Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-378

Proposal Title: Unrecognized Threats: Impact of Zoonotic Bacteria on Wildlife

Project Manager Information

Name: Gillian Tarr

Organization: U of MN - School of Public Health

Office Telephone: (612) 626-9308

Email: gtarr@umn.edu

Project Basic Information

Project Summary: This project seeks to understand the potential impacts on wildlife of common gastrointestinal diseases transmitted from animals to humans. We will examine effects on health and public perception of wildlife.

ENRTF Funds Requested: $472,000

Proposed Project Completion: June 30, 2029

LCCMR Funding 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.

With increasing public awareness of zoonotic infections (i.e., those transmitted from animals to humans), fear of nature is on the rise. A recent review reported 35 cases of wildlife culling in response to fear of zoonotic diseases, which is likely only the tip of the iceberg (Anderson & Reaser 2024). Zoonotic diseases may also harm wildlife directly through illness. Three of the four most common enteric (i.e., gastrointestinal) bacteria in the U.S. – Campylobacter, Salmonella, and Shiga toxin-producing E. coli (STEC) – are zoonotic and can infect many hosts. Diarrheal illnesses in several domestic and agricultural species have been linked to these pathogens, but little is known about their health effects in wildlife populations. At the same time, knowledge of which wildlife species are most important for transmitting major enteric zoonoses is lacking. We have identified dozens of STEC strains that persist in Minnesota for multiple years. Although some appear linked to agricultural operations, others have no obvious source, and wildlife may play a pivotal role in their persistence. A more comprehensive understanding of the dynamics between wildlife and zoonotic enteric bacteria is needed to effectively mitigate health risks in both humans and wildlife.

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.

Our overall objective is to elucidate the impact of zoonotic enteric bacteria on wildlife in Minnesota. Given the little that is known in this area, we will focus on the most common zoonotic enteric bacteria, Campylobacter, Salmonella, and STEC. We will conduct the following activities:

Activity 1: Estimate the prevalence of Campylobacter, Salmonella, and STEC among deer, small mammals, songbirds, and waterfowl in Minnesota. These bacteria have been detected in a wide assortment of animals from these groups. During this activity we will also determine whether any STEC detected belong to previously identified locally persistent strains.

Activity 2: Assess the association between zoonotic enteric bacterial infection and the health of mammals and birds brought to the Wildlife Rehabilitation Center of Minnesota. We will specifically examine a) presentation (e.g., injury, illness, orphaned), and b) final disposition (e.g., released, transferred, deceased).

Activity 3: Measure knowledge and attitudes of the public toward zoonotic infectious diseases and wildlife. We propose to complete this work with a survey conducted at the Minnesota State Fair through the Driven to Discover Research Facility, which is managed by University of Minnesota School of Public Health and Medical School faculty.

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?

During the project period, we will develop a white paper on Minnesotans' knowledge of and attitudes towards zoonotic infectious diseases and the role played by wildlife. We anticipate this white paper will be useful for identifying important gaps in public knowledge and informing conservation education efforts. The knowledge gained about zoonotic enteric bacteria prevalence and health effects among wildlife can provide a foundation for wildlife management and public health to collaboratively determine how best to address threats to the wildlife and human populations.

Activities and Milestones

Activity 1: Estimate the prevalence of Campylobacter, Salmonella, and STEC among wildlife

Activity Budget: $251,913

Activity Description:
Our overall objective is to identify the types of major zoonotic enteric bacteria among Minnesota deer, small mammals, songbirds, and waterfowl. We will do this by 1) estimating the prevalence (i.e., percent positive) of Campylobacter, Salmonella, and STEC, and 2) identifying any locally persistent STEC strains. In collaboration with the Wildlife Rehabilitation Center of Minnesota (WRC), we will obtain approximately 500 fecal samples from mammals and birds over 2.5 years. Fecal samples will be collected at admission to avoid detection of pathogens acquired during care. Additionally, we will augment the number of samples from deer with fecal collections from a recent study of deer in the Twin Cities metro area conducted by Dr. Wolf and possibly hunter-harvested deer. Dr. Singer will test samples for Campylobacter, Salmonella, and STEC using PCR. We will summarize the prevalence of each pathogen overall, by taxonomic order, and by species. Any STEC detected by PCR will be cultured, whole genome sequenced, and integrated into our existing database of the Minnesota STEC population. STEC isolates falling within previously identified locally persistent groups will be identified. Our results will provide a first glimpse into the importance of enteric infections in wildlife populations.

Activity Milestones:

Description	Approximate Completion Date
First half of fecal samples collected and tested via PCR	October 31, 2027
All fecal samples collected and tested via PCR	January 31, 2029
Report produced and disseminated to WRC and other interested parties	February 28, 2029
Whole genome sequencing of STEC isolates completed	March 31, 2029
Brief manuscript produced and submitted for publication	June 30, 2029

Activity 2: Assess the association between zoonotic enteric bacterial infection and the health of animals brought to WRC

Activity Budget: $113,700

Activity Description:
In this activity, our overall objective is to determine whether zoonotic enteric bacterial infections adversely affect wildlife health. Using data from animals at WRC sampled and tested in Activity 1, we will analyze the association between infection and 1) initial presentation, and 2) final disposition. The WRC records the health status on initial presentation and the final disposition of every animal it takes into care. Upon intake, WRC veterinarians examine and perform diagnostic tests to assess the health of the animal at presentation. We will broadly categorize diagnoses as injury, illness (infection or toxicity), orphaning, starvation or other. Final disposition will be categorized as released, transferred, or deceased (euthanasia or other causes). We will assess whether the presence of Campylobacter, Salmonella, and/or STEC is associated with presentation for rehabilitation or outcome using epidemiological models and accounting for animal age/stage and species. For common species, we will conduct additional analyses to determine whether any associations between enteric pathogens and presentation or disposition differ by species.

Activity Milestones:

Description	Approximate Completion Date
Metadata obtained from WRC and cleaned	February 28, 2028
Analysis complete	April 30, 2029

Report produced and disseminated to WRC and other interested parties	May 31, 2029
Manuscript produced and submitted for publication	June 30, 2029

Activity 3: Measure knowledge and attitudes of the public toward zoonotic infectious diseases and wildlife

Activity Budget: $106,387

Activity Description:

Our objective is to determine what the public knows about zoonotic infectious diseases and the role of wildlife in maintaining or spreading disease, and how this shapes their attitudes toward disease prevention and wildlife. To accomplish this objective, we will 1) develop a survey based on exploratory interviews with wildlife managers, and 2) survey members of the public. We will request interviews with wildlife management staff at the Minnesota Department of Natural Resources and municipal parks departments. Using standardized interview questions, we will determine what wildlife managers see as the greatest or most consequential gaps in knowledge among the public about zoonotic disease and wildlife, and we will provide an opportunity to suggest questions that would be particularly helpful to them in their duties. After interviews are complete, we will identify themes and develop a public-facing survey using the information gathered. This will be pilot tested with non-expert individuals to refine question wording and presentation. We will survey the public through the Driven to Discover Research Facility at the Minnesota State Fair. We will survey approximately 500 individuals over the course of 4 shifts/days. We will generate summary statistics of the answers for each question and summarize main messages.

Activity Milestones:

Description	Approximate Completion Date
Interviews completed	December 31, 2026
Survey developed and pilot tested	May 31, 2027
Survey administered at Minnesota State Fair	September 30, 2027
White paper produced and disseminated	March 31, 2028

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Tiffany Wolf	University of Minnesota College of Veterinary Medicine	CoI – Dr. Wolf will provide expertise in wildlife sampling and collaborate in experimental design, data analysis and interpretation.	Yes
Randall Singer	University of Minnesota College of Veterinary Medicine	CoI – Dr. Singer will lead all laboratory testing of samples collected from wildlife for each of the enteric pathogens of interest, as well as collaborate in data analysis and interpretation.	Yes
Renee Schott	Wildlife Rehabilitation Center of Minnesota	Collaborator – Dr. Schott will oversee and coordinate wildlife sampling through the Wildlife Rehabilitation Center of Minnesota, working closely with project partners to accomplish research goals.	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 work be funded?

We will disseminate a white paper on public knowledge and attitudes about zoonotic diseases and wildlife to the Department of Natural Resources and wildlife managers, who we will approach prior to developing the survey to learn about their priorities and make the white paper as relevant as possible. Results from Activities 1 and 2 will be summarized in a report for the WRC and published in peer-reviewed journals, which will be publicized through the UMN SPH communications team. Depending on our specific findings, results from this project may be used as preliminary data for future NIH and NSF funding applications.

Project Manager and Organization Qualifications

Project Manager Name: Gillian Tarr

Job Title: Assistant Professor, Environmental Health Sciences

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

As Project Manager, Dr. Tarr will lead all aspects of the study, including research activities, team communication, and project management. She has the necessary subject matter knowledge, methodological expertise, and leadership experience to bring the proposed project to successful completion. Dr. Tarr is an Assistant Professor of Environmental Health Sciences with a specialty in Environmental Infectious Diseases and an Associate at the Institute on the Environment. Her research program focuses on the epidemiology of enteric infections, particularly those of zoonotic origin. Dr. Tarr uses a combination of advanced analytic techniques to conduct her work, including spatial and genomic epidemiology. This application builds on Dr. Tarr's NIH-sponsored research on local reservoirs of Shiga toxin-producing Escherichia coli (STEC), which she uses as a model organism for enteric zoonotic pathogens. That work has identified over three dozen groups of persistent and locally evolving STEC strains in Minnesota. Other zoonotic enteric pathogens, such as Salmonella and Campylobacter, are almost certainly similar in their existence of local reservoirs. While these pathogens are often associated with livestock, they have been isolated from an expansive set of wildlife species, and their presence in and effect on wildlife is poorly understood. Dr. Tarr's work demonstrates her expertise in zoonotic enteric pathogens and provides a basis for examining their local ecology in Minnesota. Dr. Tarr and collaborator Dr. Tiffany Wolf, a wildlife veterinarian and epidemiologist, have team-taught a graduate course in disease ecology for five years, providing a strong track record of working side-by-side that will benefit the proposed study. In summary, the

focus of Dr. Tarr's research program on zoonotic enteric pathogens and her methodological expertise and experience leading research projects make her well-suited to lead the proposed study to successful completion.

Organization: U of MN - School of Public Health

Organization Description:
The University of Minnesota (UMN) is one of three universities in the U.S. that houses its state's major medical, veterinary, and public health schools on a single campus, making it an ideal environment for the proposed research. The UMN School of Public Health (SPH) is a top school of public health and has the third largest research portfolio at UMN. The proposed research is aligned with the SPH2030 strategic plan in the area of Infectious Diseases, which SPH uses to guide investments in faculty and research. The SPH communications team publicizes research conducted by faculty, broadening the audience that learns about our work. The Division of Environmental Health Sciences (EnHS) will directly support the objectives of the project and the development of subsequent applications. EnHS is widely recognized for its excellence in enteric disease and food safety research. EnHS faculty are active in multiple centers for human and animal health, and our work's zoonotic disease focus aligns closely with the missions of these centers. We will leverage their expertise to disseminate knowledge produced. EnHS faculty also regularly conduct research studies through the Driven to Discover Research Facility, which will enable our survey to reach a large number of Minnesotans.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Gillian Tarr		PI - Oversee all aspects of the project, including designing the study and determining the approach, supervising Research Assistants, leading the development of the interview questionnaire and survey, leading the phylogenetic analysis, leading the epidemiological analyses, and leading the production of all reports and papers			26.8%	0.45		$84,302
Tiffany Wolf		CoI - Provide expertise in wildlife sampling and collaborate in experimental design, data analysis and interpretation			26.8%	0.24		$49,116
Randall Singer		CoI - Lead all laboratory testing of samples collected from wildlife for each of the enteric pathogens of interest, as well as collaborate in data analysis and interpretation			26.8%	0.12		$42,639
Graduate Research Assistant		Draft interview questionnaire and conduct interviews, draft survey, administer survey, conduct data analyses, draft reports and papers			46%	1.5		$170,933
Brittany Peters		Laboratory technician - Conduct all PCR and culture testing			24.3%	0.45		$30,253
Hourly Research Assistants		Administer the survey at the Minnesota State Fair Driven to Discover Research Facility			0%	0.03		$1,936
Veterinary summer scholar		Compile data, generate summaries			0%	0.15		$6,890
							Sub Total	**$386,069**
Contracts and Services								
Wildlife Rehabilitation Center of Minnesota	Subaward	WRC will collect fecal samples during the first 2.5 years of the project, freeze them, and store them for study team pick-up. They will provide metadata on all samples.				0.33		$42,122
University of Minnesota	Internal services or	UMGC will sequence any STEC isolated from fecal samples.				0		$17,146

Genomics Center	fees (uncommon)							
Driven to Discover Research Facility at the Minnesota State Fair	Internal services or fees (uncommon)	To conduct research at the D2D facility, a $750 fee per shift is charged for internal (UMN) faculty. We will apply for 4 shifts during the 2027 fair.				-		$3,000
							Sub Total	**$62,268**
Equipment, Tools, and Supplies								
	Tools and Supplies	Laboratory supplies	Conduct PCR analysis for 700 samples and culture for 150 isolates					$17,413
							Sub Total	**$17,413**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	75 trips per year of 17 miles each at $0.67 per mile plus 3% inflation per year for 2.5 years	Travel to and from the Wildlife Rehabilitation Center from UMN to pick up fecal samples 1-2 times per week depending on volume					$2,250
							Sub Total	**$2,250**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								

	Publication	Open access publication of study results	Share study results with a broader audience					$4,000
							Sub Total	**$4,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$472,000**

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: $472,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 7cb80c32-0e9.pdf

Alternate Text for Visual Component

The image shows the components of Activities 1 and 2. Fecal collection is followed by PCR detection of Salmonella, Campylobacter, and STEC, followed by culture and whole genome sequencing of STEC to detect persistence. Detection results are summarized as prevalence and used to estimate an association with wildlife health....

Supplemental Attachments

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

Title	File
UMN SPA authorization letter	87eec75c-af4.pdf
WRC Letter of Support	ce91be24-1b1.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?

Yes

Does the organization have a fiscal agent for this project?

No

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:

Joann Larson, University of Minnesota

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