



Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-133

Proposal Title: Ticks in Minnesota! Informing Control and Response

Project Manager Information

Name: Jesse Berman

Organization: U of MN, School of Public Health

Office Telephone: (612) 626-0923

Email: berma186@umn.edu

Project Basic Information

Project Summary: Our goal is to identify weather and land-use conditions that impact tick populations in Minnesota. The findings will make local and broad-scale tick control plans more streamlined and cost efficient.

Funds Requested: \$250,000

Proposed Project Completion: 2023-06-30

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

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.

Minnesota is at the forefront of a nationwide tick invasion. Over the past 20 years, ticks have expanded their range and are found in places they hadn't been observed. As a consequence, the number of people finding ticks on themselves, family members, or animals is on the rise. In 1989, the Minnesota legislature mandated the Metropolitan Mosquito Control District (MMCD) to "consult and cooperate with the Minnesota Department of Health (MDH) in developing management techniques to control disease vectoring ticks." Yet these agencies are limited in their ability to carry this out. It is unknown what causes variation in tick numbers by year or across counties. Cold winters, heavy rain, persistent heat, and regional drought are likely to impact tick populations; however, the relationship is poorly understood. If we can identify conditions that lead to increased tick risks, it will enable the MDH to focus their tick-borne disease communication. This would include more effective messaging to citizens and businesses seeking best times to institute personal controls. Secondly, our findings would provide the MMCD with the data to implement broad-scale tick control strategies, including ideal times and locations for tick control, resulting in less acreage sprayed and reduced costs.

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.

We will jumpstart broad-scale tick-control strategies at the MMCD and improve tick-related public communication from the MDH, by identifying exact timing when weather and land-use conditions result in peak tick numbers during any year across Minnesota. This project fulfills an informational gap, which can be used to inform planning and implementation of tick control treatments. Our primary steps are to:

- Characterize historical weather conditions (1991-2016) in Minnesota, including drought, heat, cold, humidity, and precipitation.
- Use statistical modeling to identify weather conditions and land-use changes that lead to expanding tick populations by leveraging a unique and pre-existing data set of black-legged larval ticks collected by MMCD 100+ sites for the past 30 years.
- Use our data to identify "periods" of greatest larval tick-related risk. We will work with MMCD and MDH to use our findings and inform tick control strategies and improve communication efforts.

It is important to note that this project represents a unique collaboration and leveraging of expertise, data, and resources between University of Minnesota, MMCD, and MDH. Only through joint efforts can we address this very important issue.

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?

Our primary project objective is to identify environmental conditions that cause increased numbers of ticks. Our findings will provide critical data for the MMCD to fulfill their mandate of public serving tick control plans. Our work will also enable the MDH to provide better responses to the public who inquire about personal prevention tools for lessening tick exposures. Indirectly, our findings will benefit people that utilize parks and open spaces, business owners whose patrons or workers may be exposed to ticks (summer camps, landscapers, etc.), and homeowners seeking to reduce ticks on their property.

Activities and Milestones

Activity 1: Characterize conditions that lead to increased tick-risks to inform control plans and local communication.

Activity Budget: \$250,000

Activity Description:

In the first outcome, we will compile weather and climate data to identify temperature, precipitation, snowfall, drought, and other meteorological measures at monitor sites across Minnesota (1991-2016). We will use spatial analysis to classify weather into “conditions” important for tick populations, such as snowfall from the previous winter, high humidity days, or temperature days above normal. To visualize weather pattern changes, we will map tick-focused weather conditions over time.

For the next outcome, we will use GIS to combine weather events with black-legged tick counts collected by MMCD across 26 years. Additional characteristics of tick sample sites will be evaluated, including the surrounding land types, geography, and community characteristics. Using statistical modeling, we will assess the relationship between weather, landscape, and tick abundance, to determine how environmental conditions influence tick numbers.

In our final outcome, we will identify the weather and environmental conditions causing peak numbers of ticks. This information will be used management strategies, including tick control practices and behavioral education. The MMCD will incorporate our findings to develop efficient, timely, and cost-effective tick control practices. The MDH we will use our findings to improve public interactions, including targeted communication plans for greatest individual tick risk.

Activity Milestones:

Description	Completion Date
Characterize Minnesota weather from 1991-2016 using historical data	2022-03-31
Use GIS to spatially link weather conditions with changes in tick counts	2022-08-31
Identify conditions that result in increased risks of ticks using statistical models	2023-01-31
Collaborate with MMCD and MDH to design tick control strategy and improve public communication	2023-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Janet Jarnefeld	Metropolitan Mosquito Control District	Tick specialist Ms. Jarnefeld will provide our team with tick count data, details on collection sites, and general expertise on tick issues in the state of Minnesota. She will be our lead collaborator for informing large-scale tick control efforts at the MMCD.	No
Dave Neitzel	Minnesota Department of Health - Vectorborne Disease Unit	Dr. Neitzel is a co-investigator and primary collaborator with the Minnesota Department of Health. He will provide expertise on environment, ticks, and tick surveillance. He will also lead efforts to incorporate our findings among the MDH to improve public communication efforts for tickborne disease risk.	Yes
Jon Oliver	U of M - School of Public Health	Dr. Oliver is a public health entomologist with an expertise in ticks and environmental conditions impacting tick numbers. He will assist in the study design, data gathering, research, and writing. He will also co-supervise the student training at UMN, who will be assisting us with the project.	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?

The results will be directly used by the MMCD and MDH to better inform and enhance their surveillance, control activities, and public communication. The MMCD goal is to have the necessary data to begin economically feasible and safe tick control efforts. Our findings will be utilized by the MDH to improve the timeliness and details of online communication and public health related inquiries. In addition, our findings have inherent scientific value and will be presented at conferences and submitted to scientific journals. Broader dissemination will be valuable to other states looking to inform their own tick control plans.

Project Manager and Organization Qualifications

Project Manager Name: Jesse Berman

Job Title: Assistant Professor

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

Dr. Jesse Berman is an Assistant Professor in Environmental Health Sciences at the University of Minnesota School of Public Health. Dr. Berman earned a doctorate at the Johns Hopkins Bloomberg School of Public Health (JHSPH) and served in postdoctoral positions at Yale School of Forestry and Environmental Studies and in Epidemiology at JHSPH. His training has been in environmental epidemiology with an emphasis on exposure assessment and spatial statistics, including the use of Geographic Information Systems (GIS) to address scientific problems. Dr. Berman has a particular interest in how weather events and environment impact health. His past research has looked at the association between drought conditions and hospitalizations among older adults in the western United States, and was highlighted by the National Institute Health (NIH) as a 'Selected Extramural Publication' for significance and public health importance. Dr. Berman has additionally performed a number of health based assessments looking at the impacts of weather and environment on behavior. He has extensive expertise with using large historical data sets and employing GIS to understand the impact of environmental change. The expertise of Dr. Berman is highly specialized and the Minnesota Department of Health and Metropolitan Mosquito Control District (MMCD) do not have the capacity to perform this work in isolation. However, through collaborative efforts, we can combine state-collected data with the research expertise at UMN to help improve the jobs of both the MMCD and Department of Health.

Organization: U of MN - Twin Cities

Organization Description:

The University of Minnesota in the Twin Cities is the flagship campus of the state of Minnesota's land grant university. The University houses 18-colleges and brings together a unique combination of agriculture, veterinary, medicine, law, liberal arts, engineering, public health, journalism, business, and design experts. Strong cross-disciplinary collaborations are common and strongly encouraged at the highest levels of University leadership. The School of Public Health is currently the 8th ranked public health school by US News and World Reports and 6th in NIH funding with about 130 full-time faculty and 1,500 enrolled students. It offers 19 graduate degrees (15 masters, 4 doctoral) and has 25 research centers collaborated across 4 academic divisions (Environmental Health Sciences, Biostatistics, Epidemiology and Community Health, and Health Policy and Management). We have close relationships with state agencies, including the Department of Health, Climatology Office, and Department of Natural Resources.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Lead Investigator		Involved in all aspects of the project and supervision			36.5%	0.6		\$77,807
Co-Investigator		Assist with study design, research, reporting, and supervision of students			36.5%	0.3		\$43,538
Research Assistant 1		Data download, cleaning, preparation			0%	0.25		\$10,337
Research Assistant - PhD Level		Data preparation and cleaning, GIS, summary analysis, liason with other agencies			19.9%	1		\$96,906
							Sub Total	\$228,588
Contracts and Services								
MDH Senior Epidemiologist	Sub award	Incorporation of findings into MDH tick risk communications. Support with study design, expertise, and data acquisition.				0.2		\$21,412
							Sub Total	\$21,412
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								

							Sub Total	-
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$250,000

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
State				
In-Kind	University of Minnesota Federally-negotiated Indirect Charges 55% MTDC	Indirect costs associated with University materials and equipment use	Secured	\$119,431
			State Sub Total	\$119,431
Non-State				
			Non State Sub Total	-
			Funds Total	\$119,431

Attachments

Required Attachments

Visual Component

File: [bde9a6e4-625.pdf](#)

Alternate Text for Visual Component

Our poster shows a picture of ticks with the caption, "Minnesota Tick Numbers are Increasing, but We Don't Know Why." It then states, "By Working with Our State Agency Partners, we can Identify How Weather and Land-Use Impact Minnesota Ticks." We then show a picture of a worker spraying to control ticks and a picture of a communication sticker on tick awareness from the Minnesota Department of Health. Our captions for each state, "Enable Cost-Efficient Tick Control Strategies" and "Improve Tick Risk Communication Strategies."

Optional Attachments

Support Letter or Other

Title	File
Letter of Support from MMCD	436fb5bc-6b8.pdf
Tax Status of UMN	6d733e81-da2.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Ticks in Minnesota! Informing Control and Response



Minnesota Tick Numbers are Increasing, but We Don't Know Why...



By Working with Our State Agency Partners, we can Identify How Weather and Land-Use Impact Minnesota Ticks

Enable Cost-Efficient Tick Control Strategies!



Improve Tick Risk Communication!

