Environment and Natural Resources Trust Fund

M.L. 2025 Approved Work Plan

General Information

ID Number: 2025-260

Staff Lead: Noah Fribley

Date this document submitted to LCCMR: June 5, 2025

Project Title: Minnesota's Priority Native Rough Fish: Gars and Bowfin

Project Budget: $568,000

Project Manager Information

Name: Solomon David

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

Office Telephone: (734) 274-1722

Email: srdavid@umn.edu

Web Address: https://cfans.umn.edu/

Project Reporting

Date Work Plan Approved by LCCMR: June 24, 2025

Reporting Schedule: March 1 / September 1 of each year.

Project Completion: June 30, 2028

Final Report Due Date: August 14, 2028

Legal Information

Legal Citation: M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03bb

Appropriation Language: $568,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to develop population dynamics, habitat use, and food web models for Minnesota gars and bowfins and conduct outreach to inform conservation and management and serve as a template for study of Minnesota's other native rough fish species.

Appropriation End Date: June 30, 2028

Narrative

Project Summary: This study will directly address priority native rough fish knowledge gaps regarding population dynamics and ecology as identified by MNDNR, and directed by the MN legislature.

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

The Minnesota Department of Natural Resources (MNDNR) was directed by MN legislature to complete a "native fish report," identifying conservation measures, and research needs for native rough fish management (2023 Minnesota Session Law Chapter 60, Article 4, Sec. 104). Upon completion of the Native Fish Conservation Report (MNDNR 2023; LiteratureCited1), three species were identified as top priority: Bowfin, Shortnose Gar, and Longnose Gar. These long-lived species play crucial roles in Minnesota waters by maintaining ecological balance, serving as hosts to freshwater mussels, and serving as environmental indicators. To effectively manage these species, MNDNR requires population dynamics data (age, growth, recruitment) and ecological data (e.g. habitat use and diet). Further, MNDNR acknowledges that they do not have established sampling strategies for native rough fish and seek to launch new research to secure population-level data. To help address these priority native rough fish knowledge gaps, the MNDNR report specifically identifies collaborating with Dr. Solomon David at the University of Minnesota. Through collaboration, a management strategy can be developed for Minnesota gars and bowfins, and a methodological template for the remaining priority native rough fish species.

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.

To better understand population dynamics and ecology of gars and bowfins in Minnesota, we will use our expertise in researching these species (over 20 years' experience, spanning the Great Lakes to the Gulf Coast; LiteratureCited2-14) to generate vital natural resource data and train collaborators and students. We will use field surveys to collect age, growth, relative abundance, trophic ecology (via stable isotope analysis) and habitat use data from three major river systems (Minnesota, Saint Croix, and Mississippi Rivers) and selected inland lakes throughout the state. Field surveys will be done in collaboration with MNDNR and Bemidji State University. Sampling methods will include boat electrofishing, and nearshore netting (e.g. fyke nets, hoop nets, seining), with additional samples acquired from citizen scientist anglers and commercial fishery by-catch. Field sampling will occur from spring through fall seasons for two years, with data analyses ongoing and concluding in a third year. From these data we will develop age-growth models (based on otolith analyses), population estimates, and food web ecology-habitat use models (based on stable isotope analysis) for Minnesota gars and bowfins. These results will be shared with collaborators, state agencies, legislature, and the public through presentations and publications.

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?

Outcome 1: Our age, growth, and abundance data will generate population dynamics models to directly inform conservation and management of native rough fish resources in Minnesota.
Outcome 2: Food web and habitat use models will inform managers and the public regarding the health of Minnesota aquatic ecosystems, exemplifying the value of native rough fish.
Outcome 3: Using our expertise in native rough fish (specifically gars and bowfin), we will train and co-develop sampling strategies with MNDNR, students, and citizen scientists for collecting data on these species beyond the length of this project, contributing to sustainable natural resource management and conservation.

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: Field data collection, fish processing, otolith analysis for age, growth, and population dynamics models

Activity Budget: $236,000

Activity Description:
The objective of this activity is to develop baseline population dynamics and age-growth models for gars and bowfins in Minnesota lakes and rivers. To accomplish this objective we will collaborate with MNDNR and Bemidji State University (BSU) to collect target species from three major river systems (Minnesota, Mississippi, Saint Croix), and selected inland lakes. River site selection will be based on historic MNDNR fish records and on-site observations of fish and suitable habitat. Inland lakes will be selected based on MNDNR records (e.g. LakeFinder) and citizen scientist angler observations. We will use a combination of boat electrofishing and nearshore netting (e.g. hoop nets) to collect gar and bowfin samples from spring through fall seasons for two years (approximately 10 field trips/year). To develop more robust models, up to 60 individuals of each species (Bowfin, Shortnose Gar, Longnose Gar) for each site (3 rivers, 3 lakes) will be collected for age-growth analysis (approximately 1,080 fish total). Each fish will be measured, photographed, tissue-sampled (see Activity 2), dissected (gut contents/ID sex), and otoliths extracted (aging). These data will build baseline population dynamics models and serve as a template methodology for other Minnesota native rough fish species.

Activity Milestones:

Description	Approximate Completion Date
Complete fish collection for 2025 Jul-Sept field season	September 30, 2025
Measure, dissect, extract otoliths from all 2025 field season fishes	December 31, 2025
Complete all field collection of fish samples for project	July 31, 2027
Submit all otoliths for age analysis	September 30, 2027
Build age-growth and population dynamics models based on otolith, size, and abundance analyses.	February 28, 2028

Activity 2: Ecological analyses (food web and habitat-use) based on stable isotope analysis of fin tissue

Activity Budget: $172,000

Activity Description:
The objective of this activity is to investigate the ecology, specifically trophic position (food web position) and habitat use, of Minnesota gars and bowfins based on stable isotope analysis of fin tissues. This objective will be accomplished by collecting a caudal (tail) fin tissue clip from 50 individuals of each target species (2 gars, 1 bowfin) from each site (6 sites), approximately 900 fin tissue clips total. Whenever possible, these fin tissue clips will be taken from the same fishes used for otolith analysis (Activity 1). Baseline organisms (e.g. snails, mussels) will also be collected at each site to calibrate trophic position of gars and bowfins. Fin tissues and baseline organisms will be dried, ground, and sent to the Cornell Isotope Lab for stable isotope analysis of nitrogen (indicates trophic position) and carbon (source of dietary carbon). These data will provide an ecological picture of the food web placement of individual fish, populations, and species, and where their food is coming from (e.g. terrestrial or aquatic carbon, wetlands vs rivers; LiteratureCited5). Paired with analyses from Activity 1 (age-growth, population dynamics), a more accurate picture of Minnesota gar, bowfin, and aquatic ecosystem health can be developed.

Activity Milestones:

Description	Approximate Completion Date

Complete fish collection for 2025 Jul-Sept field season	September 30, 2025
Dry, grind, and ship 2025 field season fin tissue samples for stable isotope analysis	November 30, 2025
Complete all field collection of fish (fin tissue) samples for project	July 31, 2027
Submit all fin tissue samples to COIL for stable isotope analysis	September 30, 2027
Complete ecological analysis, food web and habitat-use models based on stable isotope analysis	March 31, 2028

Activity 3: Science communication, outreach, and applications based on native rough fish activities and study results

Activity Budget: $160,000

Activity Description:

The objective of this activity is to share results of our study with partners, the scientific community, and general public (diverse audiences). We will share our results with the scientific community by publishing our findings in peer-reviewed scientific journals and presenting at professional meetings (e.g. Minnesota chapter of the American Fisheries Society). We will share our results with the general public through multiple outreach strategies including partnerships with native rough fish anglers and citizen scientists (e.g. Native Fish for Tomorrow), social media updates, and popular online/print articles. PI David has extensive experience in science communication about native rough fish to diverse audiences through scientific literature, presentations (keynote speaker at American Fisheries Society 2022 National Meeting, Midwest Fish & Wildlife 2023), social media (e.g. over 48,000 followers across social media platforms), and popular science media including National Geographic, Science Friday, and NPR. PI David will also train the project team in science communication strategies to increase state-wide and national awareness of Minnesota's leadership in this area of natural resource management. These findings and communication strategies will serve as a template for future study of other native rough fish species in Minnesota and nationwide.

Activity Milestones:

Description	Approximate Completion Date
Analyze data, write manuscripts, submit findings to scientific journals	March 31, 2028
Communicate project updates through social & popular media (continuously) over project timeline	June 30, 2028
Present at meetings (public and professional) continuously over project timeline	June 30, 2028

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Mark Hove	UMN Twin Cities	Mark Hove is a research scientist in the Department of Fisheries, Wildlife, and Conservation Biology with extensive experience in field data collection in Minnesota lakes and rivers. He will assist with boat operations and fish sampling for the project.	Yes
Dr. Alec Lackmann	UMN Duluth	Dr. Lackmann is one of the world's foremost authorities in aging techniques for freshwater fishes, particularly native rough fishes (e.g. gars, bowfins, buffalo). He has been a longtime collaborator with PI David. Dr Lackmann will age fishes for the project and train students in aging techniques.	Yes
Dr. Devon Oliver	Minnesota DNR	Dr. Oliver will help provide fish samples from MN DNR and function in a consulting capacity on site selection and data analysis. Dr. Oliver has both interest and expertise in life history of Minnesota native rough fish species.	No
Matthew Kvam	Minnesota DNR	Matt is a river ecologist with MN DNR, and has extensive experience sampling fishes in MN rivers and streams. He will provide fish samples and function in a consulting capacity on site selection and data analysis.	No
Dr. Andrew Hafs	Bemidji State University	Dr. Hafs is a professor at Bemidji State University, and a fisheries scientist specializing in population dynamics. He will help coordinate field sampling of bowfins in Minnesota lakes, student mentorship, and data analysis.	No
Tyler Winter	Native Fish for Tomorrow	Tyler is Director and co-founder of Native Fish for Tomorrow, a non-profit specializing in conservation and advocacy for native rough fish. Tyler will help coordinate citizen scientist angler aspects of the project.	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.
Our findings will be shared directly with managers (e.g. MNDNR, USFWS) and local stakeholders through meetings, reports and updates. Results will be shared with the broader scientific community through peer-reviewed publications and scientific presentations. The general public will have access to findings through reports, publications, presentations, and popular media (e.g. social media, news coverage, online articles, K-12 educational outreach). If additional work toward dissemination of our research efforts is needed (e.g. additional field surveys, expanded public/scientific outreach), we will submit another proposal for continued research and outreach. These efforts will be ongoing throughout the course of the project period, and our lab will also continue outreach efforts beyond the completion of the project.

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?
Our findings will be shared directly with managers (e.g. MNDNR) and local stakeholders through reports and updates. Results will be shared with the broader scientific community through peer-reviewed publications and scientific presentations. The general public will have access to findings through reports, publications, presentations, and popular media (e.g. social media, news coverage, online articles). If additional work is needed (e.g. additional sites surveyed, samples analyzed), we will submit another proposal for continued research.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Solomon David		PI, lead and conduct research activities; involved in all aspects of project. Summer Salary for one month, all 3 years of project			37.1%	0.21		$48,500
Mark Hove		Fieldwork, specifically boat operations and fish collection for all field trips over the course of the study.			37.1%	2		$11,016
Graduate Student		PhD Student, full time all three years of project, involved with all aspects of project including publications. Full time all summers, 50% time during academic years.			25.1%	2.25		$254,534
Researcher 4		Co-leads field and lab work; involved with all aspects of project over 3 years. 50% year 1 and year 2, 21% year 3.			37.1%	1.2		$103,391
Undergraduate Researcher 1		Assist with field work, lab work, all aspects of the project. 50% during academic years and full time for two summers, half time last summer of project.			0%	1.5		$24,035
Undergraduate Researcher 2		Assist with field work, lab work, all aspects of the project. 50% during academic years and full time for two summers, half time last summer of project.			0%	1.5		$24,034
Alec Lackmann		Analysis of otoliths for age-growth models. Alec is one of the foremost experts on native rough fish otolith analysis.			37%	0.51		$60,000
							Sub Total	**$525,510**
Contracts and Services								
Cornell Isotope Lab (COIL)	Service Contract	COIL is a stable isotope analysis lab that will process our samples for carbon and nitrogen. We have worked with them for these analyses for over 6 years. Clarification: They know our work and are best-suited to carry out these analyses.				0		$10,000
							Sub Total	**$10,000**

Equipment, Tools, and Supplies								
	Tools and Supplies	Tools and supplies for stable isotope analysis including ziplock storage bags, eppendorf tubes, specimen boxes, mortar & pestle.	Expendable items for sample storage & processing.					$1,000
	Tools and Supplies	Miscellaneous field supplies (e.g. nets, waders, gloves, coolers)	Field collection of fishes, sample processing, dissection, and transport.					$4,800
	Equipment	Tagging equipment for population & abundance estimates, fish ID: PIT tags, PIT tag reader, FLOY tags	Identification of collected fish and wild fish for population and abundance estimates, ID of samples, mark-recapture analyses.					$4,300
							Sub Total	**$10,100**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	We assume 100 miles per trip @$0.33 per mile for university fleet vehicles = $660 plus @$93 per day rental fee = 2 days/trip x 20 trips = $3720 vehicle rental and mileage; lodging $107/room, 3 rooms (10 overnight trips for project) = $3210 for lodging; boat fuel @$25/trip x 20 = $500; meals $60/person x 4 people x 20 trips = $4800	Trips to field sites (approximately 20 site visits to project-designated rivers and lakes) to collect fish					$12,890
	Conference Registration Miles/ Meals/ Lodging	Minnesota American Fisheries Society annual meeting, 3 years (registration fee, lodging, meals, mileage) for PI and graduate student to present findings; estimated cost per year $1500	PI and graduate student to present findings at state chapter meeting of American Fisheries Society					$4,500
							Sub Total	**$17,390**
Travel Outside Minnesota								
							Sub Total	**-**

Printing and Publication								
	Publication	Publication; page charges, at least 3 manuscripts are anticipated from the study, publications that waive most page charges will be preferred.	Share project findings through peer-reviewed publications/scientific journal articles					$5,000
							Sub Total	**$5,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$568,000**

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				
			State Sub Total	**-**
Non-State				
Cash	University of Minnesota unrecovered indirect cost return (54% MDTC, updated beginning July 2024)	$568,000 direct total - $88,532 tuition (exempt category) = $479,468 x .54 = $258,913 unrecovered IDC	Secured	$258,913
			Non State Sub Total	**$258,913**
			Funds Total	**$258,913**

Total Project Cost: $826,913

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 267f1d13-28d.pdf

Alternate Text for Visual Component

Visual shows MNDNR native fish conservation report priorities, highlighting need for population & ecological information for gars and bowfins. Included are map of Minnesota showing rivers & inland lakes, bordered by images of Bowfin, Shortnose Gar, Longnose Gar (right), and logos of collaborating organizations (bottom)....

Supplemental Attachments

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

Title	File
Support Letter Native Fish for Tomorrow	39df02a1-539.pdf
Support Letter Izaak Walton League of America MN Division	234b6026-a28.pdf
Board Letter - Solomon David LCCMR 2024	76098d8d-fb1.pdf
Literature Cited - Solomon David LCCMR	f789537e-530.pdf
2025-260 Research Addendum revised_final	82e7a197-a7d.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Update 2/6/2025 - We have addressed the request for Alec Lackmann to be moved from Services Contract to Personnel, and updated the FTE, benefits, etc accordingly. We have also included a detail about COIL Lab analyzing our stable isotope samples, clarifying that they are the lab most familiar with our work and we have worked with them before. They are the most reliable to get these tasks done within the expected timeframe.

Previous Update -
The only substantive change from proposal to workplan stage was a reduction of the budget by $25,000 to account for the difference between requested funds ($593,000) and recommended funds ($568,000). This was accomplished by reducing a staff position FTE value (R4 Researcher from a 0.5 FTE in project year 3, to a 0.21 FTE in project year 3). Project goals and milestones will still be achievable with the new budget and all other aspects of activities, milestones, and budget.

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?

N/A

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?

Yes, Sponsored Projects Administration

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:

Riana Fletcher, Principal Grants and Contracts Officer; Sponsored Projects Administration; 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

Yes, I understand