Environment and Natural Resources Trust Fund

M.L. 2022 Approved Work Plan

General Information

ID Number: 2022-162

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: June 10, 2022

Project Title: Bugs Below Zero: Engaging Citizens in Winter Research

Project Budget: $198,000

Project Manager Information

Name: Rebecca Swenson

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

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Project Reporting

Date Work Plan Approved by LCCMR: June 27, 2022

Reporting Schedule: March 1 / September 1 of each year.

Project Completion: June 30, 2025

Final Report Due Date: August 14, 2025

Legal Information

Legal Citation: M.L. 2022, Chp. 94, Art. , Sec. 2, Subd. 05e

Appropriation Language: $198,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to raise awareness about the winter life of bugs, inspire learning about stream food webs, and engage citizen scientists in research and environmental stewardship.

Appropriation End Date: June 30, 2025

Narrative

Project Summary: Bugs Below Zero raises awareness about the winter life of bugs, inspires citizens and classrooms to unlock secrets of stream food webs, and engages new citizen scientists in research.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Bugs are everywhere in the summer, but have you considered what happens to them in the winter? To increase public support of environmental science and engagement in stewardship efforts, it is important that citizens understand and value the year-round dynamics of aquatic ecosystems. Despite the long Minnesota cold season, there is little awareness of cold-adapted insects and their critical role in groundwater-fed streams and trout populations. This project expands access to educational resources that raise awareness about the winter life of bugs, inspires citizens and classrooms to unlock some secrets of winter food webs, and engages new citizen scientists in winter research efforts.
This proposal builds upon early success with a program called Bugs Below Zero, piloted in 2020-2021 by a multi-disciplinary team of University of Minnesota faculty and students, in which participants learn about, observe, and photograph insects on the snow. New activities proposed here expand outreach and strengthen the potential for community-building, engagement, and data-sharing with participants of Bugs Below Zero. This project also provides new virtual field trips and outdoor learning experiences for a diverse set of classrooms and citizens that will take place in the winter, a time when experiential learning opportunities are often limited.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

This project helps new audiences understand the value of cold-adapted insects to Minnesota streams and provides a hands-on way to help protect Minnesota resources and support global scientific work. Minnesota's climate is unique and it helps researchers across the globe better understand interactions between weather, water, insects, and food webs. The work of the research team and Bugs Below Zero participants is important, for if the climate continues to warm, insects that emerge in winter may disappear, and so will trout that depend upon insects for food. Involving students and public audiences will deepen their appreciation of aquatic ecosystems, and in turn, inspire new and continued participation in other forms of environmental stewardship.
Specifically, we are seeking funding to:

- Expand outreach to new potential participants in the Bugs Below Zero program, including classrooms, outdoor recreationalists, and environmental educators.
- Strengthen community-building, engagement, data sharing, and communication systems with citizen science participants.
- Implement a series of virtual field trips and in-person events that raise awareness about cold-adapted insects and their connection to stream food webs and inspire involvement in citizen science projects.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

There are two major overarching outcomes for this project: 1) to increase research capacity and 2) to inspire environmental learning and stewardship in all seasons. The field season to study cold-adapted insects is short and often dependent on snow cover. Data submitted by Bugs Below Zero participants will strengthen knowledge of when and where winter insects emerge and will make field site selection more efficient for UMN researchers. Participants will learn new insights about insect life on the snow and ice and help researchers build knowledge that can be used to best manage water and trout resources.

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: Host a series of in-person and virtual events to expand Bugs Below Zero program

Activity Budget: $118,800

Activity Description:
We propose a series of events for K12 students, teachers, conservation organizations, and families. Using interactive presentations by UMN experts and hands-on demonstrations with insects from Wet Bugs LLC, event content will increase understanding of stream food webs and connections between healthy water habitats, aquatic insects, and trout populations, as well as provide training and inspiration to get involved with the Bugs Below Zero citizen science program. In-person events will be held at educational centers (like the Bell Museum, Belwin Conservancy, and Minnesota Valley National Wildlife Refuge). Digital materials are an important component of educational resources and not all schools have the ability or funding to join on-site events, thus we will also host a virtual field trip and create digital resources with similar content. For the virtual field trip, educators will join live via social media channels to view streaming content, presentations, and demos, and ask questions with their classrooms. Additionally, virtual field trip content will be archived for later use by educators and can be leveraged as a resource by organizations like Trout in the Classroom. The proposal leaders have experience doing similar virtual field trips with dairy and turkey farms.

Activity Milestones:

Description	Approximate Completion Date
Host 1-2 events with the Bell Museum, create virtual field trip resources, share with educators	June 30, 2023
Host 1-2 events with Belwin, create digital resources, share with educators	June 30, 2024
Host 1-2 events with MN Valley Natl Wildlife Refuge, share digital resources with educators	June 30, 2025

Activity 2: Strengthen Bugs Below Zero communication channels, build community, and strengthen data sharing with participants

Activity Budget: $79,200

Activity Description:
Initial Bugs Below Zero educational materials – including a website (www.bugsbelowzero.com), videos, and classroom activities – and trial system for public collaboration and participation in research were created in 2020-2021 and shared with small groups of students, landowners, and outdoor recreation enthusiasts. Participants of all ages shared their excitement, as one student commented, “I've gained a greater awareness and interest in winter bugs, especially down by the stream!” An adult participant shared their desire to use Bugs Below Zero information to “teach my grandchildren and make them more comfortable in the outdoors.” These early participants also gave feedback and ideas on how to effectively build the program and maintain engagement.

With this proposal, we will strengthen efforts to connect with Bugs Below Zero participants, build community, improve data collection systems, and increase data sharing with citizen science volunteers. We will create social media content, blog posts, and newsletters to share participant stories, researcher highlights, data insights, training tips, and insect facts. With consistent communication, classrooms and citizen volunteers will stay engaged with the Bugs Below Zero program and outreach can motivate ongoing learning and environment stewardship. We will assess learning outcomes and engagement for continued improvement of citizen science activities.

Activity Milestones:

Description	Approximate Completion Date

Create communication channels, develop plan for specific content and stories, share information	June 30, 2023
Engage outdoor recreationalists, educators, and classrooms with Bugs Below Zero communication content	June 30, 2024
Continue sharing content, assess learning outcomes and evaluate engagement of participants	June 30, 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dean Hansen	Wet Bugs, LLC	Hansen is an aquatic entomologist and owner of Wet Bugs, which provides interactive educational workshops. He will provide interactive, live demonstrations of aquatic insects and related equipment during the events.	Yes
Research staff	University of Minnesota	Graduate researchers will help plan and execute events, provide entomology and water expertise to event and communication materials, interact with Bugs Below Zero volunteers, and review data provided by program.	Yes
Amy Schrank	University of Minnesota Sea Grant	Schrank will help plan and execute events, provide fisheries expertise to events and materials, and help communicate event and educational materials through University of Minnesota Sea Grant channels.	Yes
Troy McKay	University of Minnesota, Agricultural Education & Communication	McKay is a digital media instructor who will help support the virtual field trip event, as well as the creation of digital educational resources (like videos, podcasts, and photo tours) that result from the virtual field trip.	Yes
Bruce Vondracek	University of Minnesota	Vondracek is an emeritus professor in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. He will help plan and execute events.	No
Holly Menninger	University of Minnesota Bell Museum	Menninger will be the contact person for the Bell Museum and will coordinate staff support, facilities, and communication support for potential Bell Museum events.	Yes
Susan Haugh	Belwin Conservancy	Haugh will be the contact person for the Belwin Conservancy and will coordinate staff support, facilities, and communication support for potential Belwin Conservancy events.	Yes
Vicki Sherry	Minnesota Valley National Wildlife Refuge	Sherry will be the contact person for the MN Valley National Wildlife Refuge and will coordinate staff support, facilities, and communication support for potential MN Valley National Wildlife Refuge events.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
Our team will maintain a website connected to the Bugs Below Zero project. We will also disseminate our information using our partner websites and social media channels (Bell Museum, Belwin Conservancy, and MN Valley National Wildlife Refuge, and University of Minnesota). We will also use established email lists that reach Minnesota educators. Additional communication and dissemination efforts are described in the main narrative. On all communication, the Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo and attribution language on project print and electronic media, publications, signage, and other communications. We will follow the ENTRF Acknowledgment Guidelines.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
Educational resources created by this project will be publicly available and continue to be hosted on the Bugs Below Zero website. Videos, tours, blog posts, infographics, and other stories will serve as ongoing resources for educators and families interested in learning more about winter dynamics of aquatic insects and stream food webs. We anticipate

sharing any broader insights about citizen science engagement, especially for projects focused on winter, with education and communication journals and environmental stewardship organizations.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Improve Trout-Stream Management by Understanding Variable Winter Thermal Conditions	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03i	$400,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project Director - Rebecca Swenson		Serve as project director			36.5%	0.4		$73,975
Graduate research staff		help plan and execute events, provide entomology expertise to event and communication materials, interact with Bugs Below Zero volunteers, and review data provided by program			36.5%	0.12		$20,657
Co-PI - Amy Schrank		help plan and execute events, provide fisheries expertise to events and materials, and help communicate event and educational materials through University of Minnesota Sea Grant channels.			36.5%	0.06		$7,429
Co-PI - Digital Media Instructor - Troy McKay		help support the virtual field trip event, as well as the creation of digital educational resources (like videos, podcasts, and photo tours) that result from the virtual field trip.			36.5%	0.2		$30,204
Bell Museum Public Science Events Manager		provide support for two events in year 1; Coordinate Spotlight Science in-person event at Bell Museum, featuring Bugs Below Zero experts and hands-on activities			36.5%	0.02		$1,297
Gallery Program Manager		provide support for two events in year 1; Develop and implement Bugs Below Zero content and activities for Bell Museum Outdoor Learning Landscape			36.5%	0.02		$1,312
2 undergraduate students		will help draft communication content, run video equipment, assist with video editing, edit the Bugs Below Zero website, support event planning and execution, and interact with researchers from communication, entomology, and fisheries, in order to help understand the research and translate insights for public audiences			0%	2.4		$47,476
							Sub Total	**$182,350**

Contracts and Services								
Dean Hansen	Professional or Technical Service Contract	Funds are requested for contractual services to Wet Bugs, LLC., an interactive workshop provided by Dean Hansen. Wet Bugs is a private business that specializes in interactive, educational workshops with live insects. These funds will allow us to include the Wet Bugs interactive workshop at in-person and virtual events.				-		$1,800
MN Valley Wildlife Refuge	Sub award	Funds are requested to cover expenses at educational centers in year 3. Funds will be used to cover facility costs, staff time, and communication expenses at these educational centers ($3,000/year for in-person and virtual events).				0		$3,000
Belwin Nature Conservancy	Sub award	Funds are requested to cover expenses at educational centers in year 2. Funds will be used to cover facility costs, staff time, and communication expenses at these educational centers ($3,000/year for in-person and virtual events).				0		$3,000
							Sub Total	**$7,800**
Equipment, Tools, and Supplies								
	Tools and Supplies	Vial Kits - $8.25 per vial; 100 kits per year; 3 years	Funds are requested for pre-packaged vial kits for insect collection. Volunteers will be given these vials at events and kits will be shared with classrooms, so participants can practice fieldwork and collect insects on the snow. ($8.25/kit, 100 kits per year).					$2,475
	Tools and Supplies	Materials and equipment - $200 per event; 2 events	Bell Museum materials and equipment in support of hands-on demos and events for two events in year 1. ($200 per event; a total of $400)					$400
							Sub Total	**$2,875**
Capital Expenditures								

							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	6 people; $100 per person per year	Funds are requested for the project team to travel to events, including pre-event site visits (mileage, vehicle). This also includes funds to travel to locations for the virtual events and for any interviews or photo/video shoots needed to create digital resources. (Funds are budgeted at approximately $100/year for Swenson, Schrank, McKay, Ferrington, and both undergraduate students).					$1,800
							Sub Total	**$1,800**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Printing	promotional materials and educational handouts	To conduct the event at the Bell Museum these promotional materials and educational handouts will be used by the project team					$200
	Printing	communication material development - $500 per year	We are requesting $500/year to cover the cost of printing and mailing of communication materials (postcards, flyers) to share details about the Bugs Below Zero program, classroom resources, and to send follow-up information to participants. We are also requesting funds to cover the cost of website hosting required to develop and share digital resources.					$1,500

							Sub Total	**$1,700**
Other Expenses								
		Insect guide - $39.95 each; ~36 copies needed	Funds are requested for copies of a guide that we have developed for Citizens Monitoring of Aquatic Invertebrates of the Upper Midwest (http://midge.dl.umn.edu/midwest-guide) to classrooms or high performing citizen volunteer participants. We will also use the guide as a prize during interactive games at events. We anticipate sharing 10-14 copies of the guide per year. (Copies of guide, $39.95/each, ~36 copies total).					$1,475
							Sub Total	**$1,475**
							Grand Total	**$198,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	University of Minnesota	Waived Indirect Costs	Secured	$108,900
			Non State Sub Total	**$108,900**
			Funds Total	**$108,900**

Attachments

Required Attachments

Visual Component

File: 1ffc12d0-9e9.pdf

Alternate Text for Visual Component

This is a screenshot of the Bugs Below Zero website. The website homepage features a description of the Bugs Below Zero team and information about winter aquatic insects....

Optional Attachments

Support Letter or Other

Title	File
Bell Museum letter of support	c3d26753-a6e.doc
Belwin Conservancy	c06fa527-24f.pdf
Annual Report_2020	e90c6c1d-9cb.pdf
Sponsored Projects Administration Letter	2628b0ad-774.pdf
Background check form	6b954d6d-5b7.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

The following changes have been made from the proposal to work plan stage:
- Len Ferrington has been replaced by graduate researchers with expertise in water and entomology. Their role and budget has stayed the same.
- We converted the 'Contract or Service Type' from 'Professional or Technical Service Contract' to 'Subaward' for the MN Valley Wildlife Refuge and Belwin Nature Conservancy line items, as requested.
- We provided a range of the approximate number of events to be hosted at each location in the Activities and Milestones section, as requested.
- We added the waived overhead from the UMN to the budget, as requested.
- The background form has been uploaded.
- Additional details about dissemination have been added.
- We added the statement about how the Environment and Natural Resources Trust Fund will be "acknowledged through use of the trust fund logo and attribution language on project print and electronic media, publications, signage, and other communications" to the dissemination plan.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I agree to the Commissioner's Plan.

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

No

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

BUGS BELOW ZERO

DISCOVERING WINTER AQUATIC INSECTS IN MINNESOTA

WHO ARE WE?

Bugs are everywhere in the summer, but have you ever thought about what happens to them in the winter? Join Len Ferrington, a Professor in the Department of Entomology at the University of Minnesota, and his team of researchers to discover the life-cycle dynamics of winter aquatic insects and their vital importance to trout in Minnesota.

JOIN THE JOURNEY

EDUCATIONAL MATERIALS

WHAT ARE WINTER AQUATIC INSECTS?

Insects active in the winter months, such as non-biting midges, stone flies, mayflies, and caddisflies, impact the food web in lakes, streams and rivers of Minnesota. They're able to survive freezing temperatures and can be often found on snowbanks!

MEET THE SPECIES

UNIVERSITY OF MINNESOTA
Driven to Discover®
Crookston Duluth Morris Rochester Twin Cities

Science stories like Bugs Below Zero are created by Agricultural Communication & Marketing (ACM) students at the University of Minnesota.
See UMNAgricast.com for more information and examples.

Funding for this project was also provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources.

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

FOLLOW