



# Environment and Natural Resources Trust Fund

2022 Request for Proposal

## General Information

**Proposal ID:** 2022-162

**Proposal Title:** Bugs Below Zero: Engaging Citizens in Winter Research

## Project Manager Information

**Name:** Rebecca Swenson

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

**Office Telephone:** (612) 625-3866

**Email:** boli0028@umn.edu

## Project Basic Information

**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.

**Funds Requested:** \$198,000

**Proposed Project Completion:** June 30 2025

**LCCMR Funding Category:** Small Projects (H)

**Secondary Category:** Environmental Education (C)

## 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

## Narrative

### **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? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and 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.

## 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 (at least two events each year) 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	Completion Date
Host events with the Bell Museum, create virtual field trip resources, share with educators	June 30 2023
Host events with Belwin, create digital resources, share with educators	June 30 2024
Host 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](http://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	Completion Date
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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
Leonard Ferrington	University of Minnesota, Entomology	Ferrington will 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.	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

## 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 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

## Project Manager and Organization Qualifications

**Project Manager Name:** Rebecca Swenson

**Job Title:** Associate Professor

**Provide description of the project manager’s qualifications to manage the proposed project.**

Rebecca Swenson will serve as the project manager. She will plan and execute events, create an outreach plan, draft communication content, manage student workers, interact with Bugs Below Zero volunteers, and support the arrangement and development of all education materials and partnerships. Dr. Swenson has developed and taught courses related to agricultural and environmental science communication in the College of Food, Agricultural and Natural Resource Sciences (CFANS) at the University of Minnesota since 2012. She worked with a team of University of Minnesota students and faculty experts in communication, entomology, and fisheries, wildlife, and conservation biology to create the initial Bugs Below Zero pilot materials and program. She conducts research on science communication and engagement, particularly focused on agricultural and environmental storytelling, science communication training, community-building, and public engagement with science. Before her current position, Dr. Swenson worked in marketing communication. She completed a Bachelor’s degree in Journalism at the University of Wisconsin-Madison and a Master’s degree and PhD in Mass Communication at the University of Minnesota.

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

**Organization Description:**

The Agricultural Education, Communication & Marketing (AECM) department at the University of Minnesota prepares students to be successful leaders, educators, and communicators in the agricultural, food, and natural resource career fields. The division provides curriculum in education, communication, and marketing to undergraduate and graduate students, including courses in writing, public speaking, podcasting, visual design, video production, and virtual or streaming field trips. The AECM department is housed in the College of Food, Agricultural & Natural Resources Sciences (CFANS) at the University of Minnesota. Agricultural and environmental stories produced by students can be viewed at [UMNAgricast.com](http://UMNAgricast.com).

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Project Director - Rebecca Swenson		Serve as project director			36.5%	0.4		\$73,975
Co-PI - Leonard Ferrington		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

							<b>Sub Total</b>	<b>\$182,350</b>
<b>Contracts and Services</b>								
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	Professional or Technical Service Contract	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).				-		\$3,000
Belwin Nature Conservancy	Professional or Technical Service Contract	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).				-		\$3,000
							<b>Sub Total</b>	<b>\$7,800</b>
<b>Equipment, Tools, and Supplies</b>								
	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
							<b>Sub Total</b>	<b>\$2,875</b>



<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	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
							<b>Sub Total</b>	<b>\$1,800</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	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					\$1,500

			required to develop and share digital resources.					
							<b>Sub Total</b>	<b>\$1,700</b>
<b>Other Expenses</b>								
		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 ( <a href="http://midge.dl.umn.edu/midwest-guide">http://midge.dl.umn.edu/midwest-guide</a> ) 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
							<b>Sub Total</b>	<b>\$1,475</b>
							<b>Grand Total</b>	<b>\$198,000</b>

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
			<b>Non State Sub Total</b>	-
			<b>Funds Total</b>	-

## 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
Sponsored Projects Administration Letter	<a href="#">2628b0ad-774.pdf</a>
Annual Report_2020	<a href="#">e90c6c1d-9cb.pdf</a>
Belwin Conservancy	<a href="#">c06fa527-24f.pdf</a>
Bell Museum letter of support	<a href="#">c3d26753-a6e.doc</a>

## Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**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

[Home](#) [Meet the Species](#) [About the Research](#) [More About Streams](#) [Get Involved](#) [Contact](#)

## 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

Science stories like Bugs Below Zero are created by Agricultural Communication & Marketing (ACM) students at the University of Minnesota. See [UMNAgricast.com](http://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.



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