



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-042

Proposal Title: Resilient Lawns to Mitigate Flooding from Extreme Storms

Project Manager Information

Name: John Gulliver

Organization: U of MN - St. Anthony Falls Laboratory

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Project Basic Information

Project Summary: We propose identifying a selection of grasses for lawns and parks that will open up the soil so that it can accept more rainfall and reduce flooding during extreme storms.

ENRTF Funds Requested: \$598,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Resiliency (A)

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?

In the Future

Narrative

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

We are having more extreme storms. In Minnesota, the historical 100 year storm of record has now become the 60 year storm, and the historical 50-year storm has become the 25-year storm. This trend will likely continue into the future, and flooding will become a prevalent problem. The type of ground surface surfaces that comprise municipal landscapes of a municipality becomes important in preventing flooding from these extreme storms. While we cannot reduce the impermeable surfaces (roads and parking lots) without greatly changing our life styles, we can adapt the permeable surfaces, primarily grass, to better meet these extreme storms.

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.

We need to move away from lawn grasses that do not have deep roots and cannot absorb much water. Poor-rooting perennial grasses are suitable to handle the the 60 percent increase in extreme storms that we have seen since 1970 and the continued increase in the future. We will identify a set of perennial grasses that will absorb extreme rainfall by developing deep root systems, which increase infiltration by sacrificing smaller roots in order to get water to their roots. We compare these grasses to conventional turfgrasses (i.e. Kentucky bluegrass) in both field and greenhouse environments and then communicate turfgrass species mixture recommendations for stormwater resilience to the professional stakeholders and the public . By testing a range of perennial grass species and then developing recommendations for resilient turfgrasses that produce roots deep in the soil, our project will create a more resilient landscape to deal with increasingly extreme Minnesota weather.

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?

Lawns that can absorb more water have been shown to greatly reduce flooding from extreme storms, and eliminate flooding for many extreme storms. We envision a campaign to develop lawns that are resilient to climate change and to inform the public about the importance of rainfall absorption of their lawns. At the conclusion of this research we will initiate a coordinated outreach effort to promote the use of more resilient turfgrass mixtures throughout the state our shallow-rooted lawns to ones that are resilient to flooding from extreme storms.

Activities and Milestones

Activity 1: Determine an optimal grass mix to mitigate flooding from extreme storms across Minnesota

Activity Budget: \$248,000

Activity Description:

We will first use scientific peer-reviewed literature to identify a suite of deeper-rooted resilient turfgrasses that could be useful in stormwater mitigation situations. Additionally, we will consult with Minnesota-based turfgrass seed vendors to make sure that any grasses we test will be able to be sourced at a scale that would be needed for widespread adoption by Minnesota residents. In field experiments, we will design a mixture optimization study using 5 or more of these grass species in various combinations, ranging from monocultures to 5-way mixtures. This will also be a factorial experiment in which we will examine how mowing height and frequency impact rooting characteristics of the mixtures. The ability of these grasses to absorb water, survive droughts, and break through hard pan soil will be investigated by documenting water infiltration rates. Rooting characteristics will be examined using a minirhizotron. Mixtures will also be examined for rooting characteristics in controlled environment experiments in which mixtures will be planted in PVC tubing filled with different soil treatments including soils differing in texture, layering, and soil compaction. Tubes will be cut open after a set amount of time where we will then measure the biomass of roots at various depths.

Activity Milestones:

Description	Approximate Completion Date
Finalize list of species along with mixture ratios for both field and controlled experiments	August 31, 2027
Seed field experiment	September 30, 2027
Initiate controlled environment experiment	July 31, 2028

Activity 2: Investigate the ability of current turf grasses across Minnesota to mitigate flooding from extreme storms

Activity Budget: \$300,000

Activity Description:

We will investigate the ability of current turf grasses to absorb extreme storms using infiltration technology (the MPD infiltrometer, developed at the University of Minnesota), soil moisture meters, soil cores, and other appropriate technology. We will use our relationship with municipalities to identify, get permission for and gain access to lawns that representing a range in Minnesota urban areas so that we can develop baselines for current turfgrass stormwater resilience. At each site (approximately 30 total sites) we will take core soil samples and determine root presence at various depths, along with identifying each plant species present. Water penetration into the soil depends upon soil texture, soil structure, root penetration, soil profile, soil compression, etc., and is highly variable, so approximately 20 measurements at any given location (600 total) are necessary to quantify the ability of the soil-grass combination to absorb storms. These data will help us better understand the gains that can be made from improved mixtures in Activity 1 and provide baseline data to help when communicating results to the public (Activity 3). We will also be able to prioritize future plant improvement targets that can inform plant breeding efforts to improve perennial grass resilience.

Activity Milestones:

Description	Approximate Completion Date
Determine locations for field sampling of water penetration into soil.	October 31, 2027
Measure water penetration and soil health at 30 field sites across Minnesota	November 30, 2029
Develop relationships on water penetration, soil texture, soil structure, types of grasses and location.	May 31, 2030

Activity 3: Develop draft materials for outreach to Minnesota residents.

Activity Budget: \$50,000

Activity Description:

During the final year of the project, our project team will develop resources for Minnesota residents, including specific turfgrass mixtures for resilient lawns along with recommendations for establishing and maintaining these unconventional grasses. We will work with local turfgrass seed vendors so that they can source seeds for recommended mixtures, and we will post all recommendations on UMN Extension and turf.umn.edu. Recommendations will be communicated through various channels included in person talks and workshops, field days on the St. Paul campus targeting professional and lay audiences, monthly lawn care newsletter from UMN Extension, and at meetings with local turfgrass seed vendors.

Activity Milestones:

Description	Approximate Completion Date
Development of draft outreach materials	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Eric Watkins	U of MN - Department of Horticultural Science	Co-PI	Yes
Andrew J. Erickson	U of M-St. Anthony Falls Laboratory	Co-PI	Yes
Dominic Petrella	U of MN - Department of Horticultural Science	Co-PI	Yes
Jon Trappe	U of MN - Extension	Co-PI	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

The Stormwater Research Program at the St. Anthony Falls Laboratory has contacts with city and county engineers, scientists and administrators, including the Minnesota Cities Stormwater Coalition, which represents 141 cities in the State of Minnesota. The Turfgrass Science Program and UMN Extension also have an established, statewide network for disseminating research to decision makers and managers, ensuring the final products reach the decision makers who dictate local water and land use policies.

Recommendations for resilient turfgrass mixtures will be distributed widely using existing outreach efforts. These include at least 3 in-person turfgrass field days at the University of Minnesota St. Paul campus (Turfgrass Research Outreach and Education Center), pesticide recertification workshops (multiple sessions annually as part of required pesticide applicator training), Master Gardener workshops, email newsletters, and regular blog posts at turf.umn.edu. In addition, we will add results to our 'Lawn Leaders' training; this program trains approximately 10-15 UMN Master Gardeners annually to lead lawn water conservation educational events in their neighborhood where they demonstrate best practices and answer questions about lawn care. All outreach efforts will acknowledge ENRTF funding based on published guidelines.

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?

There are agencies within the State of Minnesota who would be interested in our results and may be willing to implement the public campaign for deep rooted grasses to mitigate flooding from extreme storms, which include the Board of Soil and Water Resources, the Metropolitan Council and the Department of Natural Resources.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Phytoremediation for Extracting Deicing Salt	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 08g	\$451,000
Removing CECs from Stormwater with Biofiltration	M.L. 2023, , Chp. 60, Art. 2, Sec. 2, Subd. 04j	\$641,000

Road Salt Pollution of Surface Waters from Groundwater	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 08n	\$622,000
Promoting Pollinators on Corporate Campuses	M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 08n	\$547,000

Project Manager and Organization Qualifications

Project Manager Name: John Gulliver

Job Title: Professor Emeritus

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

John Gulliver is a professor emeritus in the Department of Civil, Environmental and Geo- Engineering, performing his research at the St. Anthony Falls Laboratory. He has successfully managed 112 research projects, including 10 projects for the LCCMR. He is continuing research into the future because it is his avocation. Much of his research, in conjunction with other faculty, involves the development of new technology for stormwater treatment and assessment of field performance of stormwater treatment practices. His most recent research projects include the retention of metals by bioretention media, the infiltration rates of various stormwater treatment practices, the impact of various types of impervious areas on runoff, and the impact of climate change on stormwater infrastructure. He is a co-author of the book, *Optimizing Stormwater Treatment Practices: A Handbook of Assessment and Maintenance*, published by Springer.

Organization: U of MN - St. Anthony Falls Laboratory

Organization Description:

The St. Anthony Falls Laboratory (SAFL) is an interdisciplinary fluid mechanics research lab and educational facility under the College of Science and Engineering at the University of Minnesota. We are engineers and scientists who collaborate across disciplines to solve fluids-related problems in the Earth-surface environment. Our vision encompasses both science and practice, beginning with basic research and moving through application, decision-making, and management. SAFL integrates cutting-edge experimental work at laboratory and field scales with advanced computational tools and theory to obtain innovative, science-based solutions to fluid-flow challenges. Located on Hennepin Island in the Mississippi River in the heart of Minneapolis, SAFL serves as a resource for departments across the Twin Cities campus, the statewide University system, and the broader research community. We partner with local, state and federal agencies; private consulting firms; businesses of many kinds; technical associations; and other educational institutions to expand knowledge and solve problems.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
John Gulliver		PI			8.3%	0.27		\$66,161
Eric Watkins		Co-PI			38.5%	0.06		\$16,932
Andrew Erickson		Co-PI			38.5%	0.24		\$46,603
Jon Trappe		Researcher			38.5%	0.3		\$36,487
Dominic Pretrella		Researcher			38.5%	0.12		\$23,970
Poornima Natarajan		Researcher			38.5%	0.24		\$31,232
Andrew Hollman		Researcher			38.5%	0.3		\$41,528
Ben Erickson		Shop Staff			34.9%	0.24		\$26,767
Levi Burrows		Researcher			34.9%	0.96		\$72,656
Post Doctoral Associate		Researcher			28.1%	3		\$127,025
2 Undergraduate Research Assistants		Field staff			0%	1.5		\$54,565
							Sub Total	\$543,926
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Equipment								
							Sub Total	-

Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	7 trips, 1300 miles, 2 people, \$0.58/mile	Trips to Greater Minnesota for field work					\$2,800
							Sub Total	\$2,800
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Journal charges	To let the community know our results					\$2,000
							Sub Total	\$2,000
Other Expenses								
		Field Supplies	To supply necessary field needs for infiltration studies					\$16,074
		Lab supplies	Chemicals and lab supplies to analyze soil columns					\$6,000
		Short Term Lease	\$2400/yr for 2 growth chambers (1 chamber = \$100/month) and \$2400/yr for 170 sq ft of greenhouse bench space (\$200/month for 170sqft)					\$7,200
		Lab and field supplies	36 rhizotrons at \$500 each + \$2000 for general lab/field supplies (fertilizer, seed, germination blankets, etc.).					\$20,000
							Sub Total	\$49,274
							Grand Total	\$598,000

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

Total Project Cost: \$598,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [8d9475c9-53d.pdf](#)

Alternate Text for Visual Component

Upper left- 60% increase in extreme storms since 1970 and picture of the flooding in Duluth, 2012. Middle upper- Our solution is deep rooted grasses planted in lawns, which will open up the soil for water absorption. Upper right- The outcome will be reduce flooding with climate resilient lawns....

Supplemental Attachments

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

Title	File
Letter from Board of Regents	bb3962c5-670.pdf
Met Council Support Letter	75dc5956-534.pdf
Dakota County Soil and Water Conservation District	7a827ce3-350.pdf
City of Maple Grove Support Letter	3f31482b-292.pdf
City of Roseville Support letter	0bd8eae6-5e8.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:

Eric Watkins, University of Minnesota; Andrew Erickson, University of Minnesota, Angela Boutch, 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