Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-536

Proposal Title: MN SMILES! Summer Mentored Internship Launching Environmental Scientists

Project Manager Information

Name: Joanna Klein

Organization: University of St. Thomas

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Project Basic Information

Project Summary: MN SMILES! will establish an interdisciplinary research internship for high school and college students to study land and soil health in Minnesota.

ENRTF Funds Requested: $286,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Small Projects (G)

Secondary Category: Education and Outdoor Recreation (C)

Project Location

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

Region(s): Metro

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

Statewide

When will the work impact occur?

During the Project

Narrative

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

MN SMILES! addresses two funding priorities of the Environment and Natural Resources Trust Fund.

Education: There are multiple barriers that may prevent students from pursuing careers in environmental science and natural resources. These barriers include lack of knowledge and enthusiasm for the fields and associated job opportunities, financial constraints associated with unpaid internships required to gain experience in the fields, and few role models for students to envision themselves in these careers. Too often, students are discouraged by complex material, memorization, and unengaging learning environments, so that by the time students enter college, many have negative attitudes and have decided against studying environment science.

Land: The health of the environment, people and animals are intimately linked and taking all three aspects into consideration is an approach called One Health. Accordingly, antibiotic resistance, which is a rising threat to human and animal health, must also be considered using an environmental lens. Antibiotic resistance occurs when bacterial infections cannot be effectively treated, and it leads to increased mortality and health care costs. The source of antibiotic resistance can be traced to humans, animals, and the environment. However, the prevalence and distribution of resistance hot spots Minnesota soils is largely 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.

MN SMILES! offers a hands-on, mentored research experience to motivate and prepare high school and college students to pursue careers in environmental science fields. This program is founded on science education literature that points to research experiences and layered mentoring as positively impacting student interest and attitudes about science, performance in the classroom and employment in the environmental field. By providing early exposure to research, this program will help students from all backgrounds develop an interest in environmental science and overcome challenges they face.

Minnesota students will conduct needed research to monitor the prevalence of antibiotic resistance present in soil throughout the state. Students will collect soil and determine the percentage of bacteria that are resistant to common antibiotics. Additionally, they will use molecular biology techniques to screen for resistance genes in soil. Geographic Information System (GIS) will be used as a tool to visualize their data on a map of Minnesota and to provide additional insights into their findings. This data will identify where there are environmental reservoirs of antibiotic resistance in Minnesota and inform practices to protect and improve the health of the soil. Considering a One Health lens, this will positively impact the well-being of all Minnesotans.

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?

The MN SMILES! internship program will directly engage high school and college students in research that monitors and protects soil resources from contamination by antibiotic resistant bacteria. Their findings will be disseminated to scientists and natural resource managers who can use the data to make informed decisions. Furthermore, members of the public will be informed about the prevalence of antibiotic resistance in soil through outreach activities done by student interns. As student interns enhance their skills and preparation for future careers, Minnesota will have a growing pool of qualified and enthusiastic individuals working in the environmental and natural resources fields.

Activities and Milestones

Activity 1: Summer Mentored Internship

Activity Budget: $261,866

Activity Description:
Objectives: i) Use a layered mentoring model to create a scaled up, high-quality, paid research internship that prepares high school and college students for study and employment in environmental studies. ii) Provide professional development for teachers to bring environmental science research into their classrooms.

Accomplishment of Task: A cohort of twenty-four participants will form under the direction of a university faculty member with expertise in environmental microbiology. Eighteen high school students, four college STEM majors, and two high school STEM teachers will be trained in research methodology and data analysis and then work in smaller teams to perform research as described in Activity 2. Career exploration and college readiness will be embedded in the program through invited speakers and field trips. Student presentations at the end of the internships will build communication skills. Research findings will be disseminated to stakeholders as described in activities 2 and 3.

Outcomes, Impact and Evaluation: The internship will run for four consecutive weeks in the summer at the University of St. Thomas. A stipend will be paid to all participants. Participant surveys of scientific knowledge, attitudes and career choice will measure success of the program.

Activity Milestones:

Description	Approximate Completion Date
Summer 1: Cohort of 24 participants complete environmental microbiology research experience	August 31, 2026
Summer 2: Cohort of 24 new participants complete environmental microbiology research experience	August 31, 2027
Summer 3: Cohort of 24 new participants complete environmental microbiology research experience	August 31, 2028

Activity 2: Land and Soil Health: Research Addressing Antibiotic Resistance in Minnesota Soils

Activity Budget: $18,734

Activity Description:
Objective: Student research teams will consult with stakeholders to systematically collect and test soils from agricultural and public lands in Minnesota for the presence of bacteria that are resistant to antibiotics.

Accomplishment of Tasks: We will leverage a nationally recognized research program studying the Prevalence of Antibiotic Resistance in the Environment (PARE), by following their standardized protocols. Students will collect soil samples and use classical microbiological methods to grow and enumerate the number of tetracycline-resistant bacteria in each sample. Each site will be categorized as having low (0-10%), medium (10-50%) or high (50-100%) levels of resistance. Students will perform molecular biology techniques to determine the resistance gene(s) present in the bacteria and whether resistance can spread between bacteria. Data will be entered into a public database and visualized using Geographic Information System (GIS) technology, which plots data on a map of Minnesota.

Outcomes, Impact and Evaluation: Over three summers, thirty-six unique sites will be sampled. Data will immediately be available online to reveal hotspots of antibiotic resistance. Instances of elevated levels of resistance will be followed up by initiating conversations with key stake holders. Students will learn marketable skills that include microbiological techniques, genetic analysis, computer bioinformatics and GIS

Activity Milestones:

Description	Approximate Completion Date
Summer 1: Twelve sites sampled and analyzed for antibiotic resistant bacteria	August 31, 2026
Summer 2: Twelve new sites sampled and analyzed for antibiotic resistant bacteria	August 31, 2027
Summer 3: Twelve new sites sampled and analyzed for antibiotic resistant bacteria	August 31, 2028

Activity 3: Outreach

Activity Budget: $5,400

Activity Description:
Objective: To multiply the investment in the MN SMILES! internship program and impact an even greater number of Minnesota citizens.

Tasks, Outcomes and Impacts:
i)The PARE educational and research materials are used by over two hundred high schools and universities around the world, however, the University of St. Thomas is the only school in Minnesota currently participating in the PARE program. We propose to expand the PARE program throughout the state by training additional educators who can then involve their students in this high impact learning experience AND contribute important data. The program lead (Dr. Joanna Klein) will conduct three training courses per year for educators in greater Minnesota. Project partners TBD.

ii) We will leverage the Minnesota One Health Antibiotic Stewardship Consortium (MOHASC) to spread research results and educate Minnesota citizens on the relationship between soil and antibiotic resistance. Student interns will present at MOHASC meetings, volunteer at their Minnesota State Fair booth, and contribute to their library display program.

iii) College students will present at regional scientific and professional meetings to disseminate research results and high school students will share their summer research experience and research findings in high school science classrooms.

Activity Milestones:

Description	Approximate Completion Date
Nine educator trainings in greater Minnesota	June 30, 2029
Networking and outreach with MOHASC	June 30, 2029
Student research presentations at scientific and professional meetings	June 30, 2029

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?

Three summer cohorts of student interns will measure the prevalence of antibiotic resistance in Minnesota soils within 60 miles of the metro area. Research results will be entered into a public spatial database and presented at regional conferences. Training of educators and students outside of the metro will occur so that soil research will be incorporated into high school and college curricula state-wide. Following LCCMR support, other funding sources will be sought and central research questions focusing on additional aspects of MN land and water resources will be added by drawing in faculty who have diverse areas of expertise.

Project Manager and Organization Qualifications

Project Manager Name: Joanna Klein

Job Title: Assistant Professor of Microbiology

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

Dr. Joanna Klein has been a professor of Biology for over twenty years, instructing undergraduate students in general biology, microbiology, genetics, biotechnology and research ethics. In addition to mentoring over seventy-five undergraduates in her research lab, Dr. Klein has incorporated semester-long authentic research projects into all her courses, resulting in hundreds of graduates gaining valuable research experience. Her current research interests center around monitoring the prevalence of antibiotic resistance in soil as well as on antibiotic discovery. From 2007-2012, she was part of a team that developed and ran a STEM education and outreach program for under-served high school students. The Science Research Institute (SRI) brought together metro high school students, college students, high school teachers and college faculty with the goal of encouraging and better equipping students to pursue careers in the sciences. It is upon this model that MN SMILES! is built. Her long-standing connections with educators and researchers throughout the state, commitment to the success of all students, scholarly work in environmental microbiology and education, and experience running a summer mentoring program qualify her to develop MN SMILES! into a standout program that will benefit all Minnesotans

Organization: University of St. Thomas

Organization Description:

The University of St. Thomas is the largest private university in the state of Minnesota. Located in the heart of the Minneapolis and St. Paul metro area, it enrolls over six thousand undergraduate students, most from within Minnesota. It boasts a faculty who excel in undergraduate teaching and research across all disciplines.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project Manager and Lead Instructor		Dr. Joanna Klein will lead the research project and provide tiered mentoring for participants.			8%	0.45		$50,631
Undergraduate researchers		Undergraduate students will perform research and mentor high school students			30%	0.99		$33,523
Project Coordinator		Work with project manager to carry out project			35%	0.51		$36,712
							Sub Total	**$120,866**
Contracts and Services								
High School Teacher Participants	Service Contract	Mentor for research teams and consultant with lead instructor				0.39		$60,000
High School Student Participants	Service Contract	Participant Support				3.12		$81,000
							Sub Total	**$141,000**
Equipment, Tools, and Supplies								
	Tools and Supplies	Research supplies	Disposable supplies and reagents needed to conduct research portion of project					$18,134
							Sub Total	**$18,134**
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-

Travel In Minnesota								
	Miles/ Meals/ Lodging	Nine training trips over 3 years	Travel by project manager to non-metro educatonal partners to conduct training and expansion of MN SMILES!					$3,000
	Conference Registration Miles/ Meals/ Lodging	Four students presenting per year	Conference registration and travel for student resarch presentations at regional research meetings					$2,400
	Other	Travel to research sites	Milage reimbursement for research teams to travel to soil collection sites.					$600
							Sub Total	**$6,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$286,000**

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 St. Thomas	Indirect costs	Pending	$45,981
			Non State Sub Total	**$45,981**
			Funds Total	**$45,981**

Total Project Cost: $331,981

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 2b088fcb-a56.pdf

Alternate Text for Visual Component

At the center of MN SMILES! lies the crucial work of protecting soil health in Minnesota by identifying reservoirs of antibiotic resistance. Students, teachers, and faculty conduct soil research during the summer. The program reaches outwards to benefit researchers, land managers, Minnesota educators, and ultimately all citizens of Minnesota....

Financial Capacity

Title	File
2023 Audit University of St. Thomas	96bc03f4-a2e.pdf
Secretary of State Business Filing Details University of St. Thomas	a88a4844-a46.pdf
Form 990 University of St. Thomas	307e73ce-577.pdf

Supplemental Attachments

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

Title	File
Authorization to submit proposal	d4265a16-03b.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 Commissioner's Plan 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?

Yes, UST Sponsored Programs

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:

Mike Warnock

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

Yes, I understand