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

SUBPROJECT TITLE: MAISRC Subproject 24: Genetic method for control of invasive fish species

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FUNDING SOURCE: Environment and Natural Resources Trust Fund (ENRTF)
LEGAL CITATION: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a
M.L. 2017, Chp. 96, Sec. 2, Subd. 06a

SUBPROJECT BUDGET AMOUNT: $250,116
AMOUNT SPENT: $249,004
AMOUNT REMAINING: $1,112

Sound bite of Project Outcomes and Results

MAISRC has laid the groundwork to develop innovative genetic biocontrol approaches to be used in the fight against invasive carp.

Overall Subproject Outcome and Results

Invasive fish species present an estimated $5.4 billion burden on our domestic economy, and much of that extends to the lakes and rivers of Minnesota. For example, the foraging habits of the invasive common carp, *Cyprinus carpio*, diminishes water quality, reduces vegetative cover and waterfowl numbers, and reduce the ability of lakes to absorb nutrients that enter water systems through agricultural runoff. Current control methods have not been able to stem the tide of invasive carp and other fish species, so improved strategies are needed. The overall goal of this project is to demonstrate a novel approach for controlling aquatic invasive species using invasive carp species as proof-of-concept. Success of this project would lead to its implementation in other aquatic invasive species (AIS), including Asian carp and zebra mussels.

Several major obstacles had to be overcome on this project to lay the foundation for genetic biocontrol of invasive carp. These included (i) Developing husbandry for year-round carp spawning in the MAISRC Containment Lab, (ii) Demonstrating transgenesis of *C. carpio*, (iii) Testing genetic reagents in a model laboratory fish that will be needed to engineer carp, and (iv) Performing a survey to gauge public perceptions of carp genetic biocontrol. We accomplished these project goals within a one-year no-cost extension to the project funding.

The impact of our results is that we are now primed to engineer carp genetic biocontrol agents in the lab during the next phase of this award, which will begin January 2022. There is still substantial work to be done before this will directly benefit Minnesotans. Specifically, we need to demonstrate a proof-of-concept carp biocontrol system in the laboratory; perform safety/efficacy testing; obtain permits for field trials; and eventually work with key stakeholders to use this new tool in the fight against invasive carp. The overall process is expected to take 10-15 years.

Subproject Results Use and Dissemination

Data generated from this subproject is expected to be included in three peer reviewed publications. These include results from the public survey (expected submission Summer 2021), results from the carp husbandry/transgenesis procedure (expected submission Winter 2021), and agent-based modeling results (waiting for accompanying wet-lab experimental confirmation).

In addition to these primary research reports, one book chapter that describes the techniques developed under this subproject has already been published:

Bajer P, Ghosal R, Maselko M, Smanski MJ, Lechelt JD, Hansen G, Kornis M (2019) Biological control of invasive fish and aquatic invertebrates: a brief review with case studies. *Management of Biological Invasions.* 10: 200-226.