M.L. 2017 Minnesota Aquatic Invasive Species Research Center Subproject Abstract
For the Period Ending June 30, 2021

SUBPROJECT TITLE: MAISRC Subproject 8.2: Impacts of invader removal on native vegetation recovery

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FUNDING SOURCE: Environment and Natural Resources Trust Fund (ENRTF)
LEGAL CITATION: M.L. 2017, Chp. 96, Sec. 2, Subd. 06a

SUBPROJECT BUDGET AMOUNT: $119,034
AMOUNT SPENT: $119,034
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

This project adds to the growing understanding that invasive species are often only one of multiple stressors that drive declines in the health of our lakes. Controlling invasive plants is not a silver bullet for restoring turbid, degraded lakes—we have to think more holistically about what's dragging down our lakes' health.

Overall Subproject Outcome and Results

Controlling dominant invasive aquatic plants is a common goal of many stakeholders around the state. These invader-reduction efforts are often motivated as ways to promote the health or recovery of native plant communities—but the potential for these efforts to actually meet those goals is uncertain. We hypothesized that, in addition to potential competitive effects of invasive species, insufficient water clarity and native plant recolonization can also be "rate-limiting" components of restoring lake vegetation. If so, these limitations must be addressed and invader control alone will be inadequate for restoration. We addressed this issue in two ways: (1) By evaluating responses of native plants to actual, on-the-ground management efforts in invaded lakes in MN through synthesis and analysis of monitoring data. This can tell us how management is working across the state at scales relevant to lake managers. (2) We compared those conclusions to results of field experiments designed to untangle how invaders, light limitation, and reproduction can hinder native plant recovery. Overall, our work resulted in the aggregation of more than 4,000 surveys that will be used to evaluate responses of native plants to curlyleaf pondweed, Eurasian watermilfoil, and the management of each of these AIS. The funding supported the completion of all experimental fieldwork, bringing four years of work to a conclusion. In short, our experiments and data synthesis reveal that native plant recovery following invader control is a realistic outcome—but only under certain conditions, i.e., where water clarity and propagule availability are sufficient to foster native plant recovery. In addition, our results show that Eurasian watermilfoil exerts a stronger negative effect on native plants than curlyleaf pondweed. Thus, control of Eurasian watermilfoil is more likely to foster native recovery than is control of curlyleaf pondweed. If lake management is to restore native macrophytes, it must target the factors that are limiting native species recovery, and we show that invasive species are one of multiple limiting factors in Minnesota lakes.

Subproject Results Use and Dissemination

This project has produced materials of interest to a wide variety of stakeholders covering a wide breadth of the work the project entailed. Among these products are peer-reviewed publications, videos, presentations, posters, databases, and a data dashboard. Videos include a webinar on the statewide plant survey database, an instructional video describing point-intercept and delineation plant-survey methods for student and extension audiences, and two short presentations—one describing analysis of statewide data for management evaluation, and another describing ecological work using statewide data to define the niches of macrophytes. A poster and a presentation detail much of the work that went into developing aquatic plant revegetation methods. The statewide database is available as a database and through a beta-version dashboard. Multiple publications will detail the work as it pertains to contributions to the state of knowledge on the ecology and management of aquatic plants. All of these materials are available upon request.

Peer-reviewed publications:

Verhoeven, M. R., D. J. Larkin, and R. M. Newman. (2020). Constraining invader dominance: Effects of repeated herbicidal management and environmental factors on curlyleaf pondweed dynamics in 50 Minnesota lakes. Freshwater Biology, 65(5), 849–862. https://doi.org/10.1111/fwb.13468

Verhoeven, M. R., W. J. Glisson, and D. J. Larkin. (2020). Niche models differentiate potential impacts of two aquatic invasive plant species on native macrophytes. Diversity, 12, 162. https://doi.org/10.3390/d12040162

Published datasets and R code:

Verhoeven, M. R., D. J. Larkin, and R. M. Newman. (2020). Complete data and analysis for: Constraining invader dominance: Effects of repeated herbicidal management and environmental factors on curlyleaf pondweed dynamics in 50 Minnesota lakes. Data Repository for the University of Minnesota. https://doi.org/10.13020/aw92-e606

Verhoeven, M. R., W. J. Glisson, and D. J. Larkin. (2021). Complete data and analysis for: Niche models differentiate potential impacts of two aquatic invasive plant species on native macrophytes. Data Repository for the University of Minnesota. https://doi.org/10.13020/cwqe-ge69