The Invasion of Variable Leaf Milfoil

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Introduction

- Variable leaf milfoil (*Myriophyllum heterophyllum*), present in Little York Lake, is an aggressive invasive that reproduces by fragmentation and has been introduced by outside sources, such as boats (Image 1 & 4).
- The dense growth crowds native plants, decreases biodiveristy, and becomes a nuisance to boaters and swimmers (2; 3).

Objective

- We tested ten different sites in Little York Lake to see whether the light and sediment properties were correlated with invasions of variable leaf milfoil.

Hypotheses

- Variable leaf milfoil will be present in areas of high light intensity (µmoles quanta $sec^{-1}m^{-2}$).
- Variable leaf milfoil will also be more abundant in soil with high organic material (grams) and high water moisture (grams).

Figure 1: Little York Lake with each sample site. N=10

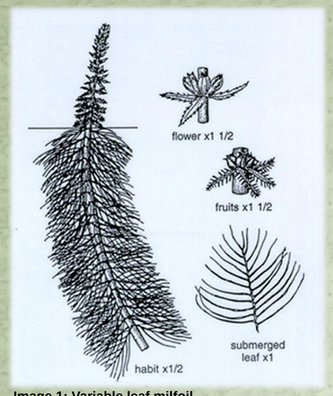

Image 1: Variable leaf milfoil.
http://www.oars3rivers.org/threats/invasive/milfoils

Methods

- Ten areas, which were previously sampled in 2011 and 2012 by Andrew Brainard (1), an ESF Ph.D. student, were sampled and marked for each of our site locations using a GPS (Figure 1).
- At each site, we measured light intensity at a half meter using the spherical cell of the Licor quantum meter (measuring photosynthetically active radiation) (Image 3).
- A sample of the substrate and macrophytes were taken using a ponar (Image 2) and the percent cover of macrophytes was estimated using a quadrat at each sample area.
- The soil samples were dried and then ashed in an oven to measure the organic material.
- Using Excel, the light intensity, organic material, and percent coverage for each site were compiled into tables and graphs.

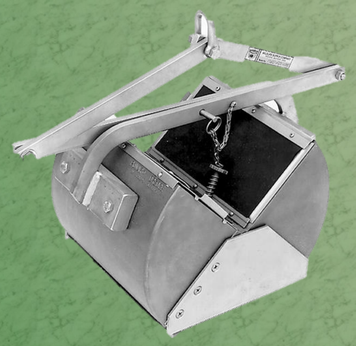

Image 2: Ponar.
http://www.rickly.com/as/bottomgrab.htm

Image 3: Licor.
http://www.advancedaquarist.com/2013/2/equipment

Image 4: Variable leaf milfoil.
http://www.moosepondassociation.org/Songo%20Locks%20Milfoil.html

References

1. Brainard, Andrew. "Little York Macrophyte Data". 2011-2012. Data Sheet.
2. "Eurasian Watermilfoil: Factsheet." Minnesota Sea Grant - Outreach - Exotic Species. Regents of the University of Minnesota, 2004. Web.
3. Wilson, Sarah, and Anthony Ricciardi. "Epiphytic Macroinvertebrate Communities on Eurasian Watermilfoil (*Myriophyllum spicatum*) and Native Milfoils *Myriophyllum sibericum* and *Myriophyllum alterniflorum* in Eastern North America." Canadian Journal of Fisheries & Aquatic Sciences 66.1 (2009): 18-30. Web.
4. "Maine Field Guide to Invasive Aquatic Plants". Maine Volunteer Lake Monitoring Program. 2007. Print.

Results

- Variable leaf milfoil made up most of the total percent cover in seven out of ten sites, while other macrophytes took up a small percentage of the total coverage.
- Between 2011 and 2012 there was no significant differences in the percent coverage of milfoil, but both years had significantly ($P<0.001$) less coverage than 2014 (Figure 2).
- There is no trend related to the amount of organic material with the percent coverage of variable leaf milfoil (Figure 3).
- There is also no trend related to the amount of water moisture with the percent coverage of variable leaf milfoil (Figure 3).
- The highest percentage of organic material also coincides with the highest percentage of water moisture (Figure 3).
- No relationship exists when examining the percentage of milfoil present in increasing intensities of light (Figure 4).

Site	% Total Cover	% Milfoil	Plants: scientific name	Common name
1	20	0	*Characeae*	Stonewort
2	100	0	*Characeae*	Stonewort
3	100	100	*Myriophyllum heterophyllum*	Variable leaf milfoil
4	75	75	*M. heterophyllum*	Variable leaf milfoil
5	85	85	*M. heterophyllum*	Variable leaf milfoil
6	0	0	None (control)	None (control)
7	100	95	*Chara, M. heterophyllum,* and *Vallisneria*	Stonewort, variable, and eelgrass
8	100	100	*M. heterophyllum*	Variable leaf milfoil
9	100	100	*M. heterophyllum*	Variable leaf milfoil
10	100	98	*M. heterophyllum* and *Potamogeton*	Variable and pondweed

Table 1: Type of macrophytes collected, scientific and common name (4), and the percentage of macrophyte coverage for each sample site. N=10

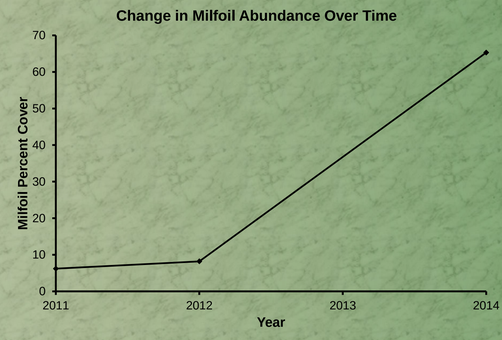

Figure 2: Comparison of milfoil percent cover in 2011, 2012, and 2014.

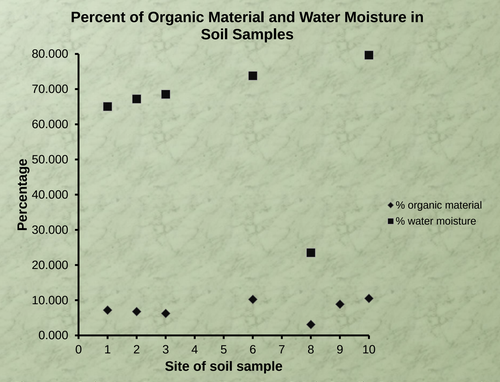

Figure 3: Soil samples were collected and dried to find the amount of organic material and water moisture was calculated. Sites 4,5, and 7 had such a high density of macrophytes, that collecting samples was not possible. N=7

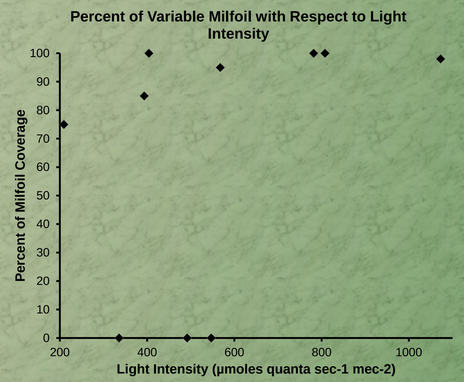

Figure 4: Measurements of light intensity were taken at each sample site at ½ meters depth. The percent coverage of variable leaf milfoil was determined as light intensity increases. N=10

Discussion/Conclusion

- Variable leaf milfoil was discovered in all but site numbers 1,2,6 and not just in areas of high light intensity.
- Milfoil also showed no preference for higher soil organic material and higher soil water moisture.
- Our results show little variability in the parameters we looked at, so it is hard to determine which conditions variable leaf milfoil prefers.
- This aquatic plant is characterized as an invasive because it has the ability to outcompete almost all other macrophytes (Table 1).
- It can be seen that there has been a dramatic increase in the spread of *M. heterophyllum* since 2011 (Figure 2).
- In the future, more soil samples and light measurements could be taken at a greater number of sites throughout the lake. Also, invertebrates could be sampled to see if indicator species are present based on the presence or absence of milfoil.
- We hope the information we found can help the lake association committee to improve the management of variable leaf milfoil in Little York Lake.

Acknowledgments

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