Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-220

Proposal Title: Minnesota Ecological Design Toolkit

Project Manager Information

Name: Matthew Tierney

Organization: U of MN - Center for Sustainable Building Research

Office Telephone: (612) 626-2737

Email: tierney@umn.edu

Project Basic Information

Project Summary: Develop an online toolkit that allows designers, engineers, state employees, developers and others to rapidly understand the ecological and cultural context of a site and implement sustainable design strategies.

Funds Requested: $433,000

Proposed Project Completion: June 30, 2026

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?
   Region(s): Central, Metro, NE, NW, SE, SW,

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.

A wealth of GIS data is currently available to inform ecologically appropriate site and building developments in Minnesota, but this data is dispersed among many separate sources, layers, maps, and formats. Compiling this information and gaining a holistic view of a particular place is critical to making informed decisions that facilitate ecologically minded solutions at the regional, site and building scales. Yet this process is challenging, time-intensive, and requires a working knowledge of various computer programming languages and navigation of various online mapping and calculation tools. For these reasons, most projects fail to benefit from the wealth of GIS data and other resources that Minnesota continues to develop and provide to its citizens. Therefore, professionals, state employees, and members of the public tasked with understanding, designing, and constructing sustainable systems are currently not able to fully utilize the wealth of data that exists in Minnesota and are, consequentially, not able to implement the most sustainable or ecologically effective solutions. Our interdisciplinary team and diverse group of collaborators represents the wide variety of users that would benefit from a streamlined online digital toolkit and also represents the resounding support we have received for the development of this type of resource.

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.

This project will develop a web-based tookit that aggregates a challenging array of data to provide: (1) a "dashboard" which allows the user to understand a project site from an ecological, political, and climatic perspective, among others. This information could be easily exported to show compliance with various laws and regulations and provides the background for (2) an enhanced, web-based version of the Minnesota Pollution Control Agency's Minimum Impact Design Standards (MIDS) calculator (Designed as a standalone Microsoft Excel based application only for Windows Operating Systems) to allow designers to implement the appropriate solutions that address the unique ecological opportunities and constraints of a particular site from an online interface. Additionally this tool would streamline compliance reporting for; the Minnesota B3 Guidelines' Site and Water sections (Administered by the Center for Sustainable Building Research), the Environmental Assessment Worksheet (Administered by the MN Environmental Quality Board), other state administered regulations requiring reporting.

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 toolkit offers anyone in the state (and potentially the larger bioregion) an improved understanding of a project site's natural resources. This improved understanding puts the tools for success in the hands of those tasked with creating sustainable solutions at the regional, site, and building scales. Through this enhanced data gathering and design process Minnesota's ecological and cultural resources are given the unique respect and attention they deserve by revealing site-specific opportunities that may not be readily available to the design team or ownership group and providing a streamlined process for reporting.

Activities and Milestones

Activity 1: Develop logic and specifications for the toolkit

Activity Budget: $130,000

Activity Description:

The Minnesota B3 Site & Water guidelines, Minnesota Pollution Control Agency's MIDS calculator, and the EQB's Environmental Assessment Worksheet (EAW) will be used as guides to develop algorithms and specifications to implement in the web-based design program. This process will lay out the steps necessary to convert a disparate array of existing data into a singular format and through the use of a web-based site/water design tool, will offer specific, site-level strategies that a project developer and/or designers can implement to support the environmental potential of the project. For example, under B3 Guidelines, projects are required to have 75% of plant species be native to the surrounding area. The proposed tool will evaluate and integrate multiple GIS layers that characterize ecological communities to supply the user with a representative plant list and help specify the optimum location and type of installation for these plants.

Activity Milestones:

Description	Approximate Completion Date
Organize Logic Questions and Compile Data Sources	October 31, 2024
Assemble online database for toolkit	January 31, 2025
Review of data sets and logic with advisory committee and outside reviewers	February 28, 2025

Activity 2: Complete set of geospatial data that meets the requirements defined in Activity 1, including references allowing future updates. Prototype online Graphic

Activity Budget: $130,000

Activity Description:

Compile current geospatial data sets from disparate sources and unify the formatting for use in the application. Convert existing Windows version of MIDS to be available online and incorporate additional functionality to use site based data to influence strategies available and calculations. Work with graphic user interface designers to develop a more intuitive and user-friendly interface for the MIDS calculator. Based on the data requirements identified in Activity 1, sets of geospatial (GIS) data will be compiled and prepared for use in the application. Data required for this tool are housed in various agencies and formats, such as County Biological Surveys, DNR data sets, FEMA flood plain maps, and ESRI GIS layers. This task will gather these data and prepare them in a unified format for use in the tool. The existing Windows/Microsoft Excel-based MIDS Calculator will be transferred to a web-based application and the functionality, graphics, and output of the tool will be renovated to incorporate the aggregated data to better inform the appropriate Best Management Practices (BMPs) suggested for a particular site.

Activity Milestones:

Description	Approximate Completion Date
Develop online graphic user interface and MIDS online	May 31, 2025
Deploy logic for MIDS and GIS integration	August 31, 2025
Pilot testing of online toolkit with collaborators	November 30, 2025

Activity 3: Develop and deploy the online interface and web-based site/water design tool, publicize its release and present at various venues.

Activity Budget: $173,000

Activity Description:

A web-based mapping application that produces a project "dashboard" will be developed alongside the web-based renovation of the MPCA's MIDS calculator. This suite of applications will provide better ecological and systems guidance unique to a proposed building site. Users will define a site by drawing its border outline on a map. This will trigger the application to test the site against all criteria identified in Activity 1 and aggregate the resulting data into a report. If the site meets the basic suitability criteria, then data about the surrounding plant, animal, and hydrological communities will be polled to give project-specific advice to the developer regarding appropriate site development. The project specific advice will be incorporated into the MIDS calculator and will offer a web-based design platform to test different strategies for site-based solutions that are appropriate for the surrounding context. This activity will also include presentations and demonstrations to the design community and members of the public to encourage its use across a wide variety of disciplines. The tool will be free and available for public use at the regional, neighborhood, site, and building scales.

Activity Milestones:

Description	Approximate Completion Date
Final graphic user interface design	February 28, 2026
Finalize MIDS online tool	March 31, 2026
Soft launch of MN Ecological Design Toolkit (EDT)	May 31, 2026
Public Launch of MN Ecological Design Toolkit (EDT) and Presentations	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Todd Smith	Minnesota Pollution Control Agency	Advisory Role - Principal Engineer MPCA - MIDS specialist	No
Len Kne	USpatial - UMN	Director - USpatial - Contributing directly to development of toolkit	Yes
Patrick Smith	Center for Sustainable Building Research	Researcher 6 - Co-Principal Investigator	Yes
Andy Erickson	University of Minnesota - St. Anthony Falls Laboratory	Advisory Role - Research Manager - St. Anthony Falls Laboratory	No
Richard Strong	University of Minnesota - College of Design	Advisory Role - Adjunct Faculty - Site and Water	No
Peter Macdonough	University of Minnesota - College of Design	Advisory Role - Adjunct Faculty - Site and Water	No
Jessica Rossi-Mastrocci	University of Minnesota - College of Design	Advisory Role - Landscape Architecture Faculty	No
Mike Trojan	Retired	Advisory Role - MIDS Specific Development - Hydrologist	No
Graduate Research Assistants	University of Minnesota - College of Design	Research Assistants	Yes
Matthew Tierney	University of Minnesota - Center for Sustainable Building Research	Architect - Co-Principal Investigator	Yes
Researcher 5	University of Minnesota - Center for Sustainable Building Research	Project support for online toolkit	Yes
Researcher 2	University of Minnesota - USpatial	Project support for online toolkit	Yes
Researcher 5	University of Minnesota - USpatial	Project support for online toolkit	Yes
Benjamin Wichterman	University of Minnesota - Sponsored	UMN SPA - Fiscal Agent	No

	Projects Administration		
Richard Graves	University of Minnesota - Center for Sustainable Building Research	Director - Project Management and Advisory	No
Eugene Park	University of Minnesota - College of Design - Graphic Design	Advisory Role - Graphic Design Faculty	No
Ryan Allen	Minnesota Department of Administration	Real Estate and Construction Services - Interim Division Director	No
TBD	TBD	Software and Technology Development Sub Consultant	Yes
TBD	TBD	Software and Technology Development Sub Consultant	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?
The web-based toolkit developed through this project will be available free of charge to the public and will be maintained by the Center for Sustainable Building Research and the University of Minnesota.

Project Manager and Organization Qualifications

Project Manager Name: Matthew Tierney

Job Title: Co Principal Investigator

Provide description of the project manager's qualifications to manage the proposed project.
Matthew is a licensed Architect in Minnesota and has over a decade of experience conducting research in the professional architectural realm as well as designing various projects in Minnesota and around the world with sustainability and site-scale green/blue infrastructure solutions at the forefront. He has a wealth of experience working in the non-profit sector and has managed state and private funds for his whole career. He holds a Master of Architecture from the University of Oregon and a Master of Science in Architectural Research Practices from the University of Minnesota. He is a Research Fellow at the Center for Sustainable Building Research at the University of Minnesota and has teaching experience at the graduate and undergraduate levels. His research and built work focuses on site and water based green/blue infrastructure and design solutions that result from a holistic understanding of ecological, cultural, and political surroundings. Through his work and through grant-funded research he has developed online tools and rating systems with various partners to help evaluate projects and allow a broader, more accessible understanding of sustainable systems for all. He is the manager of the Site and Water sections of the Minnesota B3 Guidelines for Sustainable Design and has extensive experience working as an architect with adjacent disciplines including civil, environmental, and mechanical engineers, landscape architects, hydrologists, graphic designers, urban and rural planners, among others. He has developed a broad understanding of the ecological and cultural contexts of sustainability through his work in India, Kenya, Tanzania, Denmark, Mexico, and throughout the United States working alongside First Nations communities in the Pacific Northwest. Matthew is well-positioned and qualified to manage this interdisciplinary project team and to deliver a high-quality work product that will serve the diverse population of Minnesota and our shared natural resources for years to come.

Organization: U of MN - Center for Sustainable Building Research

Organization Description:
The Center for Sustainable Building Research's role is to transform the built environment in ways that provide for the ecological, economic, and social needs of the present without compromising those of the future." The work of the center is focused in six areas all of which are part of the Minnesota B3 Guidelines: Energy and climate change; Site and water systems; Sustainable materials for a healthy built environment; Measuring regenerative design; Equitable designs to provide sustainability for all; and Creating regenerative and resilient communities. The CSBR serves students, professionals and the community in many ways but this proposal seeks to address the need for everyone to be adequately equipped with "the practical skills, analytic abilities, philosophical depth, and moral wherewithal to remake the human presence in the world". USpatial is a research unit of the University of Minnesota that offers leading edge expertise in data management, and development of tools and digital systems related to GIS, remote sensing and spatial computing. Between the CSBR and USpatial, (among the many partner organizations from other disciplines) we believe we have a diverse team to competently develop a toolkit that will serve many people for years to come.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Patrick Smith - Researcher 6		Co Principal Investigator - UMN Center for Sustainable Building Research			36.8%	0.3		$27,500
Matthew Tierney - Researcher 5		Co Principal Investigator - UMN Center for Sustainable Building Research			36.8%	1		$77,500
Len Kne - Director		UMN - USpatial (Budget accounts for time spent contributing directly to development of online toolkit)			36.8%	0.1		$16,500
USpatial Researcher 2		USpatial Research Fellow (Web Development and Integration)			32%	0.5		$36,000
CSBR Researcher 5		Support for online toolkit (Data Sourcing, Programming, and Integration)			36.8%	0.5		$39,000
USpatial Researcher 5		Support for online toolkit (GIS and MIDS online integration)			36.8%	0.6		$63,000
College of Design CSBR - Graduate Research Assistant (FY'25)		Support for online toolkit (Design, Sourcing, and Implementation)			0%	0.25		$40,500
College of Design CSBR - Graduate Research Assistant (FY'26)		Support for online toolkit (Design, Sourcing, and Implementation)			0%	0.25		$42,500
							Sub Total	**$342,500**
Contracts and Services								
TBD - Software Development Sub Contractor	Professional or Technical Service Contract	Contributing to the development and implementation of an online toolkit				0.5		$50,500

						0.5		$40,000
TBD - Technical Assistance Sub Contractor	Professional or Technical Service Contract	Contributing to the development and implementation of an online toolkit						
							Sub Total	**$90,500**
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	**$433,000**

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				
In-Kind	Minnesota Pollution Control Agency - Todd Smith and MPCA Staff	If LCCMR grant funding is secured and project moves forward, MPCA will offer In-kind services of 1-3 staff for the duration of the project to support MIDS specific development and online implementation for the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
			State Sub Total	**$10,000**
Non-State				
In-Kind	Richard Strong - Professional Services	If LCCMR grant funding is secured and project moves forward, Richard will offer in-kind professional services to support development of the online toolkit for the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
In-Kind	Andy Erickson - UMN - St. Anthony Falls Laboratory - Professional services	If LCCMR grant funding is secured and project moves forward, Andy Erickson will offer in-kind professional services on behalf of the University of Minnesota's St. Anthony Falls Laboratory for the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
In-Kind	Mike Trojan - Hydrologist - Professional Services	If LCCMR grant funding is secured and project moves forward, Mike Trojan will offer in-kind professional services to support the MIDS implementation and general project guidance for the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
In-Kind	Jessica Rossi-Mastrocci - UMN College of Design (Landscape Architecture)- Professional Services	If LCCMR grant funding is secured and project moves forward, Jessica will offer in-kind professional services to support the development of the online toolkit for the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
In-Kind	Peter MacDonough - Professional Services	If LCCMR grant funding is secured and project moves forward, Peter will provide in-kind professional services to support the development of the online toolkit. (~80hrs @$125/hr)	Pending	$10,000
In-Kind	Richard Graves - Professional Services and CSBR Management	Richard Graves, CSBR Director (3% FTE, 36.8% benefits, for 2 years)	Secured	$10,092
In-Kind	Eugene Park - UMN College of Design (Graphic Design) -Professional Services	If LCCMR grant funding is secured, Eugene will assist the project team with the development and implementation of the online toolkit over the duration of the project. (~80hrs @$125/hr)	Pending	$10,000
			Non State Sub Total	**$70,092**
			Funds Total	**$80,092**

Attachments

Required Attachments
Visual Component
File: 11949075-fea.pdf

Alternate Text for Visual Component
Top- Project Dashboard: Integration of GIS data, graphic user interface, and user-based mapping for each site.
Bottom- Digital Sankey Diagram (Sankeymatic): MIDS + Contextual GIS Input and User Defined Goals. Understanding and visualizing water flow and ecological design strategies at the site scale.
Copyright - Tierney (2021 MWMO Stewardship Planning Grant)...

Optional Attachments
Support Letter, Photos, Media, Other

Title	File
MSR - Professional Partner - Letter of Support	b365efe4-be7.pdf
Andy Erickson (UMN St. Anthony Falls Laboratory) - Letter of Support	881a4d35-2d4.pdf
Richard Strong and Peter MacDonough (UMN CDes - Architecture/Landscape Architecture) - Letter of Support	55f631c5-36b.pdf
Precipitate - Professional Partner - Letter of Support	b055f1cc-e3d.pdf
UMN SPA - Project Authorization Cover Letter	cf9ca043-8ac.pdf
UMN SPA - Letter of Intent - Tierney Authorization	022a5e36-f76.pdf
Jessica Rossi-Mastrocci (UMN CDes - Landscape Architecture) - Letter of Support	9944bc46-554.pdf
Eugene Park (UMN CDes - Graphic Design) - Letter of Support	290eadd0-798.pdf
HGA - Professional Partner - Letter of Support	144a38b7-bef.pdf
LHB - Professional Partner - Letter of Support	bf633f3c-8ce.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?
> No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?
> Yes

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?
> Yes

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF? If so, describe here:
> Yes, Any royalties, copyrights, patents, or sale of products and assets will be reinvested into the project.

Does your project include original, hypothesis-driven research?
> No

Does the organization have a fiscal agent for this project?
> Yes, Sponsored Projects Administration

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing $10,000 or more?

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?

No