Environment and Natural Resources Trust Fund

M.L. 2026 Approved Work Plan

General Information

ID Number: 2026-501

Staff Lead: Noah Fribley

Date this document submitted to LCCMR: May 27, 2026

Project Title: Evaluating Forward-Facing Sonar Impacts on Minnesota Fish

Project Budget: $676,000

Project Manager Information

Name: Gretchen Hansen

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

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Project Reporting

Date Work Plan Approved by LCCMR: June 17, 2026

Reporting Schedule: April 1 / October 1 of each year.

Project Completion: June 30, 2029

Final Report Due Date: August 14, 2029

Legal Information

Legal Citation: M.L. 2026, Chp. 104, Sec. 2, Subd. 06p

Appropriation Language: $676,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to evaluate the impact of forward-facing sonar on angler catch rates and fish mortality across multiple species and lake types to inform sustainable management of Minnesota freshwater fish populations.

Appropriation End Date: June 30, 2029

Narrative

Project Summary: Evaluating the impact of forward-facing sonar on angler catch rates and fish mortality across multiple species and lake types to inform sustainable management of Minnesota freshwater fish populations.

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

Freshwater fish populations provide a multitude of benefits to Minnesotans including recreational angling and subsistence fishing. Fishing is an integral part of Minnesota culture and livelihoods. Managing sustainable fisheries requires a detailed understanding of how angler activities impact fish vulnerability to capture, harvest, and ultimately fish mortality, and designing regulations accordingly. Recently, the use of angler technology in Minnesota lakes, specifically forward-facing sonar, has increased. This technology is being used by anglers to locate and target fish populations and could increase fish mortality. In harvest-oriented fisheries, this increased capture efficiency could lead to increased harvest, and in catch-and-release fisheries increased captures could increase hooking mortality. The impacts of forward facing sonar on fish populations depend on the level of usage by anglers, the effect on catch rates in both open water and ice angling seasons, and population dynamics of the species. The appropriate management response to changes in angler catch rates due to new technology hinges upon answering these questions. Understanding if and how much angler technologies such as forward facing sonar influence capture and mortality of across multiple species and Minnesota lake types will enable scientifically informed management decisions towards maintaining fisheries for future generations to come.

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 will employ a multi-step approach to evaluate how angler technologies such as forward-facing sonar (FFS) impact fish populations and potential management responses in Minnesota. We will collaborate with MN DNR partners to quantify the prevalence of FFS use among anglers and how it varies by target species and angling season using creel surveys. We will then evaluate the effects of FFS on fish vulnerability to capture and harvest across Minnesota lakes using an experimental test of angler technology efficiency for Walleye and Musky. Using this experimental data we will quantify average angler catch per hour between open water and ice angling seasons. Catch rates, fish size, and size distributions of fish captured during the experiment will also be analyzed to estimate population level vulnerability to capture in case study lakes. We will use this information to create simulated fishery scenarios to quantify how different combinations of technology use and fish abundances impact future fish capture and harvest rates. This work will measure the effects of technology use on fish at the individual and population level to enable rigorous assessment of the vulnerability of Minnesota fish populations to effects of changing technology.

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?

Outcomes of this project are standardized capture and harvest rates for angling with 2D and forward-facing sonar (FFS) for Walleye and Musky fisheries in both open water and ice angling seasons. The project results will quantify the prevalence of angler technology used by MN anglers across lakes, seasons, and angler avidity. Additional project outcomes include estimated catch and harvest rates of fish captured with FFS and predictions of future fishery scenarios with increased technology use in different Minnesota lake types. We will collaborate with partners throughout project implementation to develop adaptive management plans for fisheries susceptible to overexploitation with technology.

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

Activities and Milestones

Activity 1: Determining the prevalence of angler technology usage by Minnesota anglers across species and seasons

Activity Budget: $189,419

Activity Description:
The objective of this activity is to understand angler technology use trends for Minnesota anglers targeting recreational species of importance. Tasks will include a creel survey analysis of angling across seasons for targeted fisheries and comparison to standardized agency fish abundance data. Creel surveys by partners have collected general information about the frequency of FFS use in comparison to 2D sonar and no technology. We will assist in the analysis of these survey results to evaluate patterns and differences among species and angling seasons. We will compare technology use prevalence to lake and fish community characteristics to understand how angler effort and technology is distributed across the landscape. Outcomes of this survey analysis will include the overall prevalence of angler technology used by Minnesotans, frequency of FFS use in a year by anglers across seasons, catch - abundance relationships within lakes, and angler FFS use multispecies fisheries. Results from this activity will be used to inform experimental case study lakes. We will formalize results from this survey in an online scientific report to share with the general public and present findings at regional and national meetings of interests including Minnesota American Fisheries Society meeting.

Activity Milestones:

Description	Approximate Completion Date
Meetings with MN DNR and partners for designing creel questions and analysis	December 31, 2026
Estimate angler usage and difference in catch rates from FFS across species	December 31, 2028
Scientific report finalized for general public and presentation of results	June 30, 2029

Activity 2: Quantifying capture rates differences between forward-facing sonar and 2D sonar for focal freshwater fish species in Minnesota Lakes

Activity Budget: $303,455

Activity Description:
The objective of Activity 2 is to directly compare capture efficiency between FFS and 2D sonar for harvest and catch and release freshwater fish species. Tasks will include a multi-lake experimental test of angler catch rates for Walleye in both open water and through ice. We will estimate size-specific catch rates and how they vary with technology use and lake conditions such as lake size and season. This experimental data analysis will enable identification of conditions under which FFS results in the greatest increase in walleye vulnerability to capture. We will contract with fishing guides to assess musky catch rates between guides who use FFS compared to those who do not to estimate impacts of FFS of catch rates on highly successful anglers. Outcomes of this experiment are standardized estimates of the difference between angler capture efficiency with and without FFS, size distributions of captures with FFS, and how FFS capture varies across open water and ice angling seasons for our targeted fisheries.

Activity Milestones:

Description	Approximate Completion Date
Case study lake selection in coordination with MN DNR	January 31, 2027
Experimental sampling of walleye with and without FFS through ice	April 30, 2028
Experimental sampling of musky and walleye with and without FFS in open water	November 30, 2028
Quantify differences in catch rates and size distribution of fish with and without FFS	June 30, 2029
Scientific paper and presentations describing results to public and scientific audiences	June 30, 2029

Activity 3: Predicting how angler technology use could impact harvest and mortality of fish populations

Activity Budget: $183,126

Activity Description:

The objective of Activity 3 is to estimate how changes in fish vulnerability and catch rates due to FFS technology will impact fish populations across a range of species, population statuses, and lake conditions. Tasks will include creating fishery scenario models with different combinations of angler use of FFS, catch rates with and without FFS, and fish abundance informed by Activity 2. Scenario tools enable the user to predict how increased fishing capture with FFS may alter population levels in lakes from harvest and/or hooking mortality under different conditions and assumptions. Scenarios will be developed in coordination with MN DNR partners to ensure that key questions related to sustainable fisheries management are answered, and population-level parameters will be estimated from Activity 2 and drawn from other studies to represent outcomes across a range of possible conditions. We will develop an interactive tool to evaluate outcomes of different scenarios. Additionally, we will publish our results from the model scenarios in a scientific journal using open access format and an online data repository. Findings will be formalized in an agency report and available online for the general public.

Activity Milestones:

Description	Approximate Completion Date
Identification of relevant questions and scenarios via partner meetings	June 30, 2027
Parameterize population models for assessing potential impacts of FFS	June 30, 2028
Quantify conditions where FFS might impact fish populations and likelihood of those conditions	March 31, 2029
Scientific report finalized for general public and journal publication	June 30, 2029
Web-based scenario tool created and publicly available online	June 30, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Camille Mosley	University of Minnesota	Post doctoral research fellow. Lead experimental design, supervise technicians, lead data collection and analysis, lead scenario model development and analysis, collaborate with project partners for communication and dissemination of results.	Yes
Nicholas Rydell	Minnesota Department of Natural Resources	MN DNR Fisheries Specialist. Collaborate to conduct and analyze creel survey, consult on scenario development and management questions, collaborate on analysis, interpretation, and dissemination of results.	No
John Hoxmeier	Minnesota Department of Natural Resources	MN DNR Fisheries Research Supervisor. Will contribute to project design, compile existing MN DNR data, and facilitate the collection of new data. Additionally will act as liaison for the project to fisheries managers and MN DNR leadership.	No

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.
Research findings and management suggestions will be disseminated to all Minnesotans using an online web platform and presented at MN DNR meetings. The improved understanding of FFS impacts on fisheries metrics will be presented at regional science conferences such at the American Fisheries Society Minnesota chapter meetings and MN DNR fisheries workgroup meetings. We expect that fisheries managers across the state will use the results from this to consider if and how any potential risk FFS poses for lake fish populations could be mitigated with policy and/or angler outreach efforts. We also expect to engage the general public and angler community through public seminars and webinars hosted by the University of Minnesota, Minnesota DNR, and through the fishing technology group. Data and reproducible code from scientific analyses and peer reviewed journal articles will be publicly accessible through the University of Minnesota data repository (DRUM) so that our findings can be digitally documented and shareable into the future after the project's completion. the Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgment 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?
We will meet regularly with MN DNR partners to ensure that our approach aligns with their priorities and questions regarding the population-level impacts of forward-facing sonar. Results will be shared through open-access publications, presentations at conferences, in public seminars targeting anglers (in person and virtual), and a website where visitors can visualize fish population responses under multiple scenarios. Because of widespread interest in the impacts of forward-facing sonar, we expect that additional work will be of interest to multiple agencies and angler groups that would be funded by multi-state sources such as Fish and Wildlife Service multi-state grants.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded

Uncovering the Past to Protect Minnesota's Walleye Fisheries	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 04m	$1,121,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project Manager		Lead all aspects of project, including study design, supervision of staff and students, data collection and analysis, interpretation and communication of results, and engagement with partners.			36.6%	0.18		$37,697
Graduate Student		To conduct statistical analyses, assist with fieldwork, and coordinate with partners on implementation and integration of research. Cost includes 50% assistantship for 3 years plus Graduate student fringe is 23.2% plus tuition for 6 semesters totaling $60,778			23.2%	1.5		$170,308
Research Scientist		To coordinate and lead field work with state partners, coordinate data acquisition, assist with analysis and communication.			36.6%	3		$319,808
Undergraduate technicians (3)		To assist with field work and data entry. 3 undergraduates at $16 per hour for 40 hours per week for 10 weeks in summer for 2 years, plus 10 hours per week for 15 weeks in 5 academic semesters			0%	1.47		$49,600
							Sub Total	**$577,413**
Contracts and Services								
TBD	Service Contract	Experimental angling to capture how frequent users of FFS catch compares with and without FFS. Estimated funds for the average Minnesota fishing guide during hard water and open water season for half day (4 hours of fishing). Sampling costs of 3 trips with and 3 trips without FFS for each of				0		$8,100
							Sub Total	**$8,100**
Equipment, Tools, and Supplies								
	Tools and Supplies	Field sampling gear including inflatable life jackets, boat paddles, marine batteries, boat gasoline, winter outerware for safely sampling on ice, fish	Tools and supplies for conducting experimental angling from boats and through ice using forward facing					$11,127

		sampling gear including fishing line, buckets, length boards, scale envelopes, plastic bags, pliers, nets, aerators, and envelopes.	sonar and 2D sonar targeting multiple species in open water and winter seasons.					
	Equipment	Field sampling equipment including trolling moters(2), boat paddles, ice augers (2), ice fishing shelters (2), ice fishing sled (2), fishing rods, fishing lures.	Equipment for conducting experimental angling from boats and through ice using forward facing sonar and 2D sonar targeting multiple species in open water and winter seasons.					$11,498
	Equipment	2D sonars, transducer, and cables (2 units - Lowrance)	Sonar for experimental angling experiment to test forward facing sonar efficeny during open and hard water seasons. Equipment to mount technology on both experiemental research vessels.					$7,996
							Sub Total	**$30,621**
Capital Equipment								
		Forward-facing sonars, transducer, and cables (2 units- Garmin)	Sonar for experimental angling experiment to test forward facing sonar effieceny during open and hard water seasons. Equipment to mount technology on both experimental research vessels.	X				$15,470
		Research boat (pre owned aluminum boat with outboard motor and trailer included)	Boat for testing forward facing sonar effeicncey for rod and reel angling during the open water season. Trailer for 14ft boat to launch and travel to experimental lakes	X				$16,154
							Sub Total	**$31,624**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Fieldwork to conduct experimental angling in case study lakes during open water and ice-covered seasons. Travel to and from study lakes and	Fieldwork to visit case study lakes to conduct experimental angling with					$19,130

		lodging for lakes further than 3 hours. Costs estimated for 2 ppl* 4 travel weeks for overnight trips, where total based off costs of 600 miles@$0.70/mi + 4 lodging nights per person @$165/night per person+ 5 days of meals @$69/day per person (meal estimate based on state per diem rate; actual costs will be reimbursed). Additional 45 round trip day trips to study lakes with costs estimated at 300 miles@$0.70/mile.	different technologies and collect fish data in support of project objectives.					
	Miles/ Meals/ Lodging	Travel for two people to attend two outreach and MN DNR fisheries technology meetings in each of two years. Costs estimated per meeting as 400 miles@$0.70/mi + 1 lodging nights@$165/night per person + 2 travel days of meals @$51 day (meal estimate based on University per diem rate; actual costs will be reimbursed)	Travel for two people to attend two outreach and MN DNR fisheries technology meetings in each of two years to co-analyze creel and experimental research findings and integrate project results into fisheries conservation planning tools.					$1,426
	Conference Registration Miles/ Meals/ Lodging	Travel for in state meetings and conferences 1 person attending 1 per year in years 2 and 3. Costs estimated as $250 registration fee, 400 miles@$0.70/mi + 2 lodging nights@$165/night + 1 day of meals @$68/day + 2 travel days of meals @$51 day (estimates based on University per diem rates, actual costs will be reimbursed)	Travel for one person to travel to an in state conference (e.g., the Minnesota chapter of the American Fisheries Society or the Water Resources Conference) to present and communicate results					$2,060
							Sub Total	**$22,616**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Open access publication fee for peer reviewed journal article	Publishing research results in open access journal so that the public can read results without being behind a paywall					$3,200
							Sub Total	**$3,200**
Other Expenses								
		Boat Maintenance (780100)	Maintenance of lab-owned boats used for experimental field sampling,					$2,426

			including paying local boat repair shops for winterizing, regular maintenance, and repairs, and purchasing tools and supplies for minor fixes when possible					
							Sub Total	**$2,426**
							Grand Total	**$676,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Equipment		Forward-facing sonars, transducer, and cables (2 units- Garmin)	This purchase is not a generally ineligible expense. Sonar purchase is directly related to and necessary for producing the project outcomes described in the proposal. Equipment will be used solely for the project activities as described in the proposal during the entire duration of the grant. **Additional Explanation :** Project manager Gretchen Hansen will ensure that the equipment is used throughout its useful life to achieve project objectives. If appropriate, equipment could be used for future ENTRF projects within the University of Minnesota focused on fisheries management.
Capital Equipment		Research boat (pre owned aluminum boat with outboard motor and trailer included)	Boat required for conducting field experiments on lakes throughout Minnesota. We will seek to purchase a pre-owned boat/trailer/motor package to keep costs down. **Additional Explanation :** Project manager Gretchen Hansen will ensure that the equipment is used throughout its useful life to achieve project objectives. If appropriate, equipment could be used for future ENTRF projects within the University of Minnesota focused on fisheries management.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
In-Kind	Minnesota Department of Natural Resources Division of Fish and Wildlife	Minnesota DNR Fisheries staff will provide in-kind support for this project. Specifically, John Hoxmeier, Fisheries Research Supervisor, and Nicholas Rydell, Fisheries Specialist, will contribute to project design, compile existing MN DNR data, and facilitate the collection of new data. They will act as liaisons for the project to fisheries managers and MN DNR leadership with an in-kind contribution of DNR salary and benefits: Fisheries Research Supervisor and Fisheries Specialist. Both staff will contribute 80 hours each annually totaling $28,836 in kind for approximately 480 hours of work.	Secured	$28,836
			State Sub Total	**$28,836**
Non-State				
In-Kind	University of Minnesota foregone indirect costs (54% MTDC)	Administrative costs associated with support of research activities including payroll and human resources, finance, facilities, and IT. If this award is reduced from the requested amount, the proposed cost sharing will be reduced proportionately. Cost calculated based on total award amount not including graduate tuition (60,778 over three years) or capital expenses (25,470).	Secured	$318,466
			Non State Sub Total	**$318,466**
			Funds Total	**$347,302**

Total Project Cost: $1,023,302

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: f957bdd9-09c.pdf

Alternate Text for Visual Component

Visual shows project overview and outcomes. “How do we prevent freshwater fish overexploitation with new angler technologies?” Solution: Quantify Forward Facing Sonar Capture Efficiency and Simulate Future Fishery Outcomes. The graphic includes project institution and partner logos of the University of Minnesota and Minnesota Department of Natural Resources....

Supplemental Attachments

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

Title	File
Sponsored projects approval to submit sonar	b254177b-be2.pdf
MN DNR support letter	750cdb32-962.pdf
2026 LCCMR Peer Review research addendum FFS_Final	c6240f7e-b80.docx

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Due to budget reductions, we have removed limnological sampling from Activity 2 and will instead rely on existing data for this purpose. We added contract/service with professional angling guides to supplement our sampling of catch rates with and without FFS with high expertise anglers based on extensive partner and external stakeholder conversations. We updated travel and supply costs to reflect our study design sampling 3 species in different seasons, and reduced costs for partner meetings to account for remote meeting and local meeting access. Finally, project manager Hansen's time and effort was reduced.

11/3/2026: In response to LCCMR comments, we combined individual items listed under tools/supplies and equipment into 3 lines. We also provided more detail on boat maintenance, which is its own budget category at UMN and thus we believe it is correctly categorized. We added dissemination information as requested.

5/12/2026: We updated the work plan to match our revised research addendum, with more intense focus on walleye (through experimental angling) and musky (through guides), and removing black crappie.

5/27/2026: We updated the budget to reflect increased equipment and supply costs due to inflation, and reduced the field work travel budget to include lakes that can be reached with a day trip that we plan to include based on consultation with fisheries biologists.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

Yes

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 project:

Camille Mosley

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