

Eurasian and Hybrid Watermilfoil Distribution in Minnesota

UNIVERSITY OF MINNESOTA

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Introduction

Some of the most severe plant infestations in North America involve several species in the watermilfoil genus *Myriophyllum* (Moody and Les 2002). Eurasian watermilfoil (*Myriophyllum spicatum*) has become a problematic aquatic weed largely due to its rampant spread throughout. Eurasian watermilfoil was first found in Minnesota in Lake Minnetonka in 1987 and has since spread to 35 counties in over 300 waterbodies (Invasive Species Program 2015; Fig 2). Hundreds of millions are spent in the U.S. annually on its control (Homans and Newman 2011) with permits issued for control on 80 to 100 lakes per year (Invasive Species Program 2015). It is currently the most widely managed aquatic weed in the United States (Bartodziej and Ludlow 1998).

Eurasian watermilfoil hybridizes with the native northern watermilfoil (*M. sibiricum*) (Moody and Les 2002) which raises new issues regarding management strategies for controlling infestations. It is quite difficult to distinguish between Eurasian watermilfoil and hybrids (Fig 1) and thus are typically treated with similar management strategies. There is increasing concern that hybrid watermilfoil might be more invasive than Eurasian watermilfoil (Moody and Les 2002). A laboratory study by LaRue et al. (2013a) found that hybrid watermilfoils in Michigan had faster vegetative growth rates and other studies have shown increased tolerance to herbicides compared to Eurasian watermilfoil (Thum et al. 2012, Parks et al. 2016).

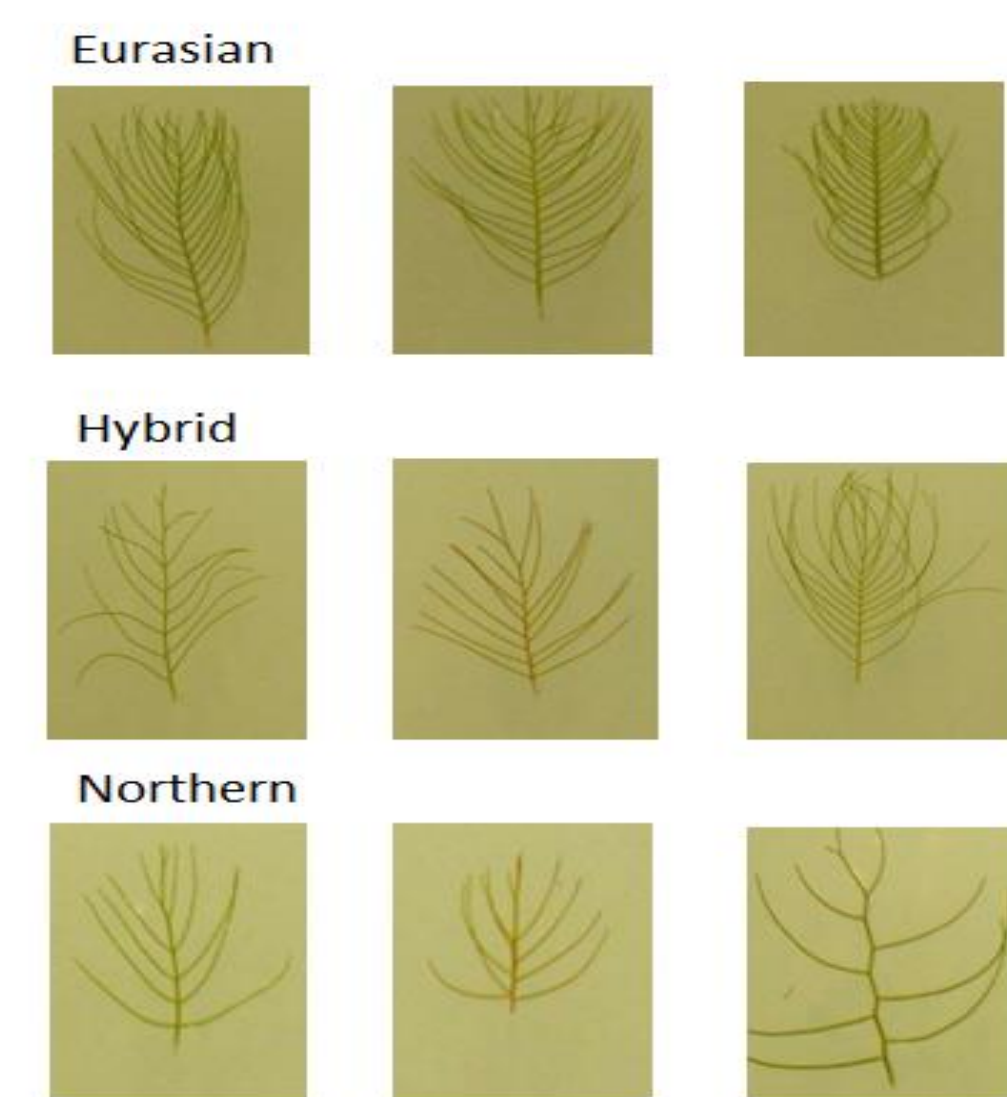


Figure 1. Leaflet comparison by taxa.

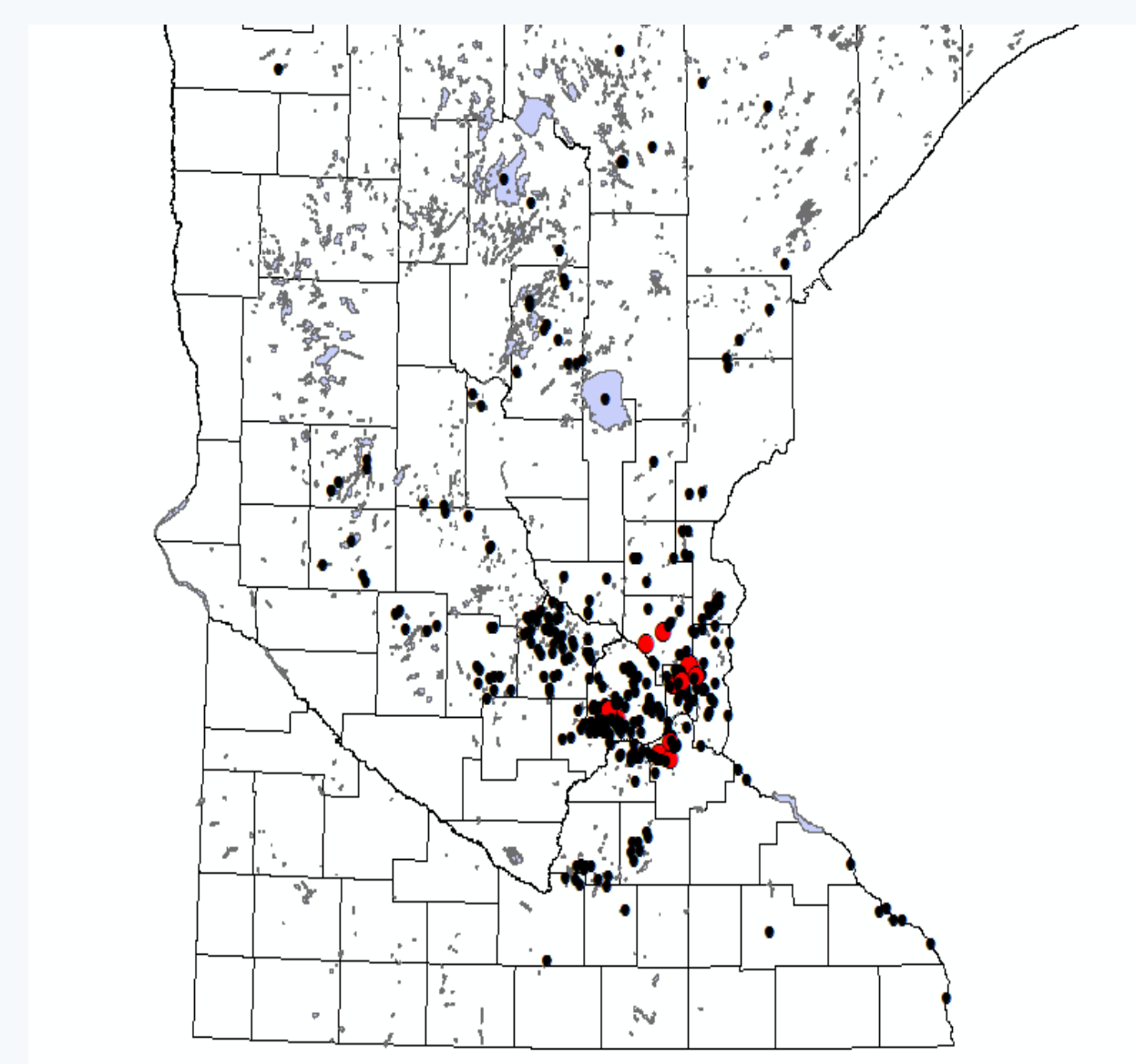


Figure 2. Distribution of Eurasian (black dot) and hybrid watermilfoil (red dot) in Minnesota.

Project Objectives

- To measure the occurrence of hybrid watermilfoil in Minnesota lakes and determine if:
 - Infestations are geographically spread across the state or restricted to the metro
 - It is more likely to be present in lakes with native northern watermilfoil or a longer invasion history
- To quantify genetic variation in hybrids.
 - Assess if specific genotypes are associated with geography and distribution extent, and invasion or management history
 - Determine if genetic diversity is related to local environment or management history and actions

Methods

To determine the distribution of hybrid (and coincidentally Eurasian and northern) watermilfoil in Minnesota we will sample 50 to 60 lakes with varying duration of invasion and size of lakes across the state (Fig 2). We will determine the number of lakes to sample per county based on their relative numbers of lakes with documented Eurasian watermilfoil infestations. At each lake, plants will be collected at up to 100 randomly selected points (Figs 3-5) with an aim to collect 25 plants.

DNA will be extracted from the plants and Eurasian, hybrid, and northern watermilfoil will be identified to taxon using a genetic assay based on internal transcribed spacer (ITS) DNA sequence. The DNA will be further analyzed with microsatellites and AFLPs to identify genotypes and determine if specific genotypes display distribution patterns.

We will examine the spatial occurrence of hybrid watermilfoil using spatial tools such as logistic regression to determine whether hybrid occurrence is related to distance from Lake Minnetonka (initial infestation in state), and spatial autocorrelation statistics to determine whether the geographic distribution of hybrids is random versus over or under-dispersed around the state.

White Bear Hybrid Sample Points 2017

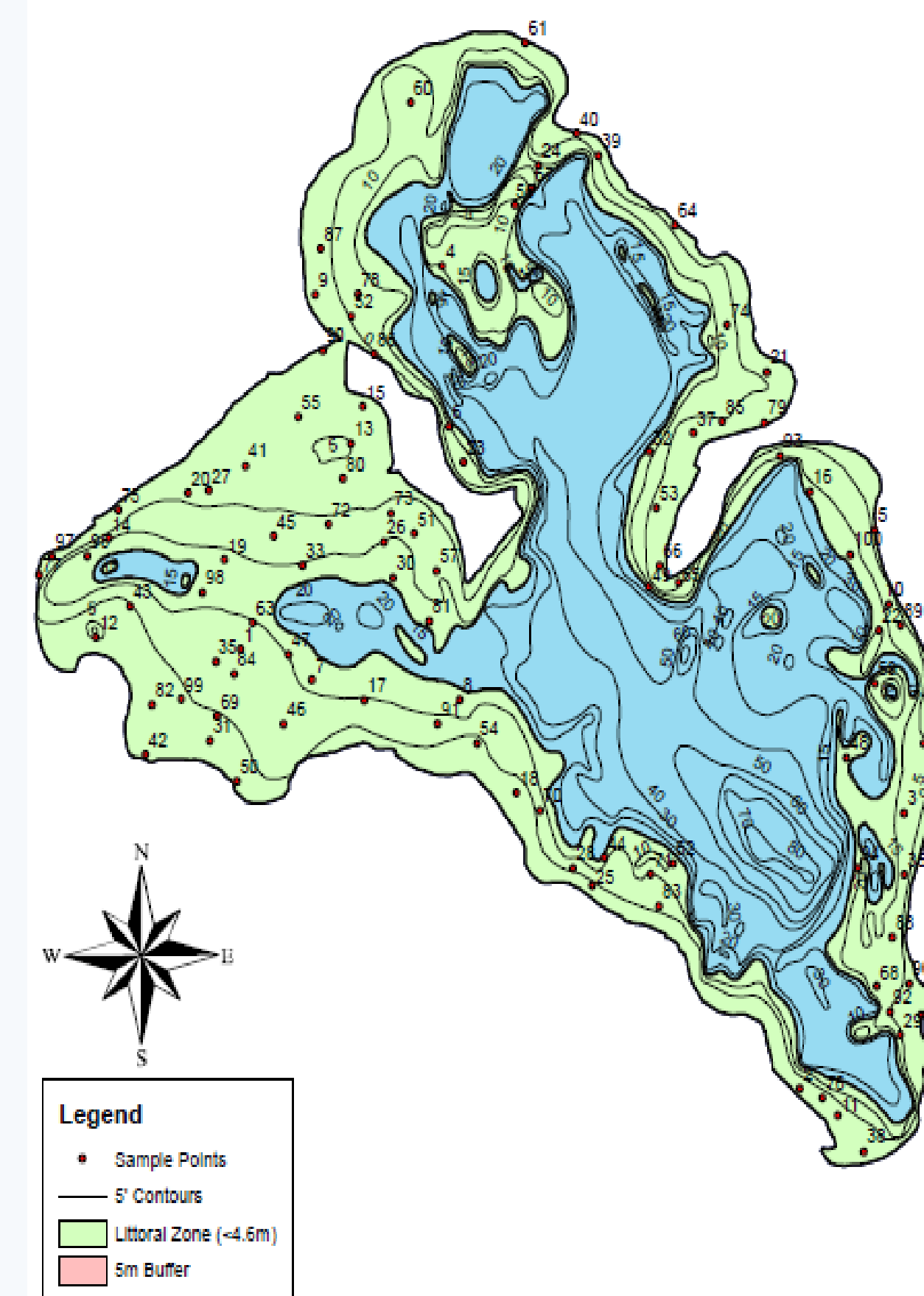


Figure 3. White Bear Lake sampling points.



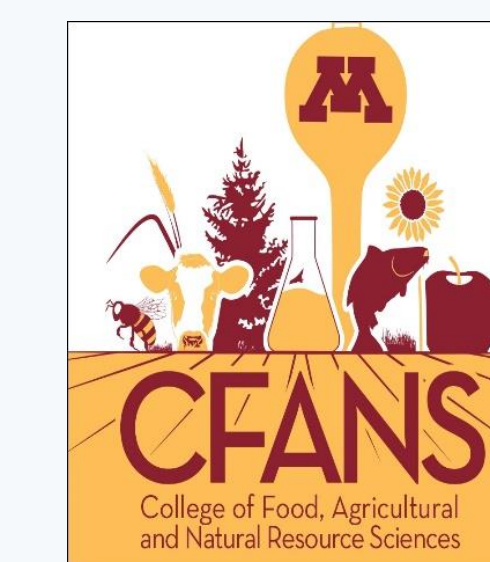
Figure 4. Plant collection using rake toss.



Figure 5. Collected milfoil stems in wash tub.

Acknowledgements

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Observations

We have sampled a total of 25 Minnesota lakes so far within the following counties: Anoka, Carver, Chisago, Hennepin, Isanti, Meeker, Ramsey, St. Louis, Scott, Sherburne, and Washington. While sampling we used visual identification based on plant color and leaflet count to identify taxa.

Some lakes were found to have watermilfoil populations of just hybrid whereas others had all Eurasian, and lakes do not necessarily need to have northern or Eurasian in order to have hybrid. We also found that a few lakes had all three taxa (northern, Eurasian, and hybrid).

Of the lakes we sampled so far, one was found to not have any watermilfoil present (Gervais Lake, Ramsey Co). There were no traces of herbicide damage, the lake was completely clear of milfoil.

We have processed all collected samples and have sent them to the Thum lab where genetic analysis will be completed this Fall.

Future Work

After genetic analyses, we will test for patterns in distribution. Based on our results from the broad scale surveys, we plan to select 10 lakes that have hybrid watermilfoil for further detailed study with 5 that are unmanaged and 5 that are undergoing active large-scale management with auxinic herbicides. In these 10 lakes, we will conduct a full point intercept survey with 150 to 200 points per littoral zone to characterize the plant community as well as the occurrence and distribution of milfoil taxa and genotypes.

References

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