A Brief Overview:
What Makes Watermilfoil So Invasive?

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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.

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