

M.L. 2021 Minnesota Aquatic Invasive Species Research Center Subproject Abstract
For the Period Ending June 30, 2025

SUBPROJECT TITLE: MAISRC Subproject 43.2: Zebra Mussel Larval Rearing, Phase 2

SUBPROJECT MANAGER: Seth Stapleton

ORGANIZATION: Minnesota Zoo

COLLEGE/DEPARTMENT/DIVISION:

MAILING ADDRESS: 12101 Johnny Cake Ridge Road

CITY/STATE/ZIP: Apple Valley, MN 55124

PHONE: 952-431-9443

E-MAIL: seth.stapleton@state.mn.us

WEBSITE: <https://mnzoo.org/>

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

LEGAL CITATION: M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 06e

SUBPROJECT BUDGET AMOUNT: \$126,457

AMOUNT SPENT: \$53,160

AMOUNT REMAINING: \$73,297

Sound bite of Project Outcomes and Results

We are continuing to advance our understanding of the husbandry, dietary and reproductive needs of invasive zebra mussels in captivity. This progress has allowed us to support researchers studying biogenetic control methods to mitigate the spread and impact of zebra mussels in Minnesota's waterways.

Overall Subproject Outcome and Results

Advancing research on biogenetic control methods for zebra mussels has been limited by an unavailability of adults during the winter and an inability to produce and rear larvae, primarily due to a lack of knowledge of appropriate diet and husbandry. To address this gap, we cultured 6 species of live freshwater and prepared saltwater algae in our laboratory and developed protocols to provide optimal water quality and flow for captive zebra mussels.

We established and staffed an algae culture laboratory to support research evaluating various algae-based diets, offering groups of adults and larvae different feed 'treatments'. Concurrently, we improved protocols for initiating spawning, washing and determining viability of gametes, fertilizing eggs, and rearing of embryos through D-stage larvae, yielding further improvements in rates of survival, development, and longevity in 2025. Initial efforts sought to replicate larval rearing conditions to most closely resembled the *in-situ* environment.

After low survival due to an abundance of competitive organisms, we progressively altered our protocols to become as sterile as possible; adult zebra mussels were cleaned extensively and allowed to release organisms and waste trapped between their valves. Then, all gametes and embryos were kept in highly purified and pH-buffered water to achieve optimal water quality while eliminating the presence of ciliates or other organisms that may be present in tap or aquarium water.

This work has advanced our understanding of zebra mussel husbandry, with initial benefits to biogenetic control research, but we note that veligers reared under our 'optimal' conditions survived and developed only as well as larvae that were not offered any food. As such, continued research is needed to better delineate the dietary needs of larvae. We will explore additional food sources that may improve survival and development, positioning us to further support research on zebra mussel controls.

Subproject Results Use and Dissemination

Project staff profiled this project at the MAISRC AIS Research and Management Showcase. Invasive species were highlighted at the Minnesota Zoo Foundation's annual Wildlife Conservation Benefit, building public awareness and generating support for AIS research. Zoo and MAISRC staff shared information during tabling and keynote talks about the zebra mussel research. Additional information-sharing outlets included summer camps and other on-site programming, the Zoo's website and social media channels, and e-newsletters distributed to member and donor households.

This project will continue into a second year on non-ENERTF funding and will explore additional food sources that may improve survival and development, positioning the team to further support research on zebra mussel controls. Resources completed after the project completion date (e.g. factsheets, infographics) will be posted on the MAISRC website.