



## Environment and Natural Resources Trust Fund

### 2026 Request for Proposal

#### General Information

**Proposal ID:** 2026-166

**Proposal Title:** Updating Land Cover Maps for Enhanced Natural Systems

#### Project Manager Information

**Name:** Bryan Runck

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

**Office Telephone:** (507) 381-699

**Email:** runck014@umn.edu

#### Project Basic Information

**Project Summary:** Land cover information for Minnesota's most populous counties is outdated. These were last updated in 2016. We will update land cover data using new LiDAR and aerial imagery.

**ENRTF Funds Requested:** \$298,000

**Proposed Project Completion:** June 30, 2029

**LCCMR Funding Category:** Small Projects (G)

**Secondary Category:** Land (F)

#### 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.**

The first step in conservation and management of natural systems in Minnesota is accurate quantification of land use and cover. Local, county, regional, and state governments rely on publicly available land cover maps, but our maps are now out-of-date. The most recent comprehensive land cover dataset for Minnesota does not capture significant land use changes driven by urban expansion, agricultural shifts, and climate-related disturbances. Additionally, alternative datasets, such as the National Land Cover Database (NLCD), lack the spatial and temporal resolution required for local and regional planning efforts.

**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 proposal addresses this gap by leveraging recent high-resolution aerial imagery (NAIP 2023) and new LiDAR acquisitions to produce a next-generation land cover dataset for Minnesota. By integrating Near-Infrared (NIR), RGB, and 3D elevation data, this project will enhance the accuracy and usability of land classification outputs. Utilizing advanced geospatial processing with Trimble eCognition, we will implement a robust workflow for segmentation, classification, and validation.

The updated land cover data will support conservation planning, water management, and climate resilience efforts across the state. It will provide a critical foundation for watershed modeling, habitat assessments, and policy development, ensuring that Minnesota's landscapes are managed sustainably and effectively.

**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?**

- 1) Updated land cover maps for the seven county metropolitan region, Mankato, St. Cloud, Duluth, and Rochester.
- 2) A database and web app to provide easy access and downloading of the data.
- 3) Online trainings that will support planners and managers in using the data for climate, land and water purposes.

## Activities and Milestones

### Activity 1: Create data product – 1-meter resolution land cover maps for the Metropolitan Council region, Mankato, St. Cloud, Rochester, and Duluth

**Activity Budget:** \$104,623

#### Activity Description:

This project will produce high-resolution land cover maps for the Twin Cities seven-county metropolitan area and key regional centers, including Mankato, St. Cloud, Duluth, and Rochester. Using 2023 NAIP imagery (60 cm resolution) and newly acquired LiDAR data, we will generate detailed land cover classifications that improve upon existing datasets. By incorporating Near-Infrared (NIR), RGB, and 3D elevation data, we will enhance the precision of land use delineation, particularly for urban, agricultural, and forested areas.

The methodology will utilize Trimble eCognition’s object-based image analysis, enabling segmentation and classification of real-world features such as impervious surfaces, tree canopy, and water bodies. Approximately 6,000 image tiles will be processed in a high-capacity computational environment, leveraging two dedicated servers with 340 TB of storage. Quality control and validation will be conducted through manual checks, automated accuracy assessments, and integration with existing ground-truth data sources.

The final land cover maps will be distributed in GIS-compatible formats and made accessible through online platforms. These datasets will support municipal planning, stormwater management, and climate resilience initiatives, providing local governments and resource managers with up-to-date, actionable information for sustainable land use decision-making across Minnesota’s most densely populated and rapidly changing regions.

#### Activity Milestones:

Description	Approximate Completion Date
Compile datasets on lab servers	December 31, 2026
Complete updating eCognition batch jobs and pilot for Hennepin County	May 31, 2027
Complete final land cover maps with accuracy assessments and post for public access	January 31, 2028

### Activity 2: Build backend tile service and front-end user interfaces for data products from Activity 1

**Activity Budget:** \$120,559

#### Activity Description:

To ensure broad accessibility and usability of the updated land cover data, this project will establish a scalable backend tile service and intuitive front-end interfaces using ArcGIS Online. The backend infrastructure will process and serve high-resolution land cover data as tiled map services, optimizing performance for web-based visualization and analysis. These tiles will be derived from the classified land cover datasets produced in Activity 1, ensuring efficient delivery of large geospatial datasets to end users.

The front-end user interface will be designed as an interactive web application, allowing stakeholders—including municipal planners, conservationists, and researchers—to explore, query, and download data easily. The ArcGIS Online platform will support feature services, dynamic styling, and interactive filtering, enabling users to visualize land cover changes, overlay additional datasets, and extract statistics relevant to their areas of interest.

Integration with Minnesota’s existing geospatial data infrastructure, such as Minnesota Geospatial Commons and local government GIS portals, will ensure interoperability and long-term accessibility. By leveraging cloud-based capabilities,

this system will provide a user-friendly, low-maintenance solution that supports real-time decision-making for urban planning, environmental monitoring, and water resource management across the project’s targeted regions.

#### Activity Milestones:

Description	Approximate Completion Date
Complete wireframe of online app	July 31, 2027
Perform feedback sessions with stakeholders	September 30, 2027
Complete alpha version of web application	January 31, 2028
Complete user reviews of alpha app version	May 31, 2028
Release final version of web application	November 30, 2028

### Activity 3: Create workshop materials to train practitioners in data download, processing, and use for climate, natural resources, and water applications

**Activity Budget:** \$72,818

#### Activity Description:

This activity will develop comprehensive training materials to equip practitioners with the skills needed to access, process, and apply the updated land cover data for climate, natural resource, and water management applications. The workshops will target municipal planners, conservation professionals, watershed managers, and GIS specialists who rely on accurate land use and cover data for decision-making.

Training materials will include step-by-step guides, video tutorials, and hands-on exercises that cover essential workflows such as data access via ArcGIS Online, processing in desktop GIS environments, and integration with hydrological and climate models. Special emphasis will be placed on using the data for applications like stormwater management, habitat conservation, and climate resilience planning.

Workshops will be delivered both in-person and online to maximize accessibility. Interactive case studies will demonstrate real-world applications, reinforcing how the data can inform policy and resource management decisions. By providing structured training, this activity ensures that stakeholders can effectively utilize the high-resolution land cover datasets, ultimately enhancing their capacity to make data-driven decisions that support Minnesota’s environmental and climate goals.

#### Activity Milestones:

Description	Approximate Completion Date
Complete first draft of curriculum and deliver one workshop	September 30, 2028
Revise workshop materials	January 31, 2029
Complete delivery of two more workshops	April 30, 2029
Workshop materials available online with a video recording with online user interface	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?**

Project results will be shared through ArcGIS Online, Minnesota Geospatial Commons, and the University of Minnesota's data repository (DRUM), ensuring free long-term access. Local and state agencies can integrate data into existing GIS workflows. Future updates and expansions may be funded through agency partnerships, competitive grants, and Minnesota's ongoing geospatial data initiatives.

## Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Sustainable Irrigation Management: Expanding an Irrigation Web Application	M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 04e	\$1,139,000

## Project Manager and Organization Qualifications

**Project Manager Name:** Bryan Runck

**Job Title:** Senior Research Scientist

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

Dr. Bryan Runck is a scientist specializing in remote sensing, environmental monitoring, and digital agriculture. He has secured over \$30 million in competitive funding since 2019. His research focuses on geospatial decision-support systems, sensor networks, and data integration for agricultural and environmental applications.

Runck is Associate Director of GeoCommons at the University of Minnesota and a Senior Research Scientist at the GEMS Informatics Center. He also serves as faculty in the Masters of Geographic Information Science program and the Department of Geography, Environment, and Society. His past positions include roles as a visiting professor at the University of Hawai'i – Manoa and a research scientist in computer science at the University of Southern California.

His funded projects include AI-driven agriclimate research (USDA and NSF), perennial overwinter management (USDA), and nature-based climate solutions (Hennepin County). He has led multiple grants on geospatial infrastructure, remote sensing applications, and decision-support tools for land and water management.

Runck has published over 35 peer-reviewed articles in top venues such as Nature Communications Biology, PNAS Nexus, Agronomy Journal, Crop Science, and Global Change Biology. His work includes developing internet-of-things systems for agricultural research, applying remote sensing to land use planning, and analyzing spatial decision frameworks for conservation.

His research integrates with local and regional governments, including Hennepin County, Three Rivers Park District, and the USDA. He has collaborated on projects for conservation planning, carbon sequestration analysis, and automated environmental monitoring.

Runck holds a Ph.D. in Geography with a minor in Computer Science from the University of Minnesota and an M.S. in Applied Plant Sciences.

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

**Organization Description:**

The University of Minnesota is a land-grant, R1 research institution and the state's flagship public university. It is among the top public research universities in the United States. As one of the nations leading Spatial Universities, we are home to a cluster of expertise spanning the spatial sciences, computer science, agriculture and environment. The university has a strong history of applied research in agriculture, natural resource management, and environmental sciences, supporting Minnesota's economy, public policy, and conservation efforts.

The College of Food, Agricultural and Natural Resource Sciences (CFANS) is a nationally recognized leader in research, education, and outreach related to agriculture, natural resources, and environmental sustainability. CFANS integrates science, technology, and policy to address challenges in food production, water management, forestry, and climate adaptation. The college collaborates with state agencies, industry partners, and local communities to develop solutions that support resilient ecosystems and sustainable resource use in Minnesota.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Bryan Runck-Principal Investigator		Project Manager - Runck will oversee the entire project and guide the technical and education aspects of the project.			27%	0.15		\$33,959
Keith Pelletier -		Remote Sensing Specialist -- Will adapt his previously developed workflow for AIM 1 to fit new data sources. Run models and perform evaluation. Lead the development of curriculum.			27%	1.2		\$129,056
Data Scientist/Engineer		Develop infrastructure for hosting and user interfaces. Engage in listening sessions with stakeholders to understand their requirements and fit application to their needs. Work with Pelletier and Runck to implement automated data science workflows.			27%	0.48		\$88,994
							<b>Sub Total</b>	<b>\$252,009</b>
<b>Contracts and Services</b>								
							<b>Sub Total</b>	-
<b>Equipment, Tools, and Supplies</b>								
							<b>Sub Total</b>	-
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
							<b>Sub Total</b>	-

<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	Publication	Open access publication costs	This project will generate two publications. For them to be open access and available, we need to pay for open access fees.					\$7,000
							<b>Sub Total</b>	<b>\$7,000</b>
<b>Other Expenses</b>								
		Google Cloud Storage	Used to host imagery tile server, batch processing jobs, and web application.					\$30,591
		MSI Tier 1 Data Storage	Storage for raw imagery during testing and model preparation.					\$4,200
		Remote Sensing and Geospatial Analysis Laboratory - Lab Services	Covers lab costs associated with local GIS and remote sensing workflows of Pelletier.					\$4,200
							<b>Sub Total</b>	<b>\$38,991</b>
							<b>Grand Total</b>	<b>\$298,000</b>



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: \$298,000

This amount accurately reflects total project cost?

Yes

## Attachments

### Required Attachments

#### *Visual Component*

File: [f8d4f634-57c.pdf](#)

#### *Alternate Text for Visual Component*

The visual summarizes the application and describes how an updated high resolution land cover map will be created to support natural resources planning and management in developed areas....

### Supplemental Attachments

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

Title	File
UMN_SPA_approval	<a href="#">fa1f240a-76f.pdf</a>
UMN Fiscal Agent/Board Resolution Letter	<a href="#">d907c1dd-268.pdf</a>
Minnehaha Creek Letter of Support	<a href="#">9aaab722-b99.pdf</a>
Knight Letter of Support	<a href="#">fddf56a0-593.pdf</a>
Three Rivers Letter of Support	<a href="#">2ab8a4bc-05e.pdf</a>
MET Council Letter of Support	<a href="#">60fd6287-802.pdf</a>

## 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?**

No

**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:**

Kari Lamp, 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