



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-063

Proposal Title: Data Buoy - A Portal Beneath the Waves

Project Manager Information

Name: Jeff Forester

Organization: Minnesota Lakes and Rivers Advocates

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Project Basic Information

Project Summary: Pilot ten low-cost water monitoring buoys that are connected to a unified statewide data platform to enhance early risk detection, improve coordination, and strengthen long-term public understanding of Minnesota's waters.

ENRTF Funds Requested: \$685,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Water (B)

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?

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.

Minnesota's water quality data is currently siloed among DNR, MPCA, Tribes, Department of Agriculture, BWSR, local governments, academic institutions and hundreds of lake associations. Although these entities effectively collect data within their respective mandates, they operate under distinct funding streams, reporting requirements, and program priorities. As a result, datasets are stored in separate systems and published in different formats, limiting interoperability and public accessibility.

At the local level, many lake association “citizen scientists” conduct annual water quality testing. While valuable, these efforts are rarely standardized or systematically aligned with state datasets. High volunteer turnover affects continuity, and results are often sequestered with limited interpretation or context. Consequently, local monitoring cannot consistently track emerging risks or evolving trends, reinforcing fragmentation rather than contributing to a unified system.

This fractured network leaves Minnesota without a cohesive, statewide picture of real-time water conditions. Impaired waters, harmful algal blooms, rising salinity, and invasive species are often identified only after thresholds have been crossed, when management options are limited and solutions are costly. Data exists, but it is dispersed and difficult to synthesize across jurisdictions. Without coordinated sensing and accessible interpretation that connects state and local monitoring efforts, water management remains reactive rather than preventive.

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 propose a three-year research pilot to develop a unified water monitoring platform and deploy ten low-cost water-monitoring buoys.

The water monitoring platform will translate all encompassing Minnesota water data into a simple, contextual website and app for the public. It will integrate open-source environmental datasets from sources like the EPA, USGS, NOAA, OpenAQ, and NASA, combining water quality records with weather, air quality, and satellite data to provide layered environmental context. A custom machine learning model will further support interpretation and forecasting.

Concurrently, we will design and field test ten affordable water monitoring buoys across Minnesota's five eco-regions, placing half in impaired lakes, and half in unimpaired lakes. The pilot will evaluate whether low-cost industrial sensors can generate reliable, decision-grade data suitable for standardizing monitoring practices among lake associations while also supplementing our statewide dashboard. Each buoy will continuously measure core parameters, including temperature, dissolved oxygen, pH, oxidation reduction potential, electrical conductivity, and turbidity.

The objective is to establish integrated, standardized water data infrastructure that translates complex environmental signals into actionable insight. By aligning continuous in-lake sensing with contextual statewide datasets, the project will strengthen early risk detection, improve cross-jurisdictional transparency, and support more informed, preventive water management decisions.

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 project outcomes will protect, conserve, preserve, and enhance Minnesota's public waters by :

- Testing feasibility of affordable water data collection buoys in ten lakes across the five ecoregions of Minnesota,
- Providing a public facing, user-friendly web portal of water quality information,
- Standardizing, improving and making available citizen science water data collection,

- Closing gaps among currently available water quality data sources,
- Increasing awareness of water quality trends and raise engagement,
- Providing a new resource for researchers,
- Linking engaged key stakeholders with governmental managers in informed, strategic and productive ways,
- Quickly identifying concerning trends.

Activities and Milestones

Activity 1: Stakeholder Organizing & Research

Activity Budget: \$35,000

Activity Description:

This activity will begin with MLR conducting structured one-on-one interviews and consultations with key stakeholders, including state agencies, watershed organizations, Tribal representatives, lake associations, and subject matter experts. The purpose is to identify the most decision-relevant data for the pilot based on three criteria:

- Data needed to fill documented monitoring gaps or extend existing datasets,
- Lake-specific conditions or impairments relevant to each pilot state,
- Probable future stressors in order to establish an informed baseline for long-term tracking.

Based on this process, two lakes will be selected in each of Minnesota’s five ecological regions: South, Metro/Urban, West Central, Central, and Arrowhead. In each region, one lake will have a documented impairment and one will not, allowing comparative analysis across differing ecological and management contexts. Meetings of partners will be ongoing for three years to organize five regional groups to test, refine and then expand water quality monitoring and dissemination programs after the grant period ends.

Activity Milestones:

Description	Approximate Completion Date
Identify 10 Lake Associations that meet criteria/secure permits from local sheriff.	October 31, 2027
Identify specific locations for buoys, meet with association members.	October 31, 2027
Tribal, academic, state agency, LGU, and local civic groups - identify existing/future data gaps.	December 31, 2027
Communication/Promotion of project in newsletters, earned media, press releases, public meetings, etc.	June 30, 2030
Meet with experts/key stakeholders to continuously refine portal scope and capacity and education/communication	June 30, 2030

Activity 2: Build Buoys and Dashboard to meet Affordability, Accessibility, and Sustainability Metrics

Activity Budget: \$400,000

Activity Description:

Build affordable water quality buoys and web based App.

MLR will use an RFP process to identify a source for affordable data buoys and related software platform. Most data buoys are deployed by water treatment plants or large institutions and are not affordable for a lake association. MLR has identified one potential source thus far - Aquatela Tech, a Minnesota-based startup led by engineers specializing in custom environmental sensing, IoT (Internet of Things) systems, and data platforms to close this gap in cost. As an independent third party, Aquatela will design and build ten modular, cost-efficient water monitoring buoys. In parallel, the team will develop an integrated digital platform, delivered through a website and mobile application, that aggregates local, state, and federal water datasets into a unified system.

The build process will prioritize affordability through scalable hardware design, accessibility through clear and contextual data presentation, and sustainability through durable components and multi-season performance testing. In collaboration with MLR and key stakeholders, the platform will provide both a technical interface for resource managers and a simplified dashboard for the public, ensuring long-term usability without increasing administrative burden on local partners.

Activity Milestones:

Description	Approximate Completion Date
Manufacture, assemble, and code buoys.	December 31, 2027
Code, design, and test the website/App.	January 31, 2028
Buoy bench testing and dry runs.	April 30, 2028
Code, design, refine with stakeholders, and test the app.	April 30, 2028

Activity 3: Buoy Deployment, Evaluation, & Reporting

Activity Budget: \$100,000

Activity Description:

Deploy the buoys in partnership with lake associations and local government units, oversee continuous monitoring, perform required maintenance on both hardware and the data platform, and retrieve and store the buoys at the end of each field season (May - October).

Local resource managers and lake associations consistently cite limited capacity as a barrier to expanded monitoring efforts. This pilot is structured to minimize additional workload while maintaining affordability, reliability, and operational simplicity.

Most research on low-cost IoT water sensors evaluates performance over short durations, often week to months in controlled testing environments. This pilot will assess durability, maintenance needs, and data integrity to determine whether affordable systems can produce sustained, decision-grade data under real-world conditions.

Activity Milestones:

Description	Approximate Completion Date
Deploy buoys at all locations and begin continuous, real-time data collection.	May 31, 2028
Analyze seasonal trends and collect user feedback	October 31, 2028
Buoy Retrieval and Safe Decommissioning	November 30, 2028
Develop and share reports with stakeholders	December 31, 2028

Activity 4: Year Two Buoy Deployment, Evaluation, & Reporting

Activity Budget: \$150,000

Activity Description:

Year Two will focus on refinement, validation, and longitudinal performance assessment. Based on findings from the first field season, MLR and buoy/App provider will refine buoy hardware, sensor configurations, data processing workflows, and user interface features to improve reliability, durability, and usability.

The existing buoys will be redeployed for a second full monitoring season to capture comparative, multi-year data. This phase will allow analysis of interannual variation, identification of emerging trends, and evaluation of whether early indicators detected in Year One correspond to observable ecological changes.

The final stage of the pilot will synthesize two seasons of continuous data into comprehensive reports for stakeholders. These reports will evaluate system durability, data reliability, and operational feasibility, while also highlighting lake-specific findings, trend shifts, and new insights generated through sustained monitoring.

Activity Milestones:

Description	Approximate Completion Date
Refine 2028 buoy, app, and website design.	April 30, 2029
Deploy existing buoys for 2nd season and begin continuous, real-time data collection.	May 31, 2029
Analyze seasonal trends and collect user feedback.	October 31, 2029
Buoy retrieval and safe decommissioning	November 30, 2029
Develop and disseminate final reports with stakeholders.	June 30, 2030

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.

MLR will use multiple channels to disseminate the Data Buoy: A Portal Beneath the Waves. Dissemination channels include, but are not limited to:

- MLR's monthly "Water Connects Us All" newsletter, opened and read by over 10,000 each month,
- Lake Association Newsletter Articles: In the spring MLR provides newsletter content for over 300 lake association members for them to use in their annual newsletters,
- Blog posts on MLR website, about 1,800 impressions a month,
- Monthly meetings: MLR will organize monthly meetings of Data Buoy stakeholders and partners and work with them to develop a communications/education program for their jurisdictions,
- Events/Meetings: MLR presents at over 70 public meetings annually, including Lake Association annual meetings, state agency meetings like BWCR Academy, DNR Roundtable, MAISRC Showcase, MAWD Annual Meeting, MLR's Annual Meeting,
- Articles through Public News Service, an Associated Press style publisher of content for local weekly papers and radio stations reaching 150,000 to 250,000 consumers,
- MLR webinars,
- We will send press releases to major market news outlets in Minnesota, including MPR, WCCO, Fox News, Star Tribune, Pioneer Press, and the Duluth News Tribune,
- Final report distribution to over 500 lake associations in Minnesota.

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?

Collectively lake associations already invest thousands of volunteer hours and hundreds of thousands of volunteer hours to track water quality data annually. Lake Association volunteers currently invest thousands of volunteer hours.

This investment falls short of potential impact because the data collected, the sampling procedures used,, the sample analysis, and the data produced largely remains siloed, posted only on that lake associations website or in an annual newsletter.

By providing technological solutions to collect and disseminate water quality data we will leverage the investments already being made by lake associations in order to provide a greater public benefit.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Stop Starry Invasion - Community Invasive Species Containment	M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 06g	\$1,000,000
Emerging Issues Stop Starry Invasion	M.L. 2023, , Chp. 60, Art. 2, Sec. 2, Subd. 10b-1	\$385,000

Project Manager and Organization Qualifications

Project Manager Name: Jeff Forester

Job Title: Executive Director

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

Jeff Forester has worked in water quality in Minnesota for over 30 years and has led the Minnesota Lakes and Rivers Advocates, MLR for over 20 years. MLR has over 300 lake association members, and Jeff has developed good working relationships with leaders at most of them. MLR is highly respected and trusted partner with citizens, LGU and state agency resource managers. He has served on a number of State Advisory Boards related to water and natural resources, and scoping or review committees for academic institutions. Publications include "Policy Challenges Relating to Integrated Pest Management of Freshwater, Aquatic Invasive Animals, Hoff, Martin, Irons and Forester, 2021, and "Coproducting a Technology Readiness Level framework for non-persistent genetic biocontrol of aquatic invasive species,) Badger Et. al, 2025.

Organization: Minnesota Lakes and Rivers Advocates

Organization Description:

Minnesota Lakes and Rivers Advocates (MLRA) protects the legacy of our lakes and rivers because we believe that thriving waters are essential to our identity, economy, and way of life—and safeguarding them takes people, relationships, and strong local leadership.

MLRA protects Minnesota's lake and river heritage for current and future generations by forging powerful links among lakes, lake advocates, and policy makers. Members include over 300 lake associations with an estimated 55,000 households, including anglers, conservationists, marina owners, Tribal members, and others. We understand that water management is siloed among many different federal, state and local governmental bodies. The citizens engaging in water protection are also siloed by lake, or fish species, or area of concern. Water flows around and between these different roles and jurisdictions and becomes impaired. MLR is a designated Civic Organization per the Midwest Active Citizenship Initiative, and we use a civic organizing framework to collapse these siloes in support of the clear public good of clean and healthy lake ecosystems. Our strategic plan includes three pillars; science, education/awareness, organized engagement.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Project lead		To coordinate and direct all activities of the project (selection of partners, coordinate findings with engineers and App designer, deployment and retrieval of buoys, dissemination of results.			25%	0.15		\$20,000
Lead Organizer		Organize monthly meetings with stakeholders, handle communications, outreach and dissemination, work for sustainability of project after grant period ends.			25%	0.12		\$10,000
							Sub Total	\$30,000
Contracts and Services								
Aquatella	Service Contract	Build to specification water quality data buoys and App, test, deploy and retrieve buoys, refine buoys and data platform based on partner feedback.				15		\$640,000
							Sub Total	\$640,000
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel to meet with partners, identify buoy locations, deploy and retrieve buoys, attend local meetings to disseminate results.	Coordinate project and receive on the ground feedback of local conditions and requirements.					\$10,000

							Sub Total	\$10,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Printing	Final report of Data Buoy: A Portal Beneath the Waves	Provide outcomes to wide audience and disseminate to 500 lake associations to ensure sustainability of project after the grant period ends.					\$5,000
							Sub Total	\$5,000
Other Expenses								
							Sub Total	-
							Grand Total	\$685,000

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				
In-Kind	Volunteer hours by project partners	Participate in initial scoping of data requirements, work with MLR during deployment and retrieval, and monthly project progress meetings to ensure continuous feedback loop for ten lake associations, LGU representatives and subject matter experts.	Pending	\$72,000
			Non State Sub Total	\$72,000
			Funds Total	\$72,000

Total Project Cost: \$757,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [7268100e-654.pdf](#)

Alternate Text for Visual Component

Map of ecoregions of Minnesota. Two buoys will be deployed in each of the 5 major ecoregions....

Financial Capacity

Title	File
MLRA 990	ce5280c8-efe.pdf

Board Resolution or Letter

Title	File
LCCMR Board Resolution - Data Buoy, A Portal Beneath the Waves	15b76169-86c.pdf

Supplemental Attachments

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

Title	File
2026 MLR LCCMR Data Buoy_Lake SWCD.pdf	ae445997-fb3.pdf
Lake Buoy - Douglas County Coalition of Lakes	8b397f29-1c3.pdf
Carrie Ohly Cusack	354e3d01-7e7.docx
BLA Letter of Support MNL&R	f8cbe9de-08c.docx
Letter of Support MLR on VLA letterhead	96db94c7-d0a.docx
Letter of support databuoy - CCCoLa	11842af7-b3a.pdf
MLR Lake Monitoring Letter of Support - SCD	91116188-58f.pdf
MLR Letter (Aitkin County Lakes and Rivers Association)	674ffed5-ba5.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?

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:

Minnesota Lakes and Rivers Advocates Board Resolution

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