

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 059-B

Chemicals of Emerging Concern in Minnesota Fish

Category: B. Water Resources

Total Project Budget: \$ 436,922

Proposed Project Time Period for the Funding Requested: 3 years, July 2017 - June 2020

Summary:

Identification of chemicals of emerging concern (CECs) and metals from fish, water, and sediments from 30 waterbodies in NE MN that are most used for subsistence harvest and MN recreation.

Name: Seth Moore

Sponsoring Organization: Grand Portage Band of Lake Superior Chippewa

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Grand Portage MN 55605

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Web Address _____

Location

Region: Northeast

County Name: Cook, Lake

City / Township:

Alternate Text for Visual:

One page handout describing project goals

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



I. PROJECT STATEMENT: Identification of chemicals of emerging concern (CECs) and metals from fish, water, and sediments from 30 waterbodies in NE MN that are used for subsistence harvest and MN recreation.

We propose to evaluate levels of unregulated and emerging contaminants within key fish species, waters, and sediments in Northeastern Minnesota within the 1854 Ceded Territory. Specifically, we will assess the threat of low concentration but potentially toxic “micropollutants” within subsistence species of fish and their environment as part of a long-term ecosystem health program. Further, the proposed project will be the first of its kind in regard to contaminant surveillance in animals and the environment simultaneously in Minnesota, providing new methodologies for natural resource managers. This project directly addresses the second priority item in the Water Resources strategic guidance of the LCCMR 2017 RFP to determine the environmental fate and ecological effects of emerging and unregulated contaminants.

Tribal communities in Minnesota rely heavily on fish species in the Lake Superior watershed for subsistence; however, concerns for the impact of endocrine-active or toxic chemicals in the environment on the health of fish populations and humans that consume them raises questions about the safety and security of subsistence foods. To address these concerns, the Grand Portage Band of Chippewa is collaborating with the University of Minnesota and Minnesota Pollution Control Agency to assess concentrations of such contaminants in the Lake Superior watershed and detect related environmental exposure pathways.

A pilot study on fish and water samples on the Grand Portage Indian Reservation conducted in 2015 revealed numerous micropollutants in water and fish tissues from locations in Lake Superior and in remote wilderness sites without an obvious source of contamination. Our team screened for over 100 CECs in four sample locations on reservation lands, which resulted in the detection of five compounds in water (androstenedione, androsterone, cotinine, hydrocodone, and metformin), seven compounds in fish tissue (betamethasone, venlafaxine, triclosan, clotrimazole, hydrocortisone, iopamidol, and triclocarbon), and DEET in both water and fish tissues. Iopamidol was ubiquitous in fish tissue across sites and DEET was ubiquitous in water and fish tissues. Research has found that aquatic exposures to some estrogen-mimics (e.g., ethinyl estradiol, a chemical used for birth control) can render fish sterile and thus threaten the sustainability of those populations. However, little is known about the potential for micropollutants to accumulate in fish and wildlife tissues, thus potentially exposing higher-level organisms and humans that consume them. Baseline levels of these contaminants in the Minnesota ecosystem have not been determined, thus no long-term chemical management strategies exist. This study will characterize the occurrence of micropollutants within fish from northeastern Minnesota lakes and streams and guide further initiatives to investigate effects on fish populations and risk to human health. Furthermore, this study, *the first of its kind*, will provide new data and new models and tools for risk assessment and surveillance useful for a variety of resource management agencies.

Project outputs: This project will focus on system-wide exposures and responses across a variety of aquatic and related terrestrial species (considering the broader food web) in the Minnesota Lake Superior watershed. Specific outputs will include: micropollutant occurrence data within key habitats and fish species in Minnesota; an analysis of potential sources; identification of at-risk areas and/or populations; land and chemical use guidelines to enhance the sustainability and improve the overall health of the Minnesota ecosystem. The information gathered by this project will also be shared with MPCA to add to their knowledge base about micropollutants in Minnesota lakes and biota, thus contributing to a state-wide risk assessment.

Methods: The objectives of this research are to i) collect baseline data on the presence of chemicals of emerging concern (CECs) and trace metals in fish from areas used by tribal members for the harvest of subsistence species



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: *Chemicals of emerging concern in subsistence species used by Minnesota Chippewa*

within the Minnesota Lake Superior watershed and ii) to further evaluate detected contaminants for biological effects that may impact food safety and security, thus threatening long standing cultural practices and natural resources of Northeastern Minnesota. This project will use conventional water, sediment, and biota sampling protocols for aquatic habitats to sample 30 waterbodies in Northeastern Minnesota that are fished for subsistence or recreational use. This project will sample fish tissues that are collected through routine management and assessment activities within the Lake Superior watershed of Minnesota. Following collection of fish, water, and sediment samples, they will be processed and shipped for screening of more than 100 chemicals of emerging concern. Sample analysis costs are \$2500 per sample and we will send 90 samples for analysis (30 each of fish tissue, water, and sediment). Sample analysis will require more than half of the requested funds, with the remainder being used for interpretation and analysis of results by University of Minnesota faculty. We will use GIS mapping and spatial analysis to evaluate high risk areas and will use our data to inform at risk populations (women of childbearing age, infants and children) of potential consumption risks.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: *Conduct Sampling in beginning in 2017*

Budget: \$436,922

Outcome	Completion Date
<i>1. Sample collection of fish, sediment and water from 30 lakes and streams (\$231,000)</i>	<i>November 2018</i>
<i>2. Analyze sampling data with UMN ecohealth researchers</i>	<i>January 2019</i>

Activity 2: *Interpret findings with University of Minnesota (\$184,700)*

Outcome	Completion Date
<i>1. Analyze data and develop spatial maps of results</i>	<i>January 2019</i>
<i>2. Disseminate findings to MPCA</i>	<i>March 2019</i>
<i>3. Plan future action, initiatives, management strategies</i>	<i>May 2020</i>
<i>4. Develop consumption advisories if required</i>	<i>May 2020</i>

III. PROJECT STRATEGY

A. Project Team/Partners

Our team is a partnership of academic, tribal, and state agencies. GPIR has an active research and natural resource management program and highly supportive local community. Project lead, Seth Moore will provide logistical support, and data analysis and interpretation. UMN partners Dominic Travis, Tiffany Wolf, Matteo Convertino and Nick Phelps specialize in addressing grand challenges in health at the intersection of animal, human, and environment. In addition, Minnesota Pollution Control Agency (MPCA) will provide relevant expertise in toxicology. ENRTF funds will be utilized by both GPIR and UMN to conduct field work, lab work, and hire necessary personnel. MPCA and USEPA personnel Mark Ferrey and Mark Jankowski, respectively, will provide subject area expertise and analysis and interpretation of testing results. Partners will synthesize data and interpret epidemiological and health/disease risks associated with micropollutant levels in the food web.

B. Project Impact and Long-Term Strategy

This project will improve our ability to monitor and manage health threats to MN wildlife from environmental change to guide consumption recommendations for the local tribe. The baseline data will help to form a long-term monitoring plan for the GPIR and provide a basis for the creation of a research/education site.

C. Timeline Requirements

This will be a 2.5 year project. Year 1: Initiate data collection and analysis (initial descriptive and mapping (spatial) analyses). Year 2: Further data collection and final data analyses and mapping (spatial) analyses. Year 3 (0.5 years): integration of data into modeling tools and formulation of management plans.

2016 Detailed Project Budget

Project Title: Evaluation of anthropogenic micro pollutants in subsistence species used by the Grand Portage Band of Lake Superior Chippewa

IV. TOTAL ENRTF REQUEST BUDGET 2.5 years

BUDGET ITEM	Sub-total	Amount
Personnel:		\$184,706
UMN Project Manager: Tiffany Wolf - 10% FTE x 2.5 yrs (\$27,000 + 34% fringe)	\$36,180	
Grand Portage Biologist: Yvette Chenaux- 25% FTE x 2.5 yrs (21,000 + 38% fringe)	\$28,980	
UMN Ecohealth Lead: Dominic Travis - 3% FTE x 2.5 yrs (12,445 + 34% fringe)	\$16,676	
UMN Fish Health Specialist: Nicholas Phelps - 2% FTE x 2.5 yrs (12,592 + 34% fringe)	\$8,417	
UMN Spatial Modeler: Mateo Convertino - 2% FTE x 2.5 yrs (12,646K + 34% fringe)	\$8,452	
UMN Spatial Modeler: Post Doc - 6% FTE x 2 yrs (3,388K + 32% fringe)	\$6,776	
UMN Grad Student: (To be hired) - 50% FTE x 2.5 yrs (\$45,000 with fringe)	\$67,500	
UMN Research associate: (Alex Primus) - 5% FTE x 2.5 years (8750 + 34% fringe)	\$11,725	
Travel:		\$21,216
UMN Staff: 1 six-day trip per investigator per year (6)	\$18,216	
Grand Portage Staff: 5 two-day trips for 2 staff	\$3,000	
Additional Budget Items:		\$231,000
Field Work: Logistics and sample collection and transport (\$3,000 per field season)	\$6,000	
Sample Processing: Analysis of contamination with micropollutants (90 samples @ \$2,500 sample)	\$225,000	
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND REQUEST		\$436,922

V. OTHER FUNDS

SOURCE OF FUNDS	Amount	Status
Other Non-State \$ To Be Applied To Project During Project Period:		
Partnership Development grant: UMN College of Veterinary Medicine, Population Systems Signature Program	\$20,000	Pending
In-kind Services To Be Applied To Project During Project Period:		
Principle Investigator: Seth Moore 15% FTE x 2.5 yrs (11,850 + 38% fringe)	\$40,882	Secured
EPA Research Ecotoxicologist - Mark Jankowski 1% FTE salary and 34% fringe	\$2,381	Secured
MPCA Environmental Scientist - Mark Ferrey salary and 34% fringe	\$9,527	Secured
Field logistics and personell for sample collection	\$25,000	Secured
Preliminary sample collection and analysis by Grand Portage	\$140,000	Secured
Laboratory resources at UMN College of Veterinary Medicine:		
Lab facilities and equipment	\$25,000	Secured
TOTAL OTHER FUNDS		\$262,790
TOTAL PROJECT VALUE		\$699,712

Baseline data on emerging and unregulated micropollutants in Minnesota's environment and wildlife is strongly needed. To meet this need, we will develop new monitoring strategies to evaluate risks to wildlife populations and human health!

A Unique Partnership Approach for Protecting Minnesota's Threatened Ecosystems



Provide LONG-TERM ecosystem protection:

- Monitor anthropogenic pollutants within subsistence fish species in the Lake Superior watershed of Minnesota
- Analyze potential sources of pollutants
- Identify at risk areas and/or populations
- Develop land and chemical use guidelines to enhance ecosystem sustainability and health



We can WORK TOGETHER to protect this ecosystem:

- Partnership of tribal, state, and academic agencies
- Provide new methodologies for natural resource managers
- Focus on system-wide exposures across a diversity of aquatic and terrestrial species



BIOGRAPHICAL SKETCH

Seth Moore	Director of Biology and Environment, Grand Portage Band of Lake Superior Chippewa		
eRA COMMONS USER NAME (credential, e.g., agency login)	Band of Lake Superior Chippewa		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY
University of Minnesota	PhD	05/2008	Water Resources Science
University of Minnesota	MS	10/1998	Environmental Biology
Northland College	BS	06/1994	Biology and Environmental Studies (Dual Major)

A. Personal Statement

The goal of this project is to determine the relative risks of consumption of subsistence species for members of Grand Portage Band of Lake Superior Chippewa. We want to analyze a suite of subsistence species to attempt 1) to rank the relative risk of consumption each species, and 2) to attempt to quantify the combined risk of consuming multiple subsistence species. Band members harvest several species of fish that bioaccumulate toxins at differing rates (primarily lake trout, walleye, and yellow perch). Also consumed are deer, moose, wild rice, maple syrup, and blueberries. I want to evaluate the health risk of each subsistence species and then to provide meaningful recommendations to enable a healthy diet that includes subsistence species. We will develop recommendations based upon demographic category (infants, kids, adults, women of childbearing age, elders etc.).

I have worked for the Grand Portage Band of Lake Superior Chippewa since 2005. I presently direct the Grand Portage Departments of Biology and Environment. I focus my research efforts on subsistence species of the Grand Portage Band of Chippewa. Many of current projects include identifying effects of climate change on subsistence species consumed by tribal members.

Positions and Honors

Awards Received

- 2013. Tribal Biologist of the Year. Native American Fish and Wildlife Society, Midwest region.
- 2006 – 2008 Highly Cited Author Award, Journal of Great Lakes Research, Stockwell, J.D., Yule, D. L., Gorman, O. T., Isaac, E. J., and Moore, S. A. 2006. Evaluation of bottom trawls as compared to acoustics to assess adult lake herring (*Coregonus artedi*) abundance in Lake Superior. Journal of Great Lakes Research 32(2).

Positions and Employment

2011-present Director of Biology and Environment, Grand Portage Band of Lake Superior Chippewa, MN.

2005-2010 Fish and Wildlife Biologist, Grand Portage Band of Lake Superior Chippewa, MN.

2002-2005 Fisheries Biologist, United States Geological Survey, Great Lakes Science Center, WI.

Other Experience and Professional Memberships

B. Peer-reviewed Publications

Daniel L. Yule, Seth A. Moore, Mark P. Ebener, Randall M. Claramunt, Thomas C. Pratt and Lorrie L. Salawater. 2013. Morphometric variation among spawning cisco aggregations in the Upper Great Lakes: are historic forms still present? Proceedings of International Coregonid Symposium 2011.

Gorman, O. T., Moore, S. A., Carlson, A.J., Quinlan, H.R. 2008. Nearshore habitat associations of brook trout and other fishes of Isle Royale, Lake Superior. *Transactions of the American Fisheries Society*. 137:1252–1267.

Moore, S. A. 2008. Predicting coaster brook trout distribution based on landscapes, habitats, fish communities, and life history traits. Dissertation. University of Minnesota. pp.143.

Bronte, C. R. and Moore, S. A. 2007. Morphological Variation of Siscowet Lake Trout in Lake Superior. *Transactions of the American Fisheries Society* 136:509–517.

Stockwell, J.D., Yule, D. L., Gorman, O. T., Isaac, E. J., and Moore, S. A. 2006. Evaluation of bottom trawls as compared to acoustics to assess adult lake herring (*Coregonus artedii*) abundance in Lake Superior. *Journal of Great Lakes Research* 32(2).

Moore, S. A. and C. R. Bronte. 2001. Delineation of Sympatric Lake Trout Morphotypes in Lake Superior Based on Whole-Body Morphometrics. *Transactions of the American Fisheries Society*. 130:6:1233-1240.

Moore, S. A. 1998. Morphological Variation in Lake Superior Lake Trout Based on Whole-Body Morphometrics. Thesis, University of Minnesota, Duluth.

White Papers

Green, P., Cochrane, T., Krumenaker, B., Moore, S.A. Northrup, J. 2008. Viral Hemorrhagic Septicemia Prevention and Response Plan. National Park System Units and the Grand Portage Indian Reservation within the Lake Superior Basin. pp.141.

Wiland, L. Moore, S. Hewitt, L. 2006. The Coaster Challenge: Restoring a Native Brook Trout Fishery to Lake Superior. Trout Unlimited special publication. Trout Unlimited National Office

1300 N. 17th Street, Suite 500, Arlington, VA 22209. pp.71.

<http://www.tu.org/atf/cf/%7B0D18ECB7-7347-445B-A38E-65B282BBBD8A%7D/CoasterChallenge1.pdf>

D. Research Support

Ongoing Grant-Funded Support

2013 – \$784,300 EPA Performance Partnership Grant BG-96585510

- Seth Moore (PI) 04/01/2013-03/30/2015 U.S.EPA
- Performance partnership grant through Indian Environmental Office, U.S. EPA.
- 2013 - \$190,000 Bureau of Indian Affairs Great Lakes Restoration Initiative
- 2013 – \$ 50,000 Bureau of Indian Affairs Fish Hatchery Maintenance Grant
- 2012 - \$200,000 Great Lakes Restoration Initiative (EPA/BIA)
- 2011 - \$526,000 USEPA GLNPO LaMP 5-year Workplan
- 2011 – \$141,000 Great Lakes Restoration Initiative (EPA)

