

M.L. 2017 Minnesota Aquatic Invasive Species Research Center Subproject Abstract

For the Period Ending June 30, 2021

SUBPROJECT TITLE: MAISRC Subproject 18.2: Genetics to improve hybrid and Eurasian watermilfoil management

SUBPROJECT MANAGER: Dr. Raymond Newman

ORGANIZATION: University of Minnesota

COLLEGE/DEPARTMENT/DIVISION: College of Food, Agriculture, and Natural Resource Sciences; Department of Fisheries, Wildlife, and Conservation Biology

MAILING ADDRESS: 135 Skok Hall, 2008 Upper Buford Circle

CITY/STATE/ZIP: Saint Paul, MN 55108

PHONE: 612-625-5704

E-MAIL: RNewman@umn.edu

WEBSITE: <http://www.maisrc.umn.edu>

FUNDING SOURCE: Environment and Natural Resources Trust Fund (ENRTF)

LEGAL CITATION: M.L. 2017, Chp. 96, Sec. 2, Subd. 06a

SUBPROJECT BUDGET AMOUNT: \$236,423

AMOUNT SPENT: \$236,423

AMOUNT REMAINING: \$0

Sound bite of Project Outcomes and Results

Invasive Eurasian and native northern watermilfoil can hybridize and we identified hybrid watermilfoil in 39 lakes across the state. Hybrid watermilfoil is genetically more diverse than Eurasian watermilfoil and has potential to be more invasive and resistant to herbicides; several potentially problematic genotypes have been identified for further study.

Overall Subproject Outcome and Results

Invasive Eurasian and native northern watermilfoil can hybridize and some genotypes of hybrid watermilfoil have been shown to be more invasive or resistant to herbicidal control. Our aim was to determine the occurrence and distribution of hybrid watermilfoil in Minnesota, assess the response of different genotypes to herbicidal management, identify potentially problematic genotypes and assess the response of some of these genotypes to herbicide in controlled laboratory conditions. We assessed watermilfoil genetic composition in 81 waterbodies in Minnesota; 55 lakes had pure Eurasian, mostly one widespread genotype that was found in 52 lakes. Eight other Eurasian genotypes were found. We identified hybrid watermilfoil in 39 lakes across the state, mostly, but not entirely, in the Twin Cities Metro. Hybrid watermilfoil is genetically more diverse than Eurasian watermilfoil and 82 genotypes were found. Most lakes have one unique genotype of hybrid but multiple genotypes were found in several lakes and 26 have been identified in Lake Minnetonka. One hybrid genotype has been found in 10 lakes. No clearly problematic genotypes have been identified in Minnesota but we did find changes in genotype frequency with management in an assessment of 5 managed waterbodies and 3 reference waterbodies over 3 years. Several hybrid genotypes have expanded while Eurasian decreased and two hybrids from Lake Minnetonka have persistently rebounded after control. We also identified one genotype of northern watermilfoil that may be less affected by herbicide treatment. We conducted laboratory performance and herbicide challenge tests with the widespread Eurasian genotype and 4 hybrid genotypes. Additional experiments are needed but preliminary results suggest that two hybrid genotypes may be more tolerant of 2,4-D than the widespread Eurasian and two other hybrid genotypes. Continued identification of hybrid genotypes

and response to management will improve milfoil management by allowing manager to appropriate controls for their particular populations.

Subproject Results Use and Dissemination

We presented our insights and results and interacted with stakeholders at the MAISRC Showcase in 2019 and 2020 and held two in person and two virtual meetings with stakeholders to discuss observations and interest in genetic testing. We provided information to update the MAISRC website and hybrid watermilfoil fact sheet and developed a genotyping fact sheet for distribution by MAISRC and the DNR. We gave 8 presentations at regional and national scientific meetings and published three papers: Eltawely et al. 2020, Pashnick and Thum 2020, and Thum et al. 2020. In addition, two Masters projects, Eltawely 2019 and Gannon 2021 were completed.

We are in regular contact with the DNR, consultants and applicators about our results, which have been used to inform management actions.

Peer-reviewed publications:

Eltawely, J. A., R. M. Newman, and R. A. Thum. 2020. Factors Influencing the Distribution of Invasive Hybrid (*Myriophyllum Spicatum* x *M. Sibiricum*) Watermilfoil and Parental Taxa in Minnesota. *Diversity* 12(3):120. <https://doi.org/10.3390/d12030120>

Pashnick, J., and R. A. Thum. 2020. Comparison of molecular markers to distinguish genotypes of Eurasian watermilfoil, northern watermilfoil, and their hybrids. *Journal of Aquatic Plant Management* 58(1):61-71. <http://www.apms.org/wp/wp-content/uploads/japm-58-01-61-full.pdf>

Thum, R.A., Chorak, G.M., Newman, R.M., Eltawely, J.A., Latimore, J., Elgin, E., and Parks, S. 2020. Genetic diversity and differentiation in populations of invasive Eurasian (*Myriophyllum spicatum*) and hybrid (*Myriophyllum spicatum* x *Myriophyllum sibiricum*) watermilfoil. *Invasive Plant Science and Management* 13(2): 59-67. <https://doi.org/10.1017/inp.2020.12>

Masters' theses:

Eltawely, J. A. 2019. Distribution of Eurasian and hybrid watermilfoil in Minnesota. Water Resources Science Masters Plan B Paper, University of Minnesota, St. Paul, MN. <https://hdl.handle.net/11299/211341>

Gannon, K. A. 2021. Integrating DNA fingerprinting of invasive watermilfoil strains into aquatic vegetation monitoring and assessment. Plant Sciences Masters of Science Thesis, Montana State University, Bozeman, MT.