



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-157

Proposal Title: Evaluating Native Prairie Willow for Managed Landscape Applications

Project Manager Information

Name: Brandon Miller

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

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Project Basic Information

Project Summary: This project aims to characterize the soil moisture tolerances of Minnesota native shrub, prairie willow, to determine its suitability for managed landscape applications and potentially identify superior adaptable selections.

ENRTF Funds Requested: \$75,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Small Projects (G)

Secondary 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?

During the Project and In the Future

Narrative

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

Managed green spaces are landscapes situated amidst human activity that utilize plants to provide environmental, social, and aesthetic benefits. These spaces are highly valued by their communities yet characterized by harsh conditions, including irregular water cycles and degraded soils. These pressures are intensifying under extreme and unpredictable climate conditions, making managed green spaces a critical area for climate adaptation. As population grows and urban development expands, nationally and within the Twin Cities, the need for resilient green spaces that deliver benefits to local residents increases. However, many managed plant assemblages in Minnesota lack the biodiversity and adaptability necessary to withstand shifting conditions. In 2024, *Fraxinus* was recorded as the second-most common tree genus in the Twin Cities and its ongoing decline illustrates the ecological and economic risks of limited plant diversity. There is a pressing local demand, highlighted by urban foresters and other green industry practitioners, for adaptable plant species that thrive in the built environment. Many native species, such as prairie willow, have potential but remain understudied. Expanding the plant palette for resilient managed landscapes requires quantitative data on the performance of novel native species. This research addresses this critical knowledge gap, enhancing the long-term sustainability of Minnesota landscapes.

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.

Enhancing managed landscapes through the use of woody plants is a natural climate adaptation solution. Woody plants provide essential ecosystem services, such as stormwater management and ecological support. Incorporating woody plants transforms landscapes into multifunctional and resilient spaces. Minnesota native willows provide a significant opportunity to expand woody plant diversity in these settings. While Minnesota hosts over 20 native willows, commercial offerings are dominated by non-native selections like dappled willow (*Salix integra* 'Hakuro-Nishiki'). Prairie willow (*Salix humilis*), a Minnesota native shrub, is a promising candidate for managed landscapes. Early-emerging flowers support pollinators and offer ornamental value. Two natural varieties, including a compact dwarf form (*Salix humilis* var. *tristis*), provide versatility across landscape contexts. Importantly, prairie willow grows naturally in disturbed environments and in a variety of soil moisture conditions. Its broad native distribution also suggests the possibility for populations with enhanced stress tolerance. However, prairie willow adaptability has never been formally evaluated. This work will assess prairie willow tolerance to drought and flood via controlled greenhouse studies and field screening and extend findings to key stakeholders. Applied performance testing is fundamental to the successful introduction of novel species, ensuring long-term survival, reducing replacement costs, and proactively addressing emerging environmental challenges.

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 contributes foundational data necessary for responsibly introducing prairie willow into managed landscapes. By quantifying the soil-moisture tolerances of different prairie willow populations, this research supports climate-resilient plant selection and addresses a growing need for natural solutions for stormwater management. The focus on a MN-native species will preserve local ecotypes and expand the use of regionally adapted plants. With growing local interest in native species, prairie willow has the potential to be broadly accepted and profitable for Minnesota industries. Through Extension and collaboration, outcomes will directly enhance the protection, sustainability, and long-term resilience of Minnesota's natural resources.

Activities and Milestones

Activity 1: Evaluate stress tolerances of prairie willow and explore potential variation in different populations representing the species' natural genetic diversity

Activity Budget: \$20,642

Activity Description:

Greenhouse trials will facilitate a controlled assessment of prairie willow responses to drought and flood. Experiments will be conducted at the University of Minnesota Plant Growth Facilities using seedlings in 6" containers. Six populations, three of the dwarf variety (*Salix humilis* var. *tristis*) and three of the non-dwarf variety (*Salix humilis* var. *humilis*), will be used to evaluate population-level variation. One plant from each population will be measured and harvested prior to treatment initiation. Remaining plants will be subjected to varying degrees of inundation and drought and assessed on their ability to maintain growth and photosynthesis. Following Peterson & Graves (2013), three inundation treatments (containers saturated to the entire root zone, lowest 7.5 cm, or lowest 3.5 cm) and three drought treatments (irrigation at 5%, 19%, and 20% soil moisture) will be applied, along with a daily-watered control. Weekly measurements include net photosynthesis (LI-6400XT), chlorophyll fluorescence (Walz Maxi Fluorometer), stem length/diameter, and chlorophyll content index (Apogee MC-100). After one month, plants will be harvested to assess leaf surface area (LI-COR 3100), and plant dry mass. These trials will generate quantitative data on prairie willow's tolerance to drought and flooding, informing its suitability for managed greenspaces and stormwater management.

Activity Milestones:

Description	Approximate Completion Date
Cultivate/grow stock plants to 6" container sizes	May 31, 2027
Execute greenhouse trials	July 31, 2027
Analyze data	December 31, 2028
Publish open-access, peer-reviewed journal article	June 30, 2029

Activity 2: Assess predicted drought tolerance of prairie willow plants at the University of Minnesota Landscape Arboretum and Horticultural Research Center

Activity Budget: \$33,807

Activity Description:

Prairie willow collections, including two populations of both dwarf and non-dwarf varieties, were established at the University of Minnesota Landscape Arboretum in spring 2026 and the Horticultural Research Center in summer 2023. In late spring and again in late summer of 2027 and 2028, predicted drought tolerance will be assessed for each individual using methodology described in Miller & Bassuk (2022) and Sjöman et al. (2023). Three uniform branches will be collected from each individual, submerged in water, and left overnight to equilibrate. The following day, a leaf disk will be taken from three separate leaves from each branch, processed to ensure proper evaporation of leaf solutes, and loaded into the chamber of a 5600 Vapor Pressure Osmometer. Measurements of solute concentration will be collected continuously until nine measurements per plant are obtained. From this data, osmotic potential at full turgor and turgor loss points can be calculated (Bartlett et al. 2012 and Sjöman et al. 2015). Lower osmotic potentials and turgor loss points correlate with drought tolerance. These measurements will reveal whether field-grown prairie willow plants have the ability to osmotically adjust between spring and summer in accordance with the onset of drought conditions and highlight population-level variation.

Activity Milestones:

Description	Approximate Completion Date
Collect pre-summer data on prairie willow osmotic potential (2027)	June 30, 2027
Collect end of summer data on prairie willow osmotic potential (2027)	August 31, 2027
Collect pre-summer data on prairie willow osmotic potential (2028)	June 30, 2028
Collect end of summer data on prairie willow osmotic potential (2028)	August 31, 2028
Analyze data	January 31, 2029

Activity 3: Develop diverse Extension publications to disperse results to green industry stakeholders

Activity Budget: \$20,551

Activity Description:

Due to the highly applied nature of this work, this study will culminate with Extension materials to aid in achieving the objectives and communicate this information to relevant stakeholders. Extension work will include publication in Extension-oriented outlets, including The Scoop (the trade journal of the Minnesota Nursery and Landscape Association), a webpage on the University of Minnesota Extension site, and a Yard & Garden News Release. A species profile for prairie willow will be developed on the Plant Elements of Design database, operated by University of Minnesota Extension. Extension field-day demonstrations and informed signage will be developed for the established field collections of prairie willow at the Horticultural Research Center and the Landscape Arboretum, specifically highlighted during Field Day demonstrations. Extension work will be accomplished through collaboration with an Extension Horticulture Educator, Laura Irish-Hanson, stationed at the University of Minnesota Landscape Arboretum.

Activity Milestones:

Description	Approximate Completion Date
Extension field-day demonstrations (1)	June 30, 2027
University of Minnesota Extension webpage	January 31, 2029
Yard & Garden News Release	January 31, 2029
Article published in The Scoop	May 31, 2029
Species profile on Prairie Willow, Plant Elements of Design	June 30, 2029
Extension field-day demonstrations (2)	June 30, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Hazel Schrader	University of Minnesota	Graduate Research Assistant. Hazel will serve as a co-PI. She will conduct the greenhouse trials, field screening, and support dissemination efforts. Hazel will also support the development of a peer-reviewed journal article.	Yes
Laura Irish-Hanson	University of Minnesota Extension	Laura is an Extension Educator in horticulture who will partner to support and oversee dissemination of research findings to public stakeholders through resource development (web and print) as well as field day events.	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 findings of this project will be disseminated through various outlets to academic audiences and the general public. This work will result in an open-access, peer-reviewed journal article that will immortalize the findings and be distributed to scholars. Through collaboration with an Extension Educator, the project will also be conveyed to the public through online Extension resources, like the Yard & Garden Newsletter, the Plant Elements of Design - plant selection database, physical handouts, and two Extension field days hosted at the Horticultural Research Center. In addition, an industry-oriented article will be written and distributed through The Scoop, the official trade magazine of the Minnesota Nursery and Landscape Association.

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?

This project will culminate in a published dissertation in the University of Minnesota digital repository and at least two formal research publications in open-access scientific journals. Results will be presented at industry gatherings and academic conferences, including the American Society for Horticultural Science annual meetings. Extension publications will be distributed to green industry stakeholders through The Scoop (Minnesota Nursery and Landscape Association), a UMN Extension webpage, and a Yard & Garden News Release. Field-day demonstrations will be developed. Prairie willow collections at the UMN Landscape Arboretum and Horticultural Research Center will continue to be maintained past funding for demonstration purposes.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Grassland Restoration for Pollinator Conservation and Demonstration	M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 08b	\$250,000

Project Manager and Organization Qualifications

Project Manager Name: Brandon Miller

Job Title: Assistant Professor

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

Dr. Brandon Miller is an Assistant Professor in the Department of Horticultural Science at the University of Minnesota.

He serves as a State Extension Specialist and as Curator of Plant Collections at the Minnesota Landscape Arboretum. His research and Extension programs are extramurally funded and he is experienced in managing a research team and grant-funded projects. Dr. Miller is experienced in the specific qualifications pertinent to this proposed plant resiliency project: controlled stress physiology experiments, field evaluation, real-world implementation of plant evaluation with green industry stakeholders, graduate student advising, and distributing findings to public stakeholders via Extension programming.

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

Organization Description:

This project will operate through the University of Minnesota Department of Horticultural Science, in particular in the Resilient Landscape Horticulture Research and Extension Program, a lab group with the core focus of developing resilient landscapes in Minnesota.

The College of Food, Agricultural and Natural Resources Sciences (CFANS) comprises twelve academic departments as well as ten research and outreach centers, in addition to the Minnesota Landscape Arboretum, the Bell Museum, and a variety of interdisciplinary centers.

The University of Minnesota Landscape Arboretum, founded in 1958, is a 1,200-acre premier northern garden that includes 28 specialty gardens, 45 plant and tree collections, 18 model landscapes and natural areas, and an extensive collection of cold hardy plants. The mission of the Arboretum is to welcome, inform and inspire all through outstanding displays, protected natural areas, horticultural research, and education. Its vision is to be the premier northern landscape arboretum, welcoming all to enjoy, learn from, and connect with nature.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Graduate Research Assistant		To set up experiments, conduct research, analyze data, compile results, and support dissemination of findings. [YR1: \$21,634 (Salary: \$17,419; Fringe: \$4,215); YR2: \$22,391 (Salary: \$18,028; Fringe: \$4,363)].			24.2%	0.5		\$44,025
Extension Educator		To support the creation of Extension resources, coordinate and support Extension field days. [YR1: \$2,216 (Salary: \$1,622; Fringe: \$594); YR2: \$2,294 (Salary: \$1,679; Fringe: \$615)].			36.6%	0.04		\$4,510
Research Plot Technician		To maintain the field plots and support greenhouse plant management. Coverage is 15% time for 9 months/yr (only works March-Nov). [YR1: \$7,856 (Salary: \$5,938; Fringe: \$1,918); YR2: \$8,131 (Salary: \$6,146; Fringe: \$1,985)].			32.3%	0.3		\$15,987
							Sub Total	\$64,522
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Tools and Supplies	Vapor Pressure Osmometer (VPO), thermocouple replacement	The VPO is used to evaluate field-grown plants to predict leaf water potential (a proxy for drought tolerance ratings). For accurate measurements, the instrument requires a new thermocouple at the onset of the experiment.					\$1,579
	Tools and Supplies	Vapor Pressure Osmometer (VPO), desiccant cartridge replacements	The VPO is used to evaluate field-grown plants to predict leaf water potential (a proxy for drought tolerance ratings). For accurate measurements, the instrument requires the routine replacement of the desiccant cartridge					\$500

			throughout the analysis periods (\$100 each).					
							Sub Total	\$2,079
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
							Sub Total	-
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	One peer reviewed, open-access manuscript will be developed based on research findings (estimated at \$2000 per publication in the journal HortScience).	To disseminate and immortalize the findings of the research in the scholarly literature. This is a publication fee necessary for the dissemination of the findings and is considered a work product.					\$2,000
	Printing	Extension printing	To generate physical resources that will be shared with public stakeholders, especially at field day events. Printing these resources will support the dissemination of the findings to lay audiences. This expense is necessary for the dissemination of the findings and is considered a work product.					\$300
							Sub Total	\$2,300
Other Expenses								

		Greenhouse and Cooler Rental Expenses	Rental fee of greenhouse space (and associated supplies and services) as well as cooler space for overwintering plants (YR1= \$1,450; YR2 =\$1,450). Greenhouse space required for 10 months. \$.0419* 175 SqFT * 30 days = \$220/month (YR1 = 5 Mo.; YR2 = 5 Mo.; July-Sept. & May-June); coolers @ \$50 monthly for Oct.-April (7 months in Y1 & Y2).					\$2,900
		Graduate Research Assistant Tuition	To support a GRA who will oversee the execution of objectives 1 & 2. Tuition is built into UMN GRA appointments. [YR1= \$1,576; YR2=\$1,623]					\$3,199
							Sub Total	\$6,099
							Grand Total	\$75,000

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: \$75,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [1482851d-bdf.pdf](#)

Alternate Text for Visual Component

A logic model of the project concept, the entities influenced by the work, and the perceived benefits of the project....

Supplemental Attachments

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

Title	File
SPA Approval to Submit	0c8683fb-f83.pdf
Support Letter_Luther Overholt_Edina City Forester	2b4a6e81-37e.pdf
Support Letter_Gary Johnson_UMN Urban Forestry	5ab5ead7-e02.pdf
Support Letter_Laura Irish-Hanson_Extension	0c2bd71b-5d1.pdf
Support Letter_Dan Gullickson_MNDOT	eb9804b8-53e.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?

N/A

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:

Hazel Schrader; Dave La Fave

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