

**Environment and Natural Resources Trust Fund
2012-2013 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 001-A

Sustaining Lakes in a Changing Environment Phase 2

Topic Area: A. Fisheries & Wildlife Research

Total Project Budget: \$ 1,411,871

Proposed Project Time Period for the Funding Requested: 3 yrs, July 2013 - June 2016

Other Non-State Funds: \$ 0

Summary:

SLICE Phase 2 will complete the process of developing whole systems monitoring and models of MN lakes to allow managers to better evaluate actions for clean water and productive fisheries.

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Location

Region: Statewide

County Name: Statewide

City / Township:

<input type="checkbox"/> Funding Priorities	<input type="checkbox"/> Multiple Benefits	<input type="checkbox"/> Outcomes	<input type="checkbox"/> Knowledge Base
<input type="checkbox"/> Extent of Impact	<input type="checkbox"/> Innovation	<input type="checkbox"/> Scientific/Tech Basis	<input type="checkbox"/> Urgency
<input type="checkbox"/> Capacity Readiness	<input type="checkbox"/> Leverage	<input type="checkbox"/> Employment	<input type="checkbox"/> TOTAL <input type="checkbox"/> %



PROJECT TITLE: Sustaining Lakes in a Changing Environment (SLICE): Phase 2

I. PROJECT STATEMENT

As Minnesota’s population grows, increased demands are being placed on our resources. Hunting and fishing related activities fuel \$3.6 billion in annual expenditures and a vibrant Minnesota economy demands on effective and efficient lake habitat and fisheries conservation. Thanks to the initial investments from the ENTF, multiple partners’ in-kind contributions, and motivated citizen volunteers, DNR Fisheries successfully launched and is near completion of a 4-yr pilot effort in 24 sentinel lakes (SLICE Phase 1). Sentinel systems are specific ecosystems (in this case lakes) chosen for focused monitoring in order to better capture important changes or trends through time, and to give us the information to better understand the mechanisms to explain those changes. Thus, in Phase 1, we have established a suite of 24 lakes across Minnesota that capture the full breadth of the basic conditions (e.g. fertility, climate) that shape our lake resources, and in large part determine the goods and services (e.g. fishing and water recreation) that our lakes provide for our citizenry. Phase 1 identified baseline conditions in a wide variety of Minnesota lake types, their initial responses to various environmental stressors, and outlined some expectations for future conditions given various changing scenarios. Phase 1 also fortuitously (and perhaps unfortunately) gave us the opportunity to set up a rigorous system to understand pending impacts from zebra mussels following the invasion of this nasty pest in Lake Carlos, near Alexandria, in 2009. Phase 1 will be completed in June 2013, and we do not request additional funds for that project in this proposal.

Phase 2 (2013 - 2016), proposed here, will take lessons learned from the first phase to develop and implement rigorous monitoring, modeling, and reporting protocols that will deliver timely information on lake trends, reduce uncertainty about potential causes, and result in more precise conservation approaches. Phase 2 also includes applying lake models to predict ecosystem impacts of zebra mussels in each Tier 1 sentinel lake should they be introduced. In order to implement proactive lake conservation measures, we must acquire information about baseline habitat conditions (the past), long-term changes to that baseline (the present), and models that forecast the risk of various impairments (the future). We seek ENTF support in the amount of approximately \$1.4 million to support this work over 3 years, and will hope for permanent funds from partner agencies in the future and for the long-term. DNR Fisheries, MPCA,USFS Superior National Forest, and USGS propose a continued in-kind contribution of \$657 thousand and associated equipment and infrastructure.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Monitoring a comprehensive suite of important lake and watershed indicators in 24 sentinel lakes to gauge status and trends of lake health (see attached map). **Budget: \$864,780**

Several scientific and programmatic lessons learned from the Phase-1 pilot will be applied to this activity. Four dedicated regional field staff will provide regional expertise regarding status and trends of important water and fisheries resources in each of the State’s four major land types. A programmatic adaptation proposed in Phase 2 is a tiered classification of sentinel lakes with comprehensive, intensive monitoring in 8 Tier 1 Sentinel Lakes (see also activity 2) and reduced monitoring schedules in the remaining 16 sentinel lakes. Thus all lakes will receive regularly scheduled monitoring of the following parameters: Water quality (according to regular MPCA protocols), Fisheries population assessments (primarily game fish), IBI surveys (index of biotic integrity) of all fish (thus including non game species) and aquatic rooted plants, zooplankton sampling, and continuous water temperature monitoring. The specific frequency for conducting the individual monitoring components will be determined from rigorous statistical analysis soon to be completed as a key part of the Phase 1 project. In addition to this, we will also install automated sensors in the eight Tier 1 lakes.

Outcome	Completion Date
1. Conduct standard lake surveys; data QA/QC & database management	Ongoing
2. Inventory watershed land cover & uses (inc. BMP’s) & drainage features and	June 30, 2015

archive in DNR's GIS database	
3. Establish automated water flow, quality, and temperature sensors in 8 Tier 1 Lakes.	May 2014
4. Reports on status and trends for 4 major landtypes, with stressors or BMP influence	Annual to June 2016

Activity 2: Build or adapt biophysical lake ecosystem models for 8 Tier 1 lakes and forecast future lake conditions based on scenarios that cause change but vary across lakes **Budget: \$547,091**

To understand complex systems like natural lakes, we need both high quality and comprehensive monitoring data, but also the capacity to synthesize those data in mechanistic system models. For example, we know in general what zebra mussels do to the food webs in other lakes, but impacts will certainly vary across lakes. We can develop sound mechanistic models to explain these changes, but these models need to be fit and calibrated to our specific lakes. To further elaborate on this example, biologists have learned a lot about how zebra mussels have changed Oneida Lake in New York state, but it would be very wrong to use the Oneida data and likely the Onieda model to predict changes in Lake Carlos. This is because the two lakes are so different (Oneida is very fertile and shallow, Carlos is deep and of moderate fertility). In Activity 2, we propose building or refining 8 lake models for each Tier-1 sentinel lake that will continually be used and recalibrated with new monitoring data to forecast lake conditions given certain scenarios that will cause some type of change.

Outcome	Completion Date
Build biophysical lake system models for Tier 1 lakes & establish change scenarios	Dec. 31, 2014
Parameterize, calibrate and validate models	June 30, 2015
Develop and run forecast scenarios for evaluating various lake management tools & BMPs	June 30, 2016

III. PROJECT STRATEGY

A. Project Partners

1. DNR Division of Fish and Wildlife Section of Fisheries – Program administration, Fisheries technical and field support, data management, (ENRTF + in-kind; Dr. Don Pereira Project Manager).
2. USGS Water Science Center – Hydrologic and limnologic technical and field support (ENTF + in-kind; Dr. Richard Kiesling PI).

Partners providing support but not receiving funds from the ENRTF:

3. DNR Divisions of Parks and Trails, Ecological and Water Resources – Survey support on Bear Head Lake (Parks), lake level gauging, watershed modeling, invertebrate data (DNR Div. EWR, in-kind).
4. MPCA – Environmental Analysis and Outcomes Division – Water quality assessments, ground-water monitoring, volunteer coordination (in-kind).
5. USDA/USFS– Superior National Forest – Survey support in sentinel lakes within the SNF (in-kind).
6. University of Minnesota Itasca Biological Station – Survey support on Elk Lake.
7. Clean water funded work by the University of Minnesota (Dr. Bruce Wilson) establishing sentinel watersheds to monitor the effectiveness of clean water funded activities in select MN watersheds.

B. Timeline Requirements

The SLICE program is an adaptive monitoring program whereby the program and outcomes are evaluated on a 3 to 4 year basis and adjustments are made in response to changing budgets, lessons learned, and new information, while maintaining the integrity of long-term datasets. Long-term monitoring is the central theme of SLICE and thus an ongoing commitment by partners will be needed for the program to realize its full potential as a powerful decision-support tool for MN lake management.

C. Long-Term Strategy and Future Funding Needs

Our long-term strategy is to complete development of a fully integrated lake monitoring program that combines and focuses the activities of key, collaborative management agencies (e.g. DNR and MPCA). Such a system will greatly increase our understanding of how these lakes change, and what management actions are most likely to provide cleaner water and healthier fish populations. After funding Phase 2, our hope will be to fully incorporate this program in to the regular activities of both agencies (thus move from concept development to operational), and thus cover future work with regular agency funding sources.

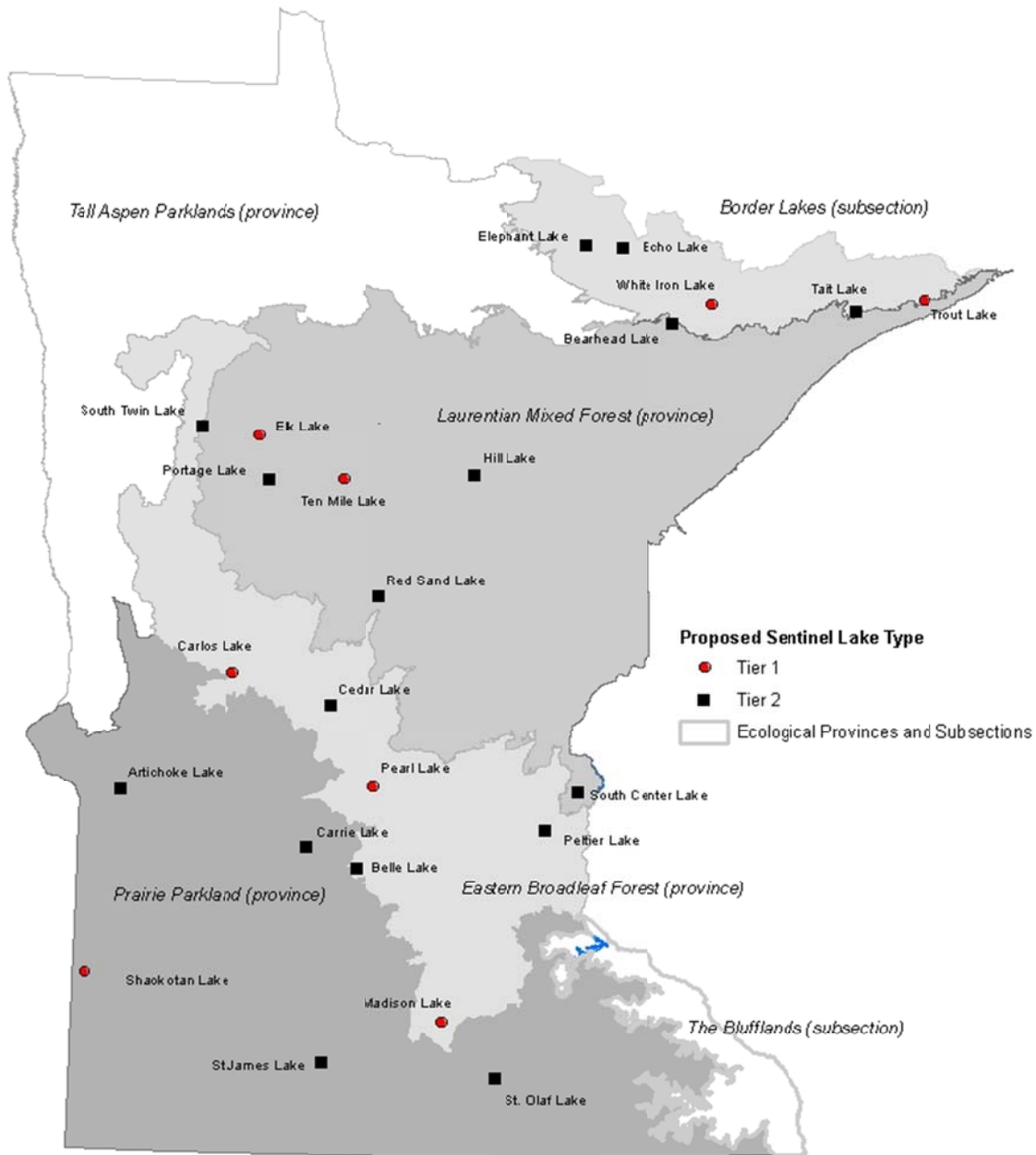
2012-2013 Detailed Project Budget

IV. TOTAL ENRTF REQUEST BUDGET Three years [two years of staffing, but for full field season]

BUDGET ITEM	AMOUNT
Personnel: Regional fisheries habitat specialists, four, unclassified 85% ENRTF, years one and two. Eight fisheries interns, 100% ENRTF, years one and two.	\$469,000
Regional fisheries habitat specialist, Walker, years 1 and 2, Salary: \$66,450, Fringe: \$19,935	
Regional fisheries habitat specialist, New Ulm, years 1 and 2, Salary: \$66,450, Fringe: \$19,935	
Regional fisheries habitat specialist, Tower, years 1 & 2, Salary: \$66,450, Fringe: \$19,935	
Regional fisheries habitat specialist, Glenwood, years 1 and 2, Salary: \$66,450, Fringe: \$19,935	
8 Summer Interns, four months per year, years one and two, \$11/hr, no fringe, \$123,460	
Contracts: USGS Water Sciences Center (itemized detail in next three lines)	\$ 513,700
USGS lake model construction (staff time) \$235,300	
USGS equipment rental and maintenance \$195,500	
USGS water sampling and analytical lab costs \$82,900	
Equipment/Tools/Supplies: (itemized detail in next four lines)	\$ 263,000
Transducers for water level gauges \$11,400	
Temperature thermistors and buoys \$8,200	
20 dissolved oxygen sensors and buoys \$125,400	
misc. equipment and repair \$118,000	
Travel: In-state travel expenses to study lakes and coordination meetings, fleet costs, years one and two. For DNR field staff, primarily regional coordinators and interns.	\$ 80,000
Additional Budget Items: DNR used a rate of 6.5% to calculate costs for direct support services, which are DNR's direct and necessary business services required to support this proposal.	\$ 86,171
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$1,411,871

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ Being Applied to Project During Project Period: USGS matching funds.	\$ 400,200	Pending
Other State \$ Being Applied to Project During Project Period: DNR funding 15% for four long-term monitoring fisheries specialists (\$61,400), plus approximately \$130,000 for 11 DNR staff, plus direct support services.	\$ 191,400	Pending
In-kind Services During Project Period: MPCA water quality sampling and analytical costs. USFS Superior National Forest staff for aquatic plant surveys. Citizen Lake Monitoring Program Volunteers.	\$ 65,000	
Remaining \$ from Current ENRTF Appropriation (if applicable): Current SLICE project (Phase 1: Assessing the consequences of ecological drivers of change on water quality and habitat dynamics of deep-water lakes with coldwater fish populations, ML 2009, Chap. 143, Sec. 2, Subd. 5C) will be complete by the time this proposed project starts. Initial funding amount was \$825,000, there is approximately \$61,000 remaining, and that will be spent by the end of the project (June 2013).	\$ -	
Funding History: Existing ENRTF funding for first phase of SLICE project (Assessing the consequences of ecological drivers of change on water quality and habitat dynamics of deep water lakes with coldwater fish populations, see above). This amount does not include match from several collaborating agencies (DNR, MPCA, USGS, Superior National Forest).	\$ 825,000	



Map of the 24 sentinel lakes (8 Tier 1 and 16 Tier 2), and the four major land types that they cover. Blufflands and Tall Aspen Parklands are not included only because they have very few fishing lakes.

Project Manager

Donald Pereira, Ph.D., is the Fisheries Research and Policy Manager for the DNR. In my thirty years of experience in fisheries and aquatic sciences, I have authored or co-authored thirty peer-reviewed papers and book chapters related to fish behavior, recruitment, community ecology, climate change and habitat interactions. I spent 17 years as a DNR Research Biologist and 7 years as a Research Supervisor. I also currently maintain an adjunct faculty appointment in the University of Minnesota's Graduate Fisheries Program where I have advised five graduate students and served on the advisory committees of thirteen additional students. In April 2007, I was hired as the Fisheries Research and Policy Manager and currently oversee a research unit with 19 biologists and 3 Research Supervisors with extensive fisheries and aquatic research and management experience. Many of these biologists have been involved in the first phase of the proposed project and along with our partners, will be involved with data collection, analysis, and dissemination of results.

Project Coordination

Specifically among Fisheries Research staff, Peter Jacobson (Habitat Research Unit Supervisor) and two experienced field biologists will be serving as field-level coordinators. Mr. Jacobson has extensive experience and interaction with Dr. Richard Kiesling, our primary subcontractor with USGS. He and I both have also established strong collaborative ties with MPCA Monitoring staff who continue to make a strong commitment to this project on a long-term basis. While this project is referred to as Phase 2 of SLICE ("Sustaining Lakes in a Changing Environment"), we foresee that it will also be the final phase.

Organization Description

The mission of the Minnesota Dept. of Natural Resources is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life. Within the DNR, the Division of Fish and Wildlife bears primary responsibility for managing, protecting and regulating the State's fisheries and wildlife resources. As part of the Division's mission, it will promote habitat protection and development of private and public lands.

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