

## **2013 Project Abstract**

For the Period Ending July 31, 2017

**PROJECT TITLE:** Aquatic Invasive Species Research Center Sub-Project 2, Phase 1: Metagenomic approaches to develop biological control strategies for aquatic invasive species

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**LEGAL CITATION:** M.L. 2013, Chp. 52, Sec. 2, Subd. 06a

**APPROPRIATION AMOUNT:** \$299,363

**AMOUNT SPENT:** \$299,363

**AMOUNT REMAINING:** \$0

### **Overall Project Outcomes and Results**

Aquatic invasive species (AIS), including Eurasian watermilfoil (EWM) and invasive mussels pose a serious threat to the health, structure, and function of aquatic ecosystems. Traditional approaches for AIS control, including the use of chemicals and manual removal, have been ineffective. This requires development of new management and eradication strategies, such as the use of (micro)biological control agents. Some microorganisms have evolved to live in close association with aquatic organisms and such relationships could potentially be exploited to develop microbe-mediated AIS management strategies. As a first step in identifying potential biocontrols, this project (Phase I) had proposed to characterize the microbial communities (bacterial and fungal) associated with invasive mussels and EWM, across time and space, using amplicon-based high-throughput sequencing approaches. To accomplish this, zebra mussels (ZMs), water, and sediment samples were obtained from 15 lakes twice a year, whereas EWM were sampled from 10 lakes, once a month for six months. Field samples were processed, DNA extracted and high-throughput sequencing was performed on all field samples using the Illumina platform. Sequencing analysis (188 million reads) showed a distinct clustering of each sample type, irrespective of sampling time and location. Core microbial communities were characterized and several taxonomic groups were identified that were either specific or present in high relative abundance in ZMs and EWM, when compared to sediment and water samples. This gives us a promising lead on microbes to pursue in Phase II of this study, which will evaluate potential pathogenic characteristics and species-specificity of any pathogens. In addition, our results also indicated that EWM was associated with elevated concentrations of fecal indicator bacteria, such as *E. coli* and *Enterococcus*. This means that not only are these aquatic plants a nuisance, but they may present a hazard to human health as well, especially if they harbor known human pathogens in addition to fecal indicator bacteria. Overall, the results obtained in Phase I have helped to define the distribution of microbes associated with these AIS, and will be useful for the development of future microbiological control strategies (Phase II).

### **Project Results Use and Dissemination**

Results obtained in this study (Phase I) helped us define the distribution of microbes specifically associated with these AIS, and will be useful for the development of future microbiological control strategies. Experiments that will be performed during Phase II will build upon the results obtained in Phase I.

Oral presentations have been made at the 'AIS Research Management Showcase' each year to update the public on research findings and progress, the next one is September 2017. In addition, project results will be presented at the 20<sup>th</sup> International Conference on Aquatic Invasive Species at Fort Lauderdale in October. Three manuscripts are currently under preparation and will be submitted for publication in peer-reviewed journals.