, streams and wetlands, see other tip sheets in the MSU Extension Smart Gardening for Shorelands series at: canr.msu.edu/smart-shorelands

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For more information on a wide variety of Smart Gardening topics, visit www.migarden.msu.edu or call MSU's Lawn and Garden hotline at 1-888-678-3464.