**PROJECT TITLE:  Expanding restoration and promoting awareness of native mussels**

**I. PROJECT STATEMENT**

To improve the conservation of mussels and benefit water quality, the Minnesota Zoo is rearing juvenile mussels produced by the DNR until they are large enough for reintroduction and researching husbandry methods that will best support restoration efforts. Native mussels serve as critical ecosystem engineers, creating habitat for fish and other aquatic wildlife and helping to keep Minnesota’s waterways clean by filtering algae, sediment, and pollutants. Today, however, freshwater mussels are the most at‐risk group of species in the nation. Minnesota is no exception, as mussel populations in many of our waterways have been significantly depleted.

With this project, the Zoo proposes to build upon previous investments. ENRTF funds have enabled the Zoo to increase its capacity for holding and rearing juvenile mussels to 10,000 individuals and have supported the construction of a research and rearing facility. To date, more than 1,000 mussels have been returned to the DNR for reintroduction. Trials to assess rearing methods are targeting black sandshell and mucket mussels. The Zoo also has provided on-site conservation and educational programs and supported teachers throughout the state in mussel conservation. Launched in 2017, the *Show Us Your Mussels Challenge* promotes awareness about Minnesota’s water resources and encourages public action through student-created digital campaigns. Projects created by some 1,300 students from 20 schools have reached >75,000 members of the public.

We will leverage our unique site, expertise in aquatic systems, and high-quality water resources to expand upon the Zoo’s mussel conservation initiative. We will continue to rear mussels provided by the DNR for eventual reintroduction, develop our on-site capacity to improve growth and survivorship for new target species, and use our educational expertise and high annual visitation – some 1.3 million visitors per year – to further promote public awareness and inspire action. This program specifically addresses the DNR’s need for additional space for rearing juvenile mussels, thereby supporting long-term restoration goals. Specific objectives of the project are:

* Rear native mussels to support reintroduction efforts led by the DNR and better position the Zoo to complement restorations
* Advance our understanding of mussel rearing and propagation to maximize growth and survival
* Promote awareness and encourage public action on behalf of healthy waterways and aquatic wildlife by expanding our digital media initiative

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Rearing native mussels at the Zoo and improving husbandry practices**

We will use the Zoo’s increased capacity for rearing juvenile mussels – we can now hold up to 10,000 individuals – to continue to promote mussel restoration by growing mussels provided by the DNR from small juveniles until they are large enough for reintroduction. To further support the DNR’s activities, we will construct new systems to breed host fish that are needed for mussels to reproduce. We also will build quarantine systems for new acquisitions to evaluate protocols for minimizing the potential transfer of disease and zebra mussels to uninfested waters. Using the Zoo’s recently constructed research and rearing lab, we will examine factors that may improve mussel survival and growth in captivity, such as sediment size, flow rates, and supplemental feed, to improve husbandry practices and accelerate the return of mussels to native waterways. This research will build upon studies conducted during 2019. Activities will focus on species identified by DNR and USFWS as priorities in the Cedar, Cannon, and Mississippi watersheds.

**ENRTF BUDGET: $368,250**

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| **Outcome** | **Completion Date** |
| 1.  Construct fish host breeding and quarantine systems. | March, 2021 |
| 2. Rear juvenile mussels provided by DNR to a releasable size. Up to 1,000 reared to releasable size per species. (Annual outcome beginning in 2021.) | June, 2024 |
| 3.  Complete experiments to evaluate rearing methods that maximize mussel growth and survival. Complete data analysis and prepare reports and manuscripts. | June, 2024 |

**Activity 2: Expanding the *Show Us Your Mussels* digital media challenge and promoting public awareness**

The Minnesota Zoo will expand the *Show Us your Mussels (SUYM)* Challenge *to* serve both middle and high school students and provide teachers multiple levels of support for implementation. Students will develop and deliver digital media campaigns — such as online videos, websites, and social media outreach — promoting mussel conservation, water quality, and personal or community action. We will leverage our educational expertise to engage teachers and students through on-site Zoo classes, site visits to schools, professional development for teachers, and educational resources updated to reflect current state and national standards. We will strengthen our partnership with local schools and evaluate the impact on knowledge, attitudes, and behaviors of participants and the public.

**ENRTF BUDGET: $121,020**

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| **Outcome** | **Completion Date** |
| 1. Recruitment of new schools to participate in the SUYM challenge annually. | December (annual) |
| 1. Analysis of surveys to evaluate changes in knowledge, attitudes, and behavior. | March (annual) |
| 1. Top schools visit the Zoo to participate in on-site mussel conservation programs (maximum of 600 students per year). | June (annual) |
| 1. Professional development, site visits and other support provided to teachers. | April (annual) |
| 1. Mussel educational resources updated to meet new state science standards. | June, 2023 |

**III. PROJECT PARTNERS AND COLLABORATORS:**

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| **Organization** | **Contact Name** | **Title** | **Role** |
| Minnesota Department of Natural Resources | Madeline Pletta | Freshwater Mussel Propagation Biologist | Rearing and provisioning of mussels; technical support; reintroductions |
| US Fish and Wildlife Service, MN and WI Field Office | Tamara Smith | Biologist | Conservation planning and permitting |

Other collaborators for this work will include the US Fish and Wildlife Service - Genoa National Fish Hatchery, US Army Corps of Engineers, National Park Service, and teachers at selected schools.

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

This proposal is part of a larger multi‐partner effort to restore threatened and endangered mussel populations across the upper Midwest to historic levels. Given the significant filtration performed by healthy mussel communities, we anticipate that these restoration efforts will play an important role in achieving Minnesota’s clean water goals. The combined efforts of the Zoo, DNR and other partners will also advance the recovery of imperiled mussels in Minnesota.  Public awareness about mussel conservation and actions to improve water quality will be increased via our activities. We expect that the mussel rearing activities will need to continue beyond the scope of this proposal; the Zoo will continue to seek other sources of support for this initiative.

**V. SEE ADDITIONAL PROPOSAL COMPONENTS:**

1. Proposal Budget Spreadsheet
2. Visual Component or Map
3. Project Manager Qualifications and Organization Description