Green Invasion: Milfoil Mitigation in Seneca Lake

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Abstract:

It is beneficial, from both an anthropocentric and an ecosystem point of view to reduce invasive Eurasian watermilfoil densities in Seneca Lake due to loss of macrophyte biodiversity in Seneca Lake but it reduces aesthetic appeal could lead to a 16% reduction in lakefront property values. (Zhang & Boyle, 2010.) The invasion of Eurasian watermilfoil is one of the largest problems facing the future of Seneca Lake that could lead to a myriad of future biological and financial problems.

Introduction:

Eurasian watermilfoil (*Myriophyllum spicatum*), is a ubiquitous, dominant, invasive rooted freshwater macrophyte species.

Milfoil exists in dense and expansive beds and forms canopies that suppress the growth and diversity of native macrophytes while providing habitat and serving as a food source for numerous aquatic species. (Marko et al., 2008.)

Milfoil reduces the aesthetic appeal of water and impeads recreational activities. Milfoil can also manipulate the ecosystem nutrient composition and other abiotic processes. (Cronin et al., 2006.)

A correlation between nutrient loading in watershed streams that feed into to the lake due to agricultural land use and macrophyte densities has also been hypothesized. (Makarewicz et al., 2007.)

Eurasian watermilfoil is the most dominate macrophyte in Seneca lake with more than 80% all aquatic vegetation found in the lake being milfoil. (Belinsky & Johnson. 2000.)

Acknowledgements:

I would like to thank Professor Halfman for his help throughout the process of writing this report and my fellow ENV 301 classmates for their constructive feedback during the powerpoint presentations.

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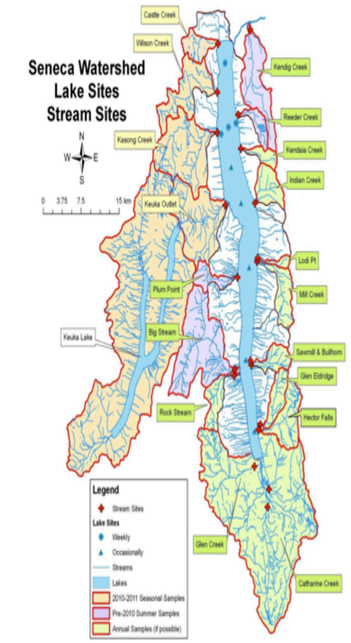

Figure 1: Preferred stream study sites (✚) for milfoil mitigation. Borrowed with permission from Halfman et al. 2012.

Mitigation Strategies:

Harvesting only strategy currently being used. Results are instantaneous for boaters and swimmers however, the results are short lived and the process is inefficient and expensive. Harvesting can cost $250-$800 per acre and would have to be repeated 2-4 times per year. (http://www.ecy.wa.gov/programs/wq/plants/management/aqua026.html) The process is non-selective may encourage milfoil colonization via fragmentation. (Smith and Barko, 1990.)

Herbicides are used in lakes nation wide but have never been used in Seneca Lake. Common herbicides include triclopyr (3,5,6-trichloro-2-pyridinyloxyacetic acid) and 2,4-D (2,4-dichlorophenoxy acetic acid). Herbicides have been very successful in reducing milfoil density. (Glomski & Netherland, 2010.) Results appear quickly, are selective and can be targeted. However, regular reapplication is required and there are high costs due to the necessity for permitting, and associated applicator fees. There human health concerns.

Biological control uses one organism is used to control the abundance of an unwanted organism via predation or pathogenesis. Due to the fact that weevils (*Euhrychiopsis lecontei*), are highly selective and specialist herbivores that prefer invasive milfoil over native species, there the preferred organism. (Sheldon & Creed, 2003.) Overall, there is high variability of effectiveness and cost between different lakes and results take longer to appear.

Best management practices (BMPs) are defined as any structural, nonstructural and/or managerial technique that is recognized to be the most effective and practical means to control nonpoint source pollutants yet is compatible with the productive use of the resource to which they are applied. BMP implementation resulted in a 30-50% decrease in milfoil densities. (Bosh et al., 2009.) Since the implementation is voluntary, it is flexible so that implementer can decide how much they would like to do.

Conclusions:

Since inlets to the lake have the greatest concentration of nutrient influx, these are the locations at which the efforts should be focused (Figure 1).

Herbicides should be used as the initial elimination technique followed by weevil stocking once the initial die off has occurred.

Monitoring of the subpopulations of weevils will be critical to measuring the success of the biological control of milfoil and could be a potential research opportunity for students

In addition to biological control, the encouraging the implementation of BMPs is recommended to reduce nutrient runoff from agricultural operations in the watershed.

The use of harvesters is not recommended for Seneca Lake because the goal of this remediation is long-term reductions in milfoil densities and due to the fact that harvesters often remove the upper 1-2 meters of the plant, which is where weevils spend their entire life cycle.