Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-246

Proposal Title: Preparedness for Midge-Borne Disease Outbreaks in Minnesota Deer

Project Manager Information

Name: Benjamin Cull

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

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Project Basic Information

Project Summary: This project will update knowledge on the distribution of biting midge species in Minnesota and test midges for viruses, to aid in the prevention of midge-borne disease outbreaks among deer.

ENRTF Funds Requested: $110,000

Proposed Project Completion: December 31, 2027

LCCMR Funding Category: Small Projects (G)

Secondary Category: Fish and Wildlife (D)

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.

White-tailed deer are found throughout Minnesota and are appreciated by hunters and wildlife watchers. Economic activity from deer hunting generates almost $500 million to the state annually, making this species a valuable component of Minnesota's outdoor recreation economy. Epizootic hemorrhagic disease (EHD) is the most important viral disease of deer in the US, and outbreaks can lead to significant animal losses. The disease is caused by EHD virus (EHDV), which is transmitted by Culicoides biting midges. In the Upper Midwest, outbreaks usually occur in late summer to early fall, then end once midges are killed by frosts. Sporadic outbreaks have occurred in Minnesota deer since 2018, including a significant outbreak among caribou at the Minnesota zoo in 2020, but EHD cases are more common in neighboring states such as Iowa and South Dakota. With climate expected to warm in future, midge populations are likely to be active longer into the fall, increasing the likelihood of Culicoides-borne disease outbreaks in northerly states like Minnesota. However, this risk is currently difficult to quantify because there is little data available on midge populations in Minnesota, and the distribution of potential EHDV vectors and the ecological conditions that give rise to outbreaks are unknown.

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 aims to improve data on Culicoides species present in Minnesota, including defining the distributions and habitats of important EHDV vector species. These data will enable the prediction of risk areas for EHD outbreaks to assist in preventing deer losses. Data on Minnesota midge populations will be collected through (a) conducting midge trapping in areas supporting large deer populations and near cervid/livestock farms throughout the state, (b) identifying midges in bycatch from the Metropolitan Mosquito Control District's established mosquito trap network in the seven-county metro area, (c) examination of historical collections of Culicoides in the UMN Insect Collection. Furthermore, specimens of known and potential vectors of EHDV will be pooled and tested for EHDV. Information from these studies will (a) identify midge species present in Minnesota, (b) identify areas with historical and/or current populations of known/potential vector species, (c) identify habitats where these species breed in Minnesota, and (d) identify areas where EHDV is circulating in midges. Combining this information will allow improved prediction of areas with potential for EHD outbreaks. Whilst focused on EHD, the results will also be relevant to preparedness for other midge-borne diseases affecting animals and humans, including bluetongue and Oropouche viruses.

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?

This project would improve current knowledge about the midge vectors and habitats that support them, and will help to identify regions of the state that present a risk of midge-borne diseases that cause severe illness in deer. The information gained from the project could be used by farmers, wildlife managers, policymakers and biologists to improve awareness of EHD risk in the state, and to assess and mitigate risks of EHD outbreaks among wild and farmed deer. This will contribute to maintaining healthy deer populations in Minnesota.

Activities and Milestones

Activity 1: Improving knowledge of midge diversity and distribution through targeted surveillance

Activity Budget: $54,615

Activity Description:
This activity will improve knowledge of midge species, their habitats, and presence of vector species, through establishing a network of traps. UV light suction traps will be run monthly during June to September (peak midge season), and collected midges will be identified at the UMN using morphological keys. Trapping sites will aim to achieve broad geographic coverage of the state and will be selected based on habitats known to support Culicoides vector species and in proximity to deer populations. These habitats include forested areas, wetlands, captive deer farms, and livestock farms. Livestock farms often include habitats such as wastewater lagoons that allow breeding of large populations of midges, including a known EHDV vector species Culicoides sonorensis. Additionally, cattle are suspected to be the primary ruminant host of EHDV in North America, and although they usually display subclinical or mild infections, they may act a source from which virus can spill over into nearby deer populations via midge bites. If possible, sampling for immature stages of midges will be conducted by collecting organic material from breeding sites such as mud around wastewater lagoons and within tree holes. Adult midges can be reared from these samples in the lab for species identification.

Activity Milestones:

Description	Approximate Completion Date
Establish trapping sites around state	June 30, 2027
Trapping & midge collections	September 30, 2027
Midge identification	October 31, 2027
Data analysis & communication	December 31, 2027

Activity 2: Determining presence, distribution and serotypes of midge-borne viruses in Minnesota

Activity Budget: $38,141

Activity Description:
This part of the project will identify the presence of EHDV in collected midges and determine the strains circulating in Minnesota. RNA will be extracted from samples of potential or known vector species. Because the prevalence of virus is typically low in vector populations, samples will be pooled in groups of the same species from the same trapping site and trapping period. RNA samples will be screened for EHDV (and potentially other viruses of concern) using RT-qPCR assays that have been used previously to detect midge-borne viruses in the US. Positive pools will be further tested to determine the virus serotype with RT-PCR assays targeting several serotypes present within the US. A minimum infection rate (MIR) will be calculated for each positive pool of midges. As a control for successful RNA extraction, a test for midge RNA will also be run on each pool; this can also be sequenced to confirm identification of midge pools. Information from sites with EHDV-positive pools of midges will be analyzed to determine any correlations between habitat characteristics, presence of vector species, and presence of virus. This information can be used to identify factors contributing to increased risk of EHDV presence.

Activity Milestones:

Description		Approximate Completion Date
(a)	RNA extractions from trapped midge pools	September 30, 2027
(b)	Virus screening of midge pools	October 31, 2027
(c)	Identification of EHDV serotypes	October 31, 2027

(d)	Data analysis to identify EHDV risk factors	December 31, 2027

Activity 3: Improve data on Minnesota midges through other historical and current sources

Activity Budget: $17,244

Activity Description:

This activity aims to complement the data gained in Activity 1 with other available sources of data on midges in the state. These include historical records from the UMN Insect Collection and current collections from the Metropolitan Mosquito Control District's (MMCD) mosquito trap network in the seven-county metro area. Material in the UMN Insect Collection will be examined and data collected and updated if necessary. The Insect collection contains around 4500 samples of biting midges, including many from Minnesota. Data from this collection will be collated and provide a historical baseline of midge data for the state, which we will build upon with other planned collections. This will also act as a valuable reference collection for the identification of samples collected in 2027. The MMCD runs carbon dioxide-baited light traps at approximately 120 sites throughout the metro area from May to September for its mosquito surveillance. These traps are likely to also capture biting midges and present a good opportunity to further study midge activity in this region. Non-mosquito bycatch from these traps during 2026 and 2027 will be separated by MMCD staff and collected by UMN for identification and data analysis.

Activity Milestones:

Description		Approximate Completion Date
(a)	Examination of UMN Insect Collection specimens	December 31, 2026
(b)	Collection and identification of MMCD samples	October 31, 2027
(c)	Collating historical and current data	December 31, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Jonathan Oliver	University of Minnesota School of Public Health	co-investigator	Yes
Scott Larson	Metropolitan Mosquito Control District	Provide midge samples collected through the MMCD's mosquito trap network covering the seven-county metro area.	No

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?

Project results will be used to update knowledge of midge species and the distribution of known and potential EHDV vectors in Minnesota. This information can be incorporated into risk assessments of midge-borne disease outbreaks in deer to aid management efforts. Results will also be shared with participating farms to raise awareness of potential local disease risk. It is expected that at least one scientific publication will result from this project. Should results highlight the presence and/or significant abundance of EHDV vectors and virus, further investigations may be planned, and additional external funding will be sought to support these.

Project Manager and Organization Qualifications

Project Manager Name: Benjamin Cull

Job Title: Research Assistant Professor

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

Dr. Benjamin Cull's research focusses on the biology of arthropod vectors, the eco-epidemiology of vector-borne diseases, and the development of novel tools for the surveillance of vector-borne pathogens. He is experienced in the sampling of blood-feeding arthropods of medical and veterinary concern, GIS mapping analysis, molecular techniques for the detection and characterization of pathogens, and the application of community science for collection of data on arthropod vectors. He has worked in the UMN Department of Entomology since 2019. Prior to moving to the University of Minnesota, Dr. Cull worked in the Medical Entomology and Zoonoses Ecology team at Public Health England (now the UK Health Security Agency) where he was involved in running national surveillance projects for ticks and mosquitoes, including running mosquito traps around England to collect data on mosquito diversity. These projects led to improved understanding of tick and mosquito species in the UK, and their distributions, seasonal activity, and host/habitat associations. His recent research has investigated the use of the open access citizen science platform iNaturalist as a tool to collect additional data on the distribution and species diversity of important tick and mosquito vector species at the state, national and continental scales. He also acts as the principal investigator or co-investigator on NIH-funded research projects investigating tick-pathogen interactions. With this experience, Dr. Cull brings the necessary skills to successfully lead and manage the proposed project.

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

Organization Description:

The UMN's College of Food, Agricultural and Natural Resources Sciences (CFANS) is comprised of 12 academic departments and 10 research and outreach centers, along with the Minnesota Landscape Arboretum, the Bell Museum, and dozens of interdisciplinary centers. As part of a major urban university located in the heart of the Twin Cities, we

also provide immersive study opportunities across the state. Our living laboratories allow students, faculty, and staff to study throughout Minnesota's diverse ecosystems.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Research Assistant Professor (Ben Cull)		Overseeing project, mentoring and training of staff, identification of Culicoides samples. Data analysis and report writing.			36.6%	0.15		$17,414
Associate professor (Jonathan Oliver)		Overseeing project, mentoring and training of staff, identification of Culicoides samples. Report writing.			36.6%	0.15		$28,318
Research scientist		Conduct lab assays to process midge samples and detect and characterize virus.			32.3%	0.2		$17,898
2 x Seasonal student worker		Conducting majority of sampling activities, including travel to sites to set up traps and collect samples, transport, storage and documentation of samples.			0%	0.25		$12,000
							Sub Total	**$75,630**
Contracts and Services								
							Sub Total	**-**
Equipment, Tools, and Supplies								
	Tools and Supplies	Costs of 20 suction traps, plus 20 batteries and 5 battery chargers, with kill jar assemblies and dry ice containers.	Supplies needed for conducting trapping of midges at field sites.					$8,500
	Tools and Supplies	Consumables needed for collection and storage of samples, including collection tubes, dry ice, DNA/RNA shield.	Consumables needed for collection and storage of samples					$3,870
	Tools and Supplies	Laboratory reagents and consumables. Takara primescript kit with gDNA eraser (400rxn), Primers, Promega GoTaq master mix (1000rxn), Trizol (100ml), Chloroform (500ml), Pipette tips, Tubes.	Reagents required for virus testing of midges, including RNA extraction reagents, RT-PCR kits, primers, and PCR reagents.					$5,000
							Sub Total	**$17,370**
Capital Expenditures								

							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Costs for 4 months' rental, mileage, and parking of vehicle. 10,000 miles estimated.	Travel to and from trapping sites throughout the state.					$7,000
	Miles/ Meals/ Lodging	Lodging and per diem expenses for 4 overnight trips each month over 4 months for 2 employees.	To cover expenses incurred during travel to conduct trapping, including overnight hotel stays and meals.					$8,000
							Sub Total	**$15,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Publication costs related to presenting findings of project in scientific journals	Dissemination of results from the project					$2,000
							Sub Total	**$2,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$110,000**

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				
			Non State Sub Total	**-**
			Funds Total	**-**

Total Project Cost: $110,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 84e12b83-739.pdf

Alternate Text for Visual Component

An outline of the proposed project with images of white-tailed deer, biting midges, and the three main activities covered by the project: 1. Collect data on midge species through targeted surveillance, 2. Test midges for viruses, 3. Improve available data on MN midges by examining historical records and current sources....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
2026-246 University confirmation letter	71e9ffad-edd.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Do you understand that travel expenses are only approved if they 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 understand the UMN Policy on travel applies.

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

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

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this proposal:

Andrea Little UMN

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

N/A