Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID: 186-F**

Restoring Wetland Invertebrates to Revive Wildlife Habitat

Category: F. Methods to Protect or Restore Land, Water, and Habitat

Total Project Budget: $ 417,895

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

Amphipods are wetland invertebrates that are critical wildlife food and indicators of water quality. We will assess reasons they are missing from Prairie Potholes and unique methods to restore amphipods.

Name: Danelle Larson

Sponsoring Organization: MN DNR

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

pictures of amphipods and their habitat

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Restoring Wetland Invertebrates to Revive Wildlife Habitat

I. PROJECT STATEMENT

Amphipods are 3" wetland invertebrates that are key food resources for salamanders, fish, water birds, ducks, and geese. Within the past 30 years, amphipods have substantially declined across the Prairie Pothole Region (PPR), and particularly in Minnesota, for reasons unknown. We will document the habitat characteristics that allow amphipods to thrive and assess the stocking of amphipods to help them successfully re-establish.

Amphipods (also called "scuds") are critical wildlife food, biological indicators of water quality and ecosystem health, and cherished by duck hunters and anglers. Amphipod decline has been noted in Minnesota, and the loss of amphipods have been blamed as a primary reason for decline in scaup and duck harvests. Today, amphipods have a very patchy distribution across the PPR and are absent from most wetlands, while few wetlands have an extremely high abundance (habitats we term "***super-wetlands***"). Amphipods are poor dispersers because they cannot fly, and the increasing distance between super-wetlands may make it difficult to establish in new wetlands. Despite the importance of amphipods, the factors that affect their distribution and abundance are poorly understood. Further, conservation groups and private land owners have been stocking amphipods to improve wetland habitats for 20+ years but the success of these efforts have not been well documented.

The overarching goals of this project are to:

(1) Identify the habitat characteristics of super-wetlands that make them of great wildlife value. This information will outline why amphipods are in decline and determine how to restore and manage wetlands towards high-quality habitats that promote amphipod and duck use.

(2) Understand the perceptions and values of stakeholders who engage in amphipod stocking in wetlands. Questioning people with stocking experience will allow us a special opportunity to understand the efficacy of the stocking practice.

(3) Document the effects of amphipod stocking to improve understanding of the habitat requirements and the utility of stocking. Experimental stockings will enable some control over factors that might influence success (e.g., size of wetland, fish presence) and further aid in understanding the habitat requirements.

Our diverse project team, which will include expert ecologists, two graduate students and many young-career technicians, will provide valuable information regarding wetland habitat quality and management. We have identified several super-wetlands to study and secured a proprietor to stock amphipods, and are requesting funds to study these sites and stocking practices in more detail.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Understand the habitat conditions of super-wetlands with amphipods. Budget: $236,946

We will identify the factors that affect amphipod abundance to understand why wetlands either have high abundance or no amphipods present. Factors will include: Landscape variables (e.g., land use, proximity to other wetlands, etc.) and in-lake variables (e.g., water chemistry, plant abundance, predator abundance). We will assess rates that amphipods naturally recolonize healthy wetlands relative to stocked wetlands.

Outcome	Completion Date
1. Choose sites and refine field methods (in-kind DNR project secured; $15,000)	December 2017
2. Wetland habitat and amphipod sampling	October 2020
3. Data processing in laboratory (water chemistry, plant and invertebrate identification)	December 2020
4. Publications, reports, and presentations	June 2021

Activity 2: Engage stakeholders to gauge their experiences with stocking Budget: $12,500

We will mail a brief social survey to known stakeholders (n=200 people; duck hunters, land owners, conservation groups, wetland managers) requesting information about: their opinion of stocking needs versus

natural colonization in wetlands; the habitat characteristics they choose to stock/not stock; their definition of stocking "success" (e.g., amphipods survived transplant; reproduced; sustained population; attracted waterfowl; other); a self-evaluation of perceptions and confidence regarding stocking successes; costs.

Outcome	Completion Date
1. Design survey (consultation with Dr. Donna Lybecker, Idaho State U.)	October 2018
2. Mail social survey to stakeholders	November 2018
3. Reminder to take the survey; survey closes Jan 15, 2019	December 2018
4. Publication, reports, and presentations	December 2019

Activity 3: Assess amphipods after stocking in natural and restored wetlands. Budget: $157,964

We will experimentally stock amphipods in wetlands to determine if they will survive the transplant, reproduce, and become a sustaining population for at least 1.5 years. Stocking may boost amphipods of management inadvertently reduced the native amphipods or if habitat restoration occurred and amphipods did not recolonize naturally because these invertebrates are unable to fly and disperse well.

Outcome	Completion Date
1. Trial stockings (in-kind DNR project pending; $30,000)	March 2018
2. Management action (drawdown, fish kill, wetland restoration, or none)	November 2018
3. Stock wetlands with amphipods	January 2019
4. Monitor amphipods populations monthly after stocking	January 2021
5. Demographic modeling (survival, reproduction, age structure)	March 2021
6. Publications, reports, and presentations	June 2021

III. PROJECT STRATEGY

A. Project Team/Partners Contributing Funds or In-kind

Dr. Danelle Larson, MN DNR: Wetland Ecologist. Will be the Project Manager and Administrator, co-advise Graduate students, and supervise student technicians and interns.

Fred Bengtson, MN DNR: Wetland Manager with 25 years' experience. Will lead stocking (Activity 3) and disseminate findings among wetland wildlife managers.

Dr. Michael Anteau, Northern Prairie Wildlife Research Center, U.S. Geological Survey: Expertise in wetland and amphipod ecology. Will help design studies and seek external funds to expand Activity 1 into ND. Dr.

Dr. Carl Isaacson, Bemidji State University: Assistant Professor of Chemistry. Contributing office space and specialized laboratory equipment.

Project Team/Partners Receiving Funds from ENRTF

Dr. Carl Isaacson, Bemidji State University: Will co-advise students and lead water chemistry analyses.

Barry Thoele, Lincoln Bait**:** Mr. Thoele is the only seller of amphipods in the state, harvests sustainably, and has had a professional relationship with MN DNR. Will provide consulting and sell amphipods (Activity 3).

B. Project Impact and Long-Term Strategy

Studying super-wetlands in detail will provide new knowledge about the characteristics of wetlands that support key invertebrates as wildlife food. The stocking survey and experiments will bring awareness and engage citizen scientists to the issue of wetland degradation and restoration options. Our analyses will provide cost-benefit comparisons of wetland enhancement and amphipod stocking for interest groups such as Ducks Unlimited, MN Waterfowl Association, Audubon Society, the many Fishing and Angling groups, and MN DNR.

C. Timeline Requirements

Larson is selecting the super-wetland sites and field methodologies in summer 2017. The crux of this project will be achieved from July 2018-June 2021 (3 years). Larson may continue evaluating super-wetlands after 2021.

2018 Detailed Project Budget

Project Title: "Restoring Wetland Invertebrates to Revive Wildlife Habitat"

IV. TOTAL ENRTF REQUEST BUDGET 3 years

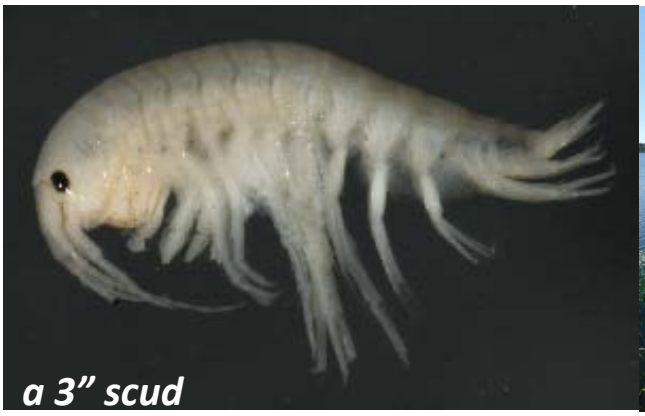
BUDGET ITEM	AMOUNT
Personnel:	$ 201,620
MN DNR Intern. 0.25% FTE. Summer 2018 and 2019. $15.00/hr and 0.0765% FICA. Two people in position type. Summer field workers to collect data with graduate student.	$ 17,920
Carl Isaacson, Bemidji State University. 0.15% FTE. Summer 2018-2020. Co-advise two graduate students, provide office and laboratory space, and run analytical chemistry.	$ 27,000
Michael Anteau, U.S. Geological Survey. 0.10% FTE. Summer 2018-2020. Scud expert to help design study, mentor two graduate students, and dessiminate findings.	$ 32,700
Hire 2 graduate students through Bemidji State U. *Environmental Studies* Master's of Science Program. $62,000 per student, which includes tuition, benefits, and salary for 2 years.	$ 124,000
Professional/Technical/Service Contracts:	$ 87,240
Contract with Lincoln Bait to provide technical consultation regarding Activity 2 and 3. Lincoln Bait will provide 400 gallons of scuds at at rate of $60/gallon. Only provider in Minnesota.	$ 29,000
Interagency Agreement to Hire 4 Bemidji State University undergraduates to assist with field work and invertebrate counting. BSU has many trained students for invertebrates, and MNDNR has the facilities, microscopes, and invertebrate expertise for supervision.	$ 58,240
Equipment/Tools/Supplies:	$ 50,000
Activity 1: paper, envelopes, post cards for surveys	$ 10,000
Activity 2 and 3: waders, temperature, oxygen, and pH meters and solutions; sampling bottles and nets; reagents for water chemistry	$ 40,000
Travel:	$ 60,550
Conferences to present FY18-20 (Larson, Isaacson, 2 graduate students; 2,000/conference)	$ 10,000
Fleet FY18-20 (25,000 miles * 0.95/mile)	$ 23,750
Hotels and per diem FY18-20 (all participants)	$ 26,800
Additional Budget Items:	$ 18,485
Publications in peer-reviewed, open-access journals (4 pubs @ $2,000 each)	$ 8,000
Direct and Necessary expenses: HR Support (~$742), Safety Support (~$171), Financial Support (~$3,350), Communication Support (~$2,541), IT Support (~$1,537), and Planning Support (~$2,144).	$ 10,485
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 417,895

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period: Pittman-Robertson funds to expand Activity 1 into North Dakota by Michael Anteau.	$ 40,000	Pending
Other State $ To Be Applied To Project During Project Period: MN DNR Research Section funds for pilot work on Activities 1 (secured) and 3 (pending). Pilot work would include site selection, field methodology trials in summer 2017 and trialing stocking experiments in winter 2018.	$ 45,000	Secured and Pending
In-kind Services To Be Applied To Project During Project Period: MN DNR supplies computers, software, GPS, field tablets ($5,000), as well as laboratory facilities, microscopes, trucks, boats and trailers ($60,000). MN DNR supplies 3 years of salary for: 2 assistant managers for field assistance (50 hours*3 years=$9,000); Danelle Larson (0.35 FTE*3 years=$82,000); and Fred Bengtson (0.10 FTE*3 years= $25,000). Bemidji State University supplies office space for students and the facilities and equipment for analytical chemistry ($60,000) and Issacson's salary (0.15 FTE*3 years; $27,000). U.S. Geological survey to match Michael Anteau salary (0.10 FTE; $32,700) and travel to visit field sites and disseminate findings ($6,000).	$ 306,700	Secured
Past and Current ENRTF Appropriation: NA	$ -	
Other Funding History: NA	$ -	

Amphipods have vanished from Prairie Pothole wetlands but ducks and salamanders are hungry!

Which habitat characteristics support amphipods in Minnesota's wetlands?



a 3" scud

What is the efficacy of stocking amphipods?

PROJECT MANAGER QUALIFICATIONS & ORGANIZATION DESCRIPTION

Project Manager: Dr. Danelle Larson, Research Scientist 2
Affiliation: Department of Natural Resources, Division of Wildlife; Wetland Habitat Team
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Danelle Larson is a young-career Research Scientist that conducts original, scientific research on wetlands and aquatic habitats in collaboration with resource managers and many academic disciplines. She also serves as a wetland expert for public and private interests regarding Minnesota's wetland resources. Danelle has over 15 peer-reviewed publications, delivered 50 oral presentations to many interest groups, mentored 9 graduate and undergraduate students, obtained and executed 12+ research grants totaling $1.5 million, and is currently adjunct faculty at Bemidji State University and Idaho State University. Danelle will be successfully concluding a large research grant ($478,000) in summer 2017 that results in the graduation of two Master's students and one Ph.D. student, several publications, and strong collaborative connections among transdisciplinary researchers (*Social-Ecological Exploratory Dynamics sub-award, National Science Foundation Award IIA-1301792*). For this proposal, Danelle has identified and united an exceptional research group comprised of several scud experts and managers to tackle critical resource information and management options for MN's wetlands.

Project Responsibilities

As Project Manager, Danelle Larson will:

- Provide direction of the team and day-to-day leadership
- Promote and support continued collaboration among a diverse research team
- Advise and supervise multiple graduate students, interns, technicians, and volunteers
- Develop a work project plan and ensure adherence
- Take responsibility for the quality of outcomes
- Disseminate findings to diverse regional and national audiences
- Manage budgets
- Document detailed tracking and reporting

Organizational Description

The mission of the Minnesota Department of Natural Resources (DNR) is to "*work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life*." Our research supports understanding for the conservation and management of Minnesota's wetland habitats, and increasing scud production will provide quality recreation for waterfowl hunters, bird watchers, and anglers. The MNDNR Research Section has peer-reviewed our proposal and supports it for scientific merit and its ability to upkeep the agency's mission.