

Environment and Natural Resources Trust Fund
2014 Request for Proposals (RFP)

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Project Title:

Chemical Removal from Minnesota Lakes by Aquatic Plants

Category: B. Water Resources

Total Project Budget: \$ 346,334

Proposed Project Time Period for the Funding Requested: May 2014 to January 2016

Other Non-State Funds: \$ 0

Summary:

This study investigates aquatic plants ability to remove personal care chemicals and contaminants from Minnesota lakes to improve water quality and habitat for fish and other aquatic species.

Name: Anne Timm

Sponsoring Organization: USDA Forest Service, Northern Research Station

Address: 1831 E Highway 169
Grand Rapids MN 55744

Telephone Number: (218) 326-7132

Email: altimm@fs.fed.us

Web Address:

Location

Region: Statewide

County Name: Statewide

City / Township:

MP: 0613-2-241-proposa

Budget: 0613-2-241-bud

Qual: 0613-2-241-qualifi

Map: 0613-2-241-map-2

Resolution:

List:

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



PROJECT TITLE: CHEMICAL REMOVAL FROM MINNESOTA LAKES BY AQUATIC PLANTS

I. PROJECT STATEMENT: The recent report by the Minnesota Pollution Control Agency (MPCA) of statewide surveys for personal care products and other contaminants of emerging concern in Minnesota lakes shows that these chemicals are ubiquitous throughout the state. The presence of personal care chemicals in water and bottom sediment is of significant importance to fish and other aquatic organisms because these chemicals can alter body functions at cellular, organism, and population levels, and accumulate in tissues. The goal of this project is to investigate the ability of aquatic plants to remove these chemicals from Minnesota lakes. This study predicts that aquatic plants will remove personal care chemicals from sediments which will reduce chemical burdens to juvenile fish and other aquatic organisms. The study also attempts to identify specific aquatic plants that can remove these chemicals, which could be planted as part of restoration projects to remove contamination and improve fish habitat quality. This study also attempts to identify contaminants toxic to aquatic plants to develop aquatic plant indicators of aquatic habitat degradation.

I. DESCRIPTION OF PROJECT ACTIVITIES: This project has potential to impact lake management throughout the state of Minnesota. Lakes will be selected through consultation with MPCA, U.S. Environmental Protection Agency, and U.S. Geological Survey. A total of nine lakes of similar surface area distributed throughout Minnesota, including St. Louis Bay Estuary will be selected. The sample period will be May to October, 2014, and each lake will be sampled three times. Within each lake, one area with habitat suitable for aquatic plant growth and one area not suitable for aquatic plant growth will be selected in locations with known wastewater effluents. At the onset of the study, water and sediment samples will be collected using USGS clean-sampling techniques. In addition, a total of 10 juvenile fish per sample area will be collected with trap nets to establish a baseline chemical burden. Water, sediment, and plant tissue will be collected again in July or August when aquatic plants are fully developed. At the end of the aquatic plant growing season, in October, 10 more juvenile fish will be collected for a chemical burden comparison. Additionally, a mesocosm study will be conducted as a controlled experiment on growth of aquatic plants in sediment samples from four sites within the St. Louis River Estuary in Duluth, Minnesota. Intact sediment cores 6 inches in diameter and 8 inches deep will be collected from two contaminated, and two clean reference areas. Each core will be planted with aquatic plants, and grown in controlled 55 gallon mesocosms for 12 weeks. This study will investigate chemical burden change in the water and sediment before and after aquatic plants are introduced.

Activity 1: *Water and sediment sampling*

Budget: \$192,431.40

This activity includes field collection and laboratory processing of 36 water and 36 sediment samples (72 total) for chemical analysis of 2 suites of chemicals.

Outcome	Completion Date
<i>1. Field collection of 36 water samples and 36 sediment samples</i>	August 30, 2014
<i>2. Laboratory processing of 36 water samples and 36 sediment samples</i>	March 30, 2015
<i>3. Database of chemical samples, Arc Map GIS database, analyses, final report</i>	May 30, 2016

Activity 2: *Aquatic plant and juvenile fish tissue sampling*

Budget: \$82,508.81

This activity includes field collection and laboratory processing of 18 plant tissue and 36 juvenile fish tissue samples (54 total) for chemical analysis of the 2 suites of chemicals.

Outcome	Completion Date
<i>1. Field collection of 18 plant tissue and 36 juvenile fish tissue samples</i>	August 30, 2014
<i>2. Laboratory processing of 18 plant tissue and 36 juvenile fish samples</i>	March 30, 2015
<i>3. Database of chemical samples, Arc Map GIS database, analyses, final report</i>	May 30, 2016



Environment and Natural Resources Trust Fund (ENRTF) 2014 Main Proposal
Project Title: Chemical Removal from Minnesota Lakes by Aquatic Plants

Activity 3: Aquatic plant mesocosm study

Budget: \$71,394.40

This activity includes a mesocosm study on growth of aquatic plants in sediment samples from four sites within the St. Louis River Estuary in Duluth, Minnesota. Laboratory processing will include 32 sediment samples, 18 water samples, and 16 plant tissue samples (66 total) for 2 suites of chemicals (1 per mesocosm , 2 suites).

Outcome	Completion Date
1. Collection of 32 sediment, 18 water, and 16 plant tissue samples from mesocosms	September 15, 2014
2. Laboratory processing of 32 sediment, 18 water, and 16 plant tissue samples	March 30, 2015
3. Database of chemical analyses for compiled sediment, water, and plant tissue samples	May 30, 2015
4. Analysis of results and preparation of final report	Jan 15, 2016

III. PROJECT STRATEGY: This is a collaborative study with the USDA Forest Service, U.S. Geological Survey, Minnesota DNR, and University of Minnesota Duluth, Natural Resources Research Institute

Lead Investigator: Dr. Anne Timm, Research Aquatic Ecologist, USFS, Northern Research Station, 1831 East Highway 169, Grand Rapids, MN 55744; (218) 326-7132; altimm@fs.fed.us (Aquatic habitat assessment and fisheries expert, will receive funds from Environment and Natural Resources Trust Fund; will oversee all aspects of the budget, project field data collection, and product delivery; will contribute salary, vehicle, and motorboat)

Co-Investigator: Kathy Lee, Hydrologist, Ecologist, U.S. Geological Survey, 415 S. Pokegama Ave., Grand Rapids, MN 55744; (763)783-3254; klee@usgs.gov (Will receive funds via agreement from USDA Forest Service; Contaminants field sampling and analysis expert; coordinator for USGS clean sampling technique and laboratory samples)

Co-Investigator: Cynthia Tomcko, Fish Research Biologist, MNDNR, 1201 E. Hwy 2, Grand Rapids, MN 55744; (218) 999-7829; cindy.tomcko@state.mn.us (Aquatic plant and fish habitat expert; will contribute salary and equipment)

Co-Investigator: Carol Reschke, Scientist, University of Minnesota, Duluth, Natural Resources Research Institute, 5013 Miller Trunk Highway, Duluth, MN 55811; (218) 720-4338; creschke@nrri.umn.edu (Aquatic plant community and mapping expert; will receive funds via agreement from USDA Forest Service; will coordinate mesocosm study of aquatic plant uptake of pharmaceuticals and wastewater indicators)

B. Timeline Requirements: This project’s timeline will last from April 1, 2014 through January 30, 2016, including one field season from April-September, 2014. Sample processing will follow the next year according to laboratory schedules. Final reports and manuscripts will be submitted by January 30, 2016.

C. Long-Term Strategy and Future Funding Needs: Results will be presented at relevant Minnesota and National meetings. Further funding will be requested depending on the significance of the results and the need for further sampling to separate out relationships identified through analysis. Products of the study will include a project summary report and management strategy, an ArcMap 10 GIS database, and at least one manuscript for publication in a scientific journal.

2014 Detailed Project Budget

Project Title: Chemical Removal from Minnesota Lakes by Aquatic Plants

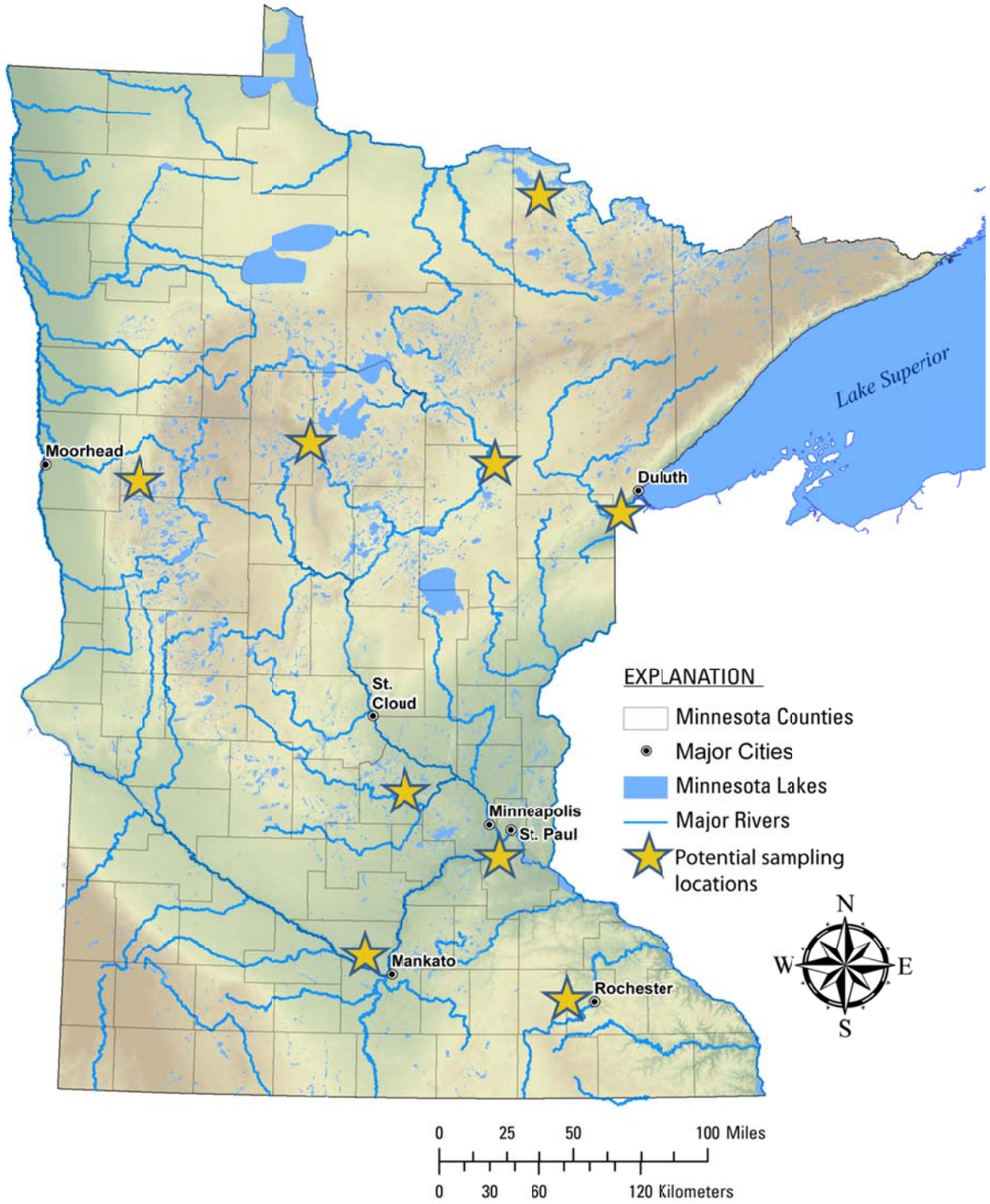
IV. TOTAL ENRTF REQUEST BUDGET, May 2014-January 2016

BUDGET ITEM	AMOUNT
Personnel:	
Carol Reschke, 40 hours salary for field work, 200 hours for analysis	\$ 14,400
Kathy Lee, 120 hours salary for field work, 520 hours of analysis	\$ 74,400
Salary for two field crew for 480 hours total	\$ 6,932
Equipment/Tools/Supplies:	
Pharmaceutical chemical suite sample processing	\$ 105,000.00
Wastewater chemical suite sample processing	\$ 105,000.00
QAQC sample processing	\$ 22,400.00
Sample shipping	\$ 1,300.00
Sample collection supplies	\$ 2,382.00
Chest waders	\$ 159.98
Boat maintenance	\$ 2,000.00
Travel:	
Lodging and per diem for two field crew and three scientists, 24 weeks of trips total	\$ 12,360
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 346,334

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other State \$ Being Applied to Project During Project Period: MPCA funding	\$19,748.43	<i>Secured</i>
In-kind Services During Project Period:		
Annd Timm, USDA Forest Service salary	\$23,750.00	<i>Secured</i>
USDA Forest Service, vehicle and motorboat	\$12,900.00	<i>Secured</i>
Cindy Tomcko, MN DNR salary and travel	\$ 7,734	<i>Secured</i>
Cindy Tomcko, equipment and motorboat	\$ 11,557	<i>Secured</i>
TOTAL In-kind funds: \$55,941.00		

State of Minnesota Lakes and Rivers



Dr. Anne Timm

Current Position:

Research Aquatic Ecologist, USDA Forest Service, Northern Research Station, Grand Rapids, Minnesota

Education:

Ph.D. Virginia Tech, Fisheries and Wildlife, May 2011

M.S. Indiana University, Bloomington, Environmental Science, Aquatic Habitat Analysis – 2000

B.A. Luther College, Biology - 1994

Employment:

2011-present Research Aquatic Ecologist, USDA Forest Service, Northern Research Station

2005-2011 Doctoral candidate, Fisheries and Wildlife Sciences, Virginia Tech

2002-2005 Aquatic Ecologist, USDA Forest Service, Hoosier National Forest

2000-2002 Environmental Scientist, stream restoration, HSMM, Inc.

Awarded Grants:

1. NRS-07, new scientist startup, “Quantifying biological structure and function associated with stream simulation aquatic organism passage projects”, \$10,000 - 2012
2. International Joint Commission, “Determine if northern pike breeding habitat and reproductive success have changed due to the 2000 Rule Curves.”, \$71,000 - 2011
3. USDA Forest Service, San Dimas Technology and Development Center, “Proposal to test methods designed for low-gradient AOP effectiveness monitoring”, \$10,500 - 2010
4. USDA Forest Service, Northern Research Station, “Aquatic species responses to variations in temperature and riparian width”, \$45,000 - 2010

Publications:

Timm, A., E. Hallerman, C.A. Dolloff, M. Hudy, and R. Kolka. 2012. What height thresholds block genetically effective brook trout dispersal? Submitted to Transactions of the American Fisheries Society, April 20, 2012.

Timm, A.L. 2011. Brook trout population genetic tools for natural barriers in fragmented subwatersheds. Doctoral dissertation. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 135 pp.

Timm, A.L., C.A. Dolloff, K. Nislow, and R. Kolka. 2010. Natural barriers and population genetics of brook trout. In: Aquatic sciences: global changes from the center to the edge, Abstract Book, 2010 Summer Meeting, Joint Meeting with ASLO and NABS, 6-11 June 2010; Sante Fe, New Mexico. Abstract.