

Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-049

Proposal Title: Which Cisco are Strongest? Identifying Healthy Populations

Project Manager Information

Name: Kenneth Zillig Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences Office Telephone: (630) 512-7508 Email: kzillig@umn.edu

Project Basic Information

Project Summary: Determine if Minnesota populations of cisco exhibit different tolerances to high temperatures and low oxygen conditions, assess habitat suitability for different cisco strains to protect and restore coldwater habitats.

ENRTF Funds Requested: \$713,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Fish and Wildlife (D)

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.

Landscape change is altering our natural environment rapidly. Lakes are warming and losing oxygen, placing native and commercially important species at risk if environmental conditions exceed their physiological limitations. Cisco are an essential species both commercially, and to their ecosystems, serving as an essential food source for trophy fish such as walleye, lake trout and muskellunge. Threats to cisco populations have been dramatically documented in large summertime fish-kills of cisco populations which are 'squeezed out' of available habitat due to increasing water temperatures and decreasing oxygen in deep waters. However, cisco populations appear to differ in their lethal thresholds, differences which may make some populations at high risk, and others extra tolerant. It is currently unknown how much variation in oxythermal physiology exists, and which cisco populations are equipped to handle rapid environmental change. Effective and efficient management of cisco under changing conditions will benefit from greater predictability about which populations are at the most risk or may be most resilient to current and future environmental conditions.

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.

Determining which populations of cisco are at the most risk requires a population-specific understanding of their oxygen and thermal tolerances, and which lakes in Minnesota match those tolerances. We will gather physiological data on several populations of Minnesota cisco. We will collaborate with both MN DNR and tribal natural resource agencies to collect cisco embryos and rear them under different temperature and oxygen conditions. We will quantify temperaturespecific population responses (e.g., survival, growth rate) of cisco embryos and larvae. We will rear cisco larvae through their juvenile life-stage. During this period we will quantify how temperature and oxygen affect fish growth, tolerance for extreme temperatures and metabolic performance. This knowledge will allow us to determine the environmental conditions under which cisco of different populations will thrive or be threatened. We will use these data to produce habitat suitability maps which will be applied to cisco populations throughout Minnesota. We will enable resource managers to identify cisco populations which may be at risk to future landscape change, as well as those populations exhibiting improved resilience which may be targets for stocking and species recovery. We will develop husbandry practices for rearing inland cisco populations which may increase capacity to restore Minnesota

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?

Cisco are crucial to Minnesota Lake ecosystems and represent an understudied inland fishery. Understanding that some cisco are threatened by increasing temperatures and low oxygen, it is essential to collect physiological data from several populations to identify which lakes exhibit acute risks and which may serve as refuges for cisco into the future. The variation in cisco tolerances is unknown and is a critical datapoint to predicting the species response to landscape change. The proposed habitat suitability maps will provide managers clarity as to which populations and under what conditions cisco are expected to survive or not, enabling their conservation.

Activities and Milestones

Activity 1: Collection and husbandry of at-risk Minnesota Cisco Populations

Activity Budget: \$249,000

Activity Description:

We will collaborate with MN DNR as well as several Tribal Nations to spawn wild cisco and acquire fertilized eggs. Target populations include, but are not limited to, Lake Superior, Lake Koronis, Leech Lake, Mille Lacs, Green Lake, and a representative lake from the Canadian Shield (e.g. Snowbank Lake). We will plan to collect three populations per year via gill netting wild, adult cisco during their spawning events (October through January). Through these collaborations we will gather information on cisco spawning locations and timings which can bolster conservation efforts by improving protections for wild fish. Collected eggs will be incubated at the University of Minnesota in systems with proven efficacy in getting cisco to develop and hatch. We will then culture larval cisco through to their juvenile stage. Throughout this period, cohorts of embryos, larvae and juveniles will be sampled to describe their oxygen limits and optimal thermal conditions. We will use the opportunity of rearing so many populations to expand our understanding of the husbandry and rearing of cisco. If we succeed in producing abundant cisco, and if permitted by state agencies we would be eager to return reared fingerlings to our collaborators for stocking.

Activity Milestones:

Description	Approximate Completion Date
Coordinate with the Minnesota DNR and tribal groups to capture wild, spawning cisco.	December 31, 2026
Incubate Eggs until Hatch	March 31, 2027
Rear Larval cisco to Juvenile Life-stage	May 31, 2027
Maintain juvenile cisco throughout experiments	August 31, 2027
Repeat Milestones 1 - 4 for 3 additional cisco population for experiments in 2027-2028	August 31, 2028

Activity 2: Measurement of Oxygen and Temperature Tolerance Traits of several Cisco Populations and lifestages.

Activity Budget: \$247,000

Activity Description:

We will measure a suite of physiological traits which describe the thermal and oxygen limitations of cisco at different life stages (egg to juvenile) from each population. Once spawned, we will expose embryos to a range of incubation temperatures to assess the rates of successful hatch, size at hatch, and mortality rates. These data show which populations exhibit greater thermal tolerance. Among larval fish we will conduct critical thermal maxima trials and monitor temperature-dependent rates of development. These data show how early life thermal experiences may aid or hinder larval survival and recruitment to the population (e.g., fast spring warming v.s slow spring warming). Once fish achieve juvenile conditions we will rear them at several ecologically relevant temperatures. We will measure their critical thermal tolerance establishing population-specific mortality to temperature. Finally, we will measure their metabolic performance to identify conditions that constrain the capacity of cisco to thrive. These data will tell us optimal thermal ranges and oxygen limitations. In conclusion, for each population we will have a holistic understanding of their oxygen and thermal requirements at several life-stages.

Activity Milestones:

Description	Approximate
	Completion Date

Determine the optimal and critical temperatures for cisco embryo development of 3 populations	March 31, 2027
Measure larval growth of and development across a range of temperatures	May 31, 2027
Identify temperature-dependent juvenile growth rates	August 31, 2027
Quantify the critical thermal temperatures of juvenile cisco of 6 populations	August 31, 2027
Conduct metabolic trials on cisco of several populations	August 31, 2027
Repeat Milestones 1 - 5 for Three new Cisco populations in 2028	August 31, 2028

Activity 3: Construct habitat suitability maps for Minnesota Lakes for different cisco populations under different climate scenarios

Activity Budget: \$217,000

Activity Description:

Current identification of at-risk populations of cisco relies on documenting mass die-off events which occur during late summer. The ability to predict when and where die-offs may occur is an essential step in mitigating die-offs or preventing them entirely. We will combine our physiological (metabolic performance, critical thermal and oxygen limits etc.) data gathered on several cisco populations with lake temperature, dissolved oxygen and bathymetry data to produce 3-dimensional maps of habitat suitability that are lake- and population-specific. We will then incorporate predictive models that project lake temperatures and dissolved oxygen into the future thereby enabling these maps to respond to annual and decadal changes. While our focus is on cisco due to the specific oxythermal threats they face, these habitat suitability maps could be modified for any fish species and any lake with available environmental data. We thereby hope to provide a foundation for detailed, physiologically driven habitat maps for entire fish communities

Activity Milestones:

Description	Approximate
	Completion Date
Calculation of Metabolic Index for cisco of 6 populations	October 31, 2028
Acquisition of Minnesota Lake temperature, dissolved oxygen and bathymetry data	December 31, 2028
Integration of metabolic indices and lake data to construct 4 dimensional maps of cisco habitat	February 28, 2029
Produce a public-facing portal for managers to visualize current and future environmental effects on	May 31, 2029
cisco	

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Gretchen Hansen	University of Minnesota - College of Food, Agricultural and Natural Resource	Principle Investigator: Supervise 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.	Yes
Dan Wilfond	Sciences Minnesota Department of Natural Resources	Dan will contribute by conducting cisco spawn take operations on several Minnesota Lakes. He will act as liaisons for the project to fisheries managers and MN DNR leadership	No
Brad Carlson	Minnesota Department of Natural Resources	Brad will contribute by conducting cisco spawn take operations on several Minnesota Lakes. He will act as liaisons for the project to fisheries managers and MN DNR leadership	No
Pat Brown	Red Lake Band of Chippewa Indians	Pat will contribute by aiding cisco spawn take operations on several Minnesota Lakes. He will act as liaisons for the project to the Red Lake Band of Chippewa Indians	No

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 results will be implemented through multiple avenues. Collaboration with tribal natural resource agencies and MN DNR will ensure that our approach meets partner priorities and will facilitate the incorporation of our results into conservation and management planning. The integration of physiological data with environmental conditions to generate habitat suitability maps for cisco populations throughout Minnesota that will be publicly available via a webbased platform. We will produce reports on cisco embryo and larval culture to facilitate future production of cisco for stocking or conservation needs. Finally, we will publish data and peer-reviewed publications in open access formats.

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

Project Manager and Organization Qualifications

Project Manager Name: Kenneth Zillig

Job Title: Post-doctoral Researcher

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

Dr. Ken Zillig is a Postdoctoral Researcher in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. He brings over a decade of experience in studying the ecophysiology of cold-water fish, making him exceptionally qualified to lead this research on the oxythermal physiology of multiple cisco populations across Minnesota. With a deep understanding of how fish adapt to and thrive in cold-water environments, Dr. Zillig has

developed a specialized expertise in studying the physiological responses of fish to temperature and oxygen changes critical elements for understanding how these species survive in different environmental conditions. Having worked extensively on interpopulation comparisons among Chinook salmon and cisco, Dr. Zillig is highly skilled at examining how different populations of the same species respond to varying environmental factors. His current research focuses on the thermal and hypoxia tolerance of coregonid fishes including cisco, bloater and lake whitefish from the Great Lakes. This is particularly relevant for the proposed project, which focuses on the unique characteristics of multiple cisco populations spread across different areas of Minnesota. In addition to their research expertise, Dr. Zillig has a proven track record of overseeing complex scientific projects from start to finish. Dr. Zillig has managed ~3.3M in research grants and conducted research on a variety of fish species ranging from tropical sharks to Antarctic ice fish. Overall, Dr. Zillig's extensive experience and specialized knowledge in cold-water fish physiology, coupled with their leadership abilities, make him uniquely qualified to guide this important study on the oxythermal physiology of cisco populations across Minnesota.

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

Organization Description:

The University of Minnesota's abbreviated mission statement: The University, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world. The University's mission, carried out on multiple campuses and throughout the state, is threefold: Research and Discovery, Teaching and Learning, and Outreach and Public Service.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineli	% Bene	# FTE	Class ified	\$ Amount
				gible	fits		Staff?	
Personnel								
Associate		Lead all aspects of project, including study design,			36.6%	0.24		\$52,371
Professor: Dr.		supervision of staff and students, data collection						
Gretchen		and analysis, interpretation and communication of						
Hansen		results, and engagement with partners.						
Post-Doctoral		Project Manager. To conduct statistical analyses and			25.9%	3		\$322,857
Researcher:		coordinate with partners on implementation and						
Dr. Kenneth		integration of research						
Zillig								
Graduate		To coordinate and lead field work with state and			23.2%	3		\$178,606
Student (TBN)		non-profit partners, coordinate data acquisition,						
		assist with analysis and communication. Includes						
		salary, benefits and tuition costs.						
Undergraduate		To assist with fish husbandry and data entry,			0%	0.5		\$17,160
Technician #1		calculated as 10 hours per week for 52 weeks for						
(TBN)		each of 2 years at a rate of \$16.50 per hour.						
Undergraduate		To assist with fish husbandry and data entry,			0%	0.7		\$24,024
Technician #2		calculated as 14 hours per week for 52 weeks for						
(TBN)		each of 2 years						
							Sub	\$595,018
							Total	
Contracts and								
Services								
Minnesota	Internal	Two research bays at the Minnesota Invasive				1		\$17,528
Aquatic	services or	Species Research Center (MAISRC) rental for 1 year						
Invasive	fees	(2026-27).						
Species	(uncommon)							
Research								
Center								410.000
Minnesota	Internal	Two research bays at the Minnesota Invasive				1		\$18,054
Aquatic	services or	Species Research Center (MAISRC) rental for 1 year						
Invasive	fees	(2027-28)						
Research	(uncommon)							
Center								640.505
iviinnesota	Internal	I wo research bays at the Minnesota Invasive				1		\$18,595
Aquatic	services or	species Research Center (MAISRC) rental for 1 year						
invasive	1	(2028-2029).		1	1			1

					1	1	1	1
Species	fees							
Research	(uncommon)							
Center								
							Sub Total	\$54,177
Equipment,								
Tools, and								
Supplies								
	Equipment	10 Fiber Optic oxygen dipping probes (\$425 ea)	For measuring dissolved oxygen using the Firesting Oxygen Meter					\$4,250
	Equipment	2 Temperature Probes for Firesting Oxygen Meter	For measuring temperature with					\$510
		(\$255 ea)	Firesting Oxygen Meter					
	Equipment	Laptop Computers (\$2000 ea)	To collect and store the data output	х				\$4.000
	1. 1		from the Firesting Oxygen Meters.					, ,
	Equipment	8 McDonald Hatching jars and hangars (\$158 ea)	Incubation of Cisco Embryos gathered					\$1.267
	1. 1		from several MN Populations					
	Tools and	Materials for the construction of 12 respirometry	These materials are for the					\$1.191
	Supplies	chambers for measuring metabolic performance of	construction of respirometry					+ -)
		cisco. Included in cost are snap-ware containers	chambers. These chambers will allow					
		(\$45), small 12V circulation pumps (\$234), small	for the containment of an individual					
		pipe fittings, check valves, bulkheads (\$437), two	fish for extended trials where the					
		electronic cycling timers (\$62), tubing (\$247) and	oxygen consumption of the fish is					
		two large flush pumps (\$166).	measured. They will also be used to					
			measure pcrit.					
	Tools and	10 Heatbars and 24 thermostats	Heatbars (\$109 ea) and thermostats					\$1,930
	Supplies		(\$35 ea) for maintaining stable water					<i>+_)</i> ;;;;;
			temperatures					
	Fauipment	HOBO loggers, small waterproof temperature	Measuring and recording aquairia					\$2.370
	-90.0.0.0	recording loggers ($n = 30$, \$79ea) for measuring the	temperature throughout the					<i>+_)</i> ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
		temperature of the aquaria in which the fish are	experiment each tank (6) and aquaria					
		housed.	(24) needs a logger.					
	Tools and	Fish Husbandry Materials: Airstones (\$33), UV	For manaing and maintaining fish					\$712
	Supplies	Sterilizer (2 ct $$200 \text{ ea}$) fish nets (\$36) rearing	culture systems					<i></i> , <i>1</i>
	Supplies	buckets (~\$243)						
	Tools and	Plumbing Materials: Stainless Steel Chilling coil	Materials for the construction of a					\$3,269
	Supplies	materials ($\$$ 360) motorized ball valves (n = 10	nlumbing system for the incubation					<i>\$</i> 0)200
	Supplies	\$35.50 ea). PVC Pipe and Pipe Fittings (\$2554)	and rearing of cisco. Stainless steel					
			tubing is used to build chilling coils					
			through which chilled water is					
			circulated to maintain tank					
			temperatures					
					1	1		

Tools and Supplies	24 Well Culture Plates for the individualized incubation of Cisco larvae. 600 plates are needed (\$2.17 ea) for our experiment (6 populations x 10 temperatures x 10 plates per temperature)	To house individual cisco embryos so their development and hatching can be tracked. Fish from each population will be incubated across a	\$1,302
		range of temperatures (n = 10 per temperature., 4, 5, 6, 7, 8, 9, 10, 11C, etc.)	
Tools and Supplies	Fish feed for both larval and juvenile size classes (~12 months of feed), estimated via contact with a distributor at \$977 per year	To enable the rearing and growth of Cisco from different populations	\$2,931
Tools and Supplies	Nitrogen gas (\$7.12 per canister) and canister rental (\$0.10 per day)	To generate hypoxic conditions, we have budgeted for 10 canisters of Nitrogen lasting for 100 days total.	\$82
Equipment	Gas Regulator, Tubing and Fittings: Nitrogen Gas Regulator (\$520), gas line tubing (\$253) and assorted push-to-connect fittings (\$340), solenoid valves (\$190) and venturi injectors (\$85) needed to dissolve nitrogen into rearing and test systems.	These nitrogen gas materials will allow us to create hypoxic conditions to test the tolerances of different Cisco populations	\$1,388
Equipment	24hr belt feeders (10) for feeding rearing tanks of Cisco (\$293 ea)	Feeders are needed to deliver food to rearing juvenile Cisco and aid in reducing the number of hours needed for their care and maintenance	\$2,930
Tools and Supplies	Visible Implant Elastomer Tags and tagging equipment	Used to give fish identifying marks for distinguishing individuals or populations	\$575
Tools and Supplies	Chemicals: 2 gallons of ethanol (\$16 ea), one gallon Parasite-S (formalin treatment for egg fungus, \$86), one gallon lodophore (\$95) for surface sterilizing embryos, and Virkon-S (\$123) to creating sterilizing agent for field materials and sanitation mats.	Assorted chemicals for preserving fish specimens and sanitizing embryos and equipment.	\$336
Tools and Supplies	Total Boat Epoxy: 5 gallons of Epoxy resin kits (\$180 ea)	Epoxy resin is used to modify the 24- well incubation plates to make them negatively buoyant so that the trays naturally sink and prevent incubation wells from dewatering.	\$900
Tools and Supplies	Field Collection Materials: Three 300' long gill nets (\$850ea) for the capture of Cisco from target population lakes, as well as buoys for each net (\$100) and line (\$50). Gas for the boat to capture fish (\$200)	Nets for the capture of live cisco adults from spawning aggregations in target lakes. Nets will be deployed with the assistance of MN DNR or other local partners.	\$3,200
Equipment	Aqualogic DHSP-7: Water Heat Pump	To generate cold water for the rearing and testing fo Cisco	\$4,700

				1	-		
						Sub	\$37,843
						Total	
Capital Expenditures							
		Firesting Oxygen Meters (4 - channel)	Oxygen sensing and recording	X			\$12.704
			equipment, 2 meters (\$6352 ea)				1 / -
						Sub	\$12,704
						Total	
Acquisitions and							
Stewardship						Cub	
						Sub	-
Travel In						Total	
Minnesota							
	Miles/ Meals/	Field trips to aquire cisco embryos from several	Field trips to hatcheries and lakes to				\$5,058
	Lodging	lakes in Minnesota. Costs estimated for 2 ppl* 6	capture spawning cisco and acquire				. ,
		trips split across years 1 and 2. Total based off	embryos				
		estimated travel of 370 miles@\$0.70/mi + 1 lodging					
		nights per person @\$165/night + 2 days of meals					
		@\$51/day per person for 2 people (meal estimate					
		based on state per diem rate; actual costs will be					
		reimbursed) = \$793 per trip as well as incidentals					
		(\$300) . One trip per population, 6 populations and					
		incidentals (793 * 6 + 300= 5058)					
	Conference	Travel for in state meetings and conferences 1	Travel for one person to travel to two				\$2,200
	Registration	person attending 1 per year in years 2 and 3. Costs	in-state conferences (e.g., the				
	Miles/ Meals/	estimated as \$250 registration fee, 500	Minnesota chapter of the American				
	Lodging	miles@\$0.70/mi + 2 lodging nights@\$165/night + 3	Fisheries Society or the Water				
		days of meals (1/0 meal estimate based on	Resources Conference) to present				
		University per diem rate; actual costs will be	and communicate results				
		reimbursed) (\$1100 per conference)				- Culh	67.259
						Sub	\$7,258
Travel Outside						Total	
Minnesota							
						Sub	-
						Total	
Printing and							
Publication							
	Publication	Open access publication fee for two peer reviewed	Publishing research results in open				\$6,000
		journal article (\$3000 per article)	access journal so that the public can				

		read results without being behind a			
		paywali		 	
				Sub	\$6,000
				Total	
Other					
Expenses					
				Sub	-
				Total	
				Grand	\$713,000
				Total	

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or	Description	Justification Ineligible Expense or Classified Staff Request
Capital Expenditures		Firesting Oxygen Meters (4 - channel)	Oxygen meters of these types are the state-of-the-art method of measuring metabolic rates in an efficient manner. Alternative tools include Witrox meters from the brand Loligo, but Loligo products are both more expense and require additional software licensing costs to function. Therefore, we have selected to use Firesting Meters by Pyroscience instead. Additional Explanation : The Firesting Oxygen Meters are necessary to measure the metabolic rates of fishes and to conduct hypoxia trials. These meters will continue to be used to assess the metabolism and hypoxia performance of fishes after the completion of the project.
Equipment, Tools, and Supplies		Laptop Computers (\$2000 ea)	In order to function the Firesting Oxygen Meters must be connected to a dedicated computer which collects and stores the data from the Firesting Meter. Each meter requires it's own computer.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	Minnesota Department of Natural Resources	Minnesota DNR Fisheries staff will provide in-kind support for this project. Specifically, Dan Wilfond, Area Fisheries Supervisor and Bradley Carlson, Fisheries Specialist Intermediate will contribute by conducting cisco spawn take operations on several Minnesota Lakes. They will act as liaisons for the project to fisheries managers and MN DNR leadership with an in-kind contribution of 104 hours each annually for each of the three years of the project totaling \$37,170.00 and 624 hours.	Secured	\$37,170
			State Sub Total	\$37,170
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.	Secured	\$344,535
In-Kind	Red Lake Band of Chippewa Indians Department of Natural Resources	Pat Brown and his staff will contribute technical assistance and logistic help on the Red Lake Reservation. They will act as liaisons for the project to fisheries managers and Red Lake Tribal Council with an in- kind contribution of 80 hours to the project valued at \$8,000.	Potential	\$8,000
			Non State Sub Total	\$352,535
			Funds Total	\$389,705

Total Project Cost: \$1,102,705

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component File: <u>6805c38c-e62.pdf</u>

Alternate Text for Visual Component

Multiple cisco populations will be studied across lifestages to build physiological performance values. These values will then be combined with temperature and oxygen measurements across Minnesota's lakes to construct habitat suitability maps for both current and future environmental scenarios. At-risk and resilient populations will also be identified....

Supplemental Attachments

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

Title	File
UMN_Sponsored_Programs_Administration_Endorsement	deb9a23e-d87.pdf
Red Lake DNR Letter of Support	<u>0e5f6930-9b4.pdf</u>
MN DNR Letter of Support	8731daac-693.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 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?

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:

Dr. Gretchen Hansen (UMN), Minnesota DNR.

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