

**Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 056-B

Lake Management Guidance, Strategies to Reduce Internal Loads

Category: B. Water Resources

Total Project Budget: \$ 233,900

Proposed Project Time Period for the Funding Requested: 2 years, July 2015 - June 2017

Summary:

Guidance document/ screening process to help lake managers determine if and how to cost- effectively manage internal nutrient loads. Provide design guidance for use of hypolimnetic withdrawal in Minnesota.

Name: Rebecca Kluckhohn

Sponsoring Organization: Clearwater River Watershed District

Address: 75 Elm St, PO Box 481
Annandale MN 55302

Telephone Number: (320) 274-3935

Email rkluckhohn@wenck.com

Web Address www.crvd.org

Location

Region: Statewide

County Name: Statewide

City / Township: Annandale

Alternate Text for Visual:

Map shows the location of the Clearwater River Watershed in Minnesota as well as the relevant lakes.

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



PROJECT TITLE: *Lake Management Guidance, Strategies to Reduce Internal Loads*

I. PROJECT STATEMENT

In many cases, lakes are affected by both watershed sources and internal sources of nutrients. Proven tools are available to reduce watershed loads. But without controlling in-lake nutrient cycling, many Minnesota lakes will be doomed to pea soup summers. To achieve measurable improvements in lake water quality, lake managers must often choose from a limited suite of poorly understood, expensive techniques to stop phosphorus-rich lake sediments from belching up plumes of algae-growing phosphorus into the lake water column. The result? Pea soup summers.

Alum dosing, dredging, aeration, and oxygenation are some of the tools lake managers have to address internal loading. We lack guidance on which technologies are appropriate in which lake. There simply is no one technology or ‘magic bullet’ that works for all lakes. We will develop a guidance document with a screening process for lake managers to use statewide. This tool will help them determine which Minnesota lakes require internal load management and which technologies are the most cost effective. We will provide a case study of the 16 major lakes in the Clearwater River Watershed District (CRWD), a 159 square mile watershed in the heart of Minnesota’s North Central Hardwood Forest Ecoregion. This watershed typifies the greater Minnesota landscape where recreational lakes and agriculture coexist.

We will also further develop a currently underused tool, hypolimnetic withdrawal, and show how it can be applied in a new way. Typically, phosphorus rich water pumped out of the lake bottom (hypolimnetic withdrawal) is treated and discharged. By instead using it to irrigate nearby land, we improve the systems cost-benefit and protect groundwater by providing an alternative source of irrigation water.

The current barriers to using these technologies are cost, poor understanding of the technology, lack of guidance, and regulatory hurdles. The CRWD & St. Cloud State University will work with the top two internationally recognized experts on internal loading management to collect and analyze lake and watershed data in order to develop the guidance document/ screening process to help lake managers determine if they need to address internal loads and how best to do so. We will also identify the design parameters necessary to site and operate hypolimnetic withdrawal systems, providing a sample design plan.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: *Develop & Publish Guidance Document and Screening Process for Lake Managers to use in addressing internal load in Minnesota Lakes*

Budget: \$163,500

CRWD will use existing data and case studies to show the process of evaluating lakes to determine if internal load management is required, and then what technologies are suitable. The document will provide a guidance tool/ process for lake managers to use to understand if and when internal load management is warranted and how to do it cost effectively.

Outcomes	Completion Date
<i>1. Analyze, summarize existing internal loading parameter data, 16 CRWD test-case lakes.</i>	<i>Aug 30, 2015</i>
<i>2. Data collection & analysis: Collect and analyze additional data from 16 lakes to fill data gaps for case studies.</i>	<i>Sept 30, 2016</i>
<i>3. Stakeholder input. We will convene a stakeholder group comprised of internationally recognized experts, regulatory agency representatives and lake managers to provide input in the guidance document/ screening process to ensure that it is useful.</i>	<i>Jun 30, 2017</i>
<i>4. Develop Screening Process for lakes using 16 test case lakes determining minimum data collection requirements and design criteria for internal load management systems.</i>	<i>Jul 30, 2017</i>
<i>5. Develop Guidance Document: Prepare technical documentation for guidance document, including approved methods for analysis and evaluation.</i>	<i>Jul 30, 2017</i>



Environment and Natural Resources Trust Fund (ENRTF)

2015 Main Proposal

Project Title: *Develop Internal Load Management Strategies in Minnesota Lakes*

6. Publish guidance document & screening process. SCSU graphic design and technical writing faculty, working with Dr. Voelz and CRWD Engineer, will edit and organize content so that it is useful for highly technical practitioners, lay people, and regulators in determining internal load management strategies.	Jul 30, 2017
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Activity 2: Optimize Hypolimnetic Withdrawal with Riparian Irrigation Design for Minnesota Lakes

Budget: \$135,800

Identify and present the criteria for using hypolimnetic withdrawal with riparian irrigation in Minnesota lakes by convening local and international experts. Provide design standards that optimize cost/ benefit.

Outcomes	Completion Date
1. Evaluate data on 13 existing hypolimnetic withdrawal implementation projects. Dr. Nurnberg, the internationally recognized expert on internal loading in general and hypolimnetic withdrawal in particular, will assist with this task.	Sept 30 2015
2. Collect additional lake and watershed data on selected test case lake.	Sept 30, 2016
3. Optimize a concept design/ design guidance and cost benefit analysis for hypolimnetic withdrawal in a test case lake	Dec 30, 2016
4. Incorporate findings of hypolimnetic withdrawal and riparian irrigation design into guidance document and screening process.	Jul 30, 2017

III. PROJECT STRATEGY

A. Project Team/Partners

Clearwater River Watershed District (CRWD) Board of Managers will administer the grant as the fiscal agent. CRWD staff will serve as the technical and administrative leads in the project: Dennis Loewen, Administrator and Rebecca Kluckhohn, Engineer. CRWD will work with St. Cloud State University (SCSU) to develop the guidance document and screening process; Dr. Neal Voelz will lead this effort for SCSU. SCSU will bring in Dr. Gertrud Nurnberg and William James (two top internationally recognized experts) to assist with developing the screening process and hypolimnetic withdrawal optimization.

B. Project Impact and Long-Term Strategy

This project addresses the high costs and technical challenges of reducing internal loading, which is a barrier to significant water quality improvement in many Minnesota Lakes. The guidance document provides a screening process tool for Minnesota lake managers to take the next step to improve Minnesota lakes. It will help them understand which lakes require internal load management, and help them select the most cost effective internal load management tool. The guidance document and screening process will be prepared to assist both highly technical practitioners, as well as lay people in decision making roles. Regulators can also take comfort in working with practitioners who have gone through the process as we will convene a regulatory technical advisory panel to provide input and comments. We will develop and optimize a currently underutilized tool: Hypolimnetic withdrawal with riparian irrigation. This provides lake managers another tool to manage internal loading and protect groundwater resources. Both project elements address two center-stage issues for Minnesota: Healthy lakes and protecting our groundwater.

C. Timeline Requirements

The project will require 2 years, timing is flexible. Expected timeline: July 2015 to July 2017.

2015 Detailed Project Budget

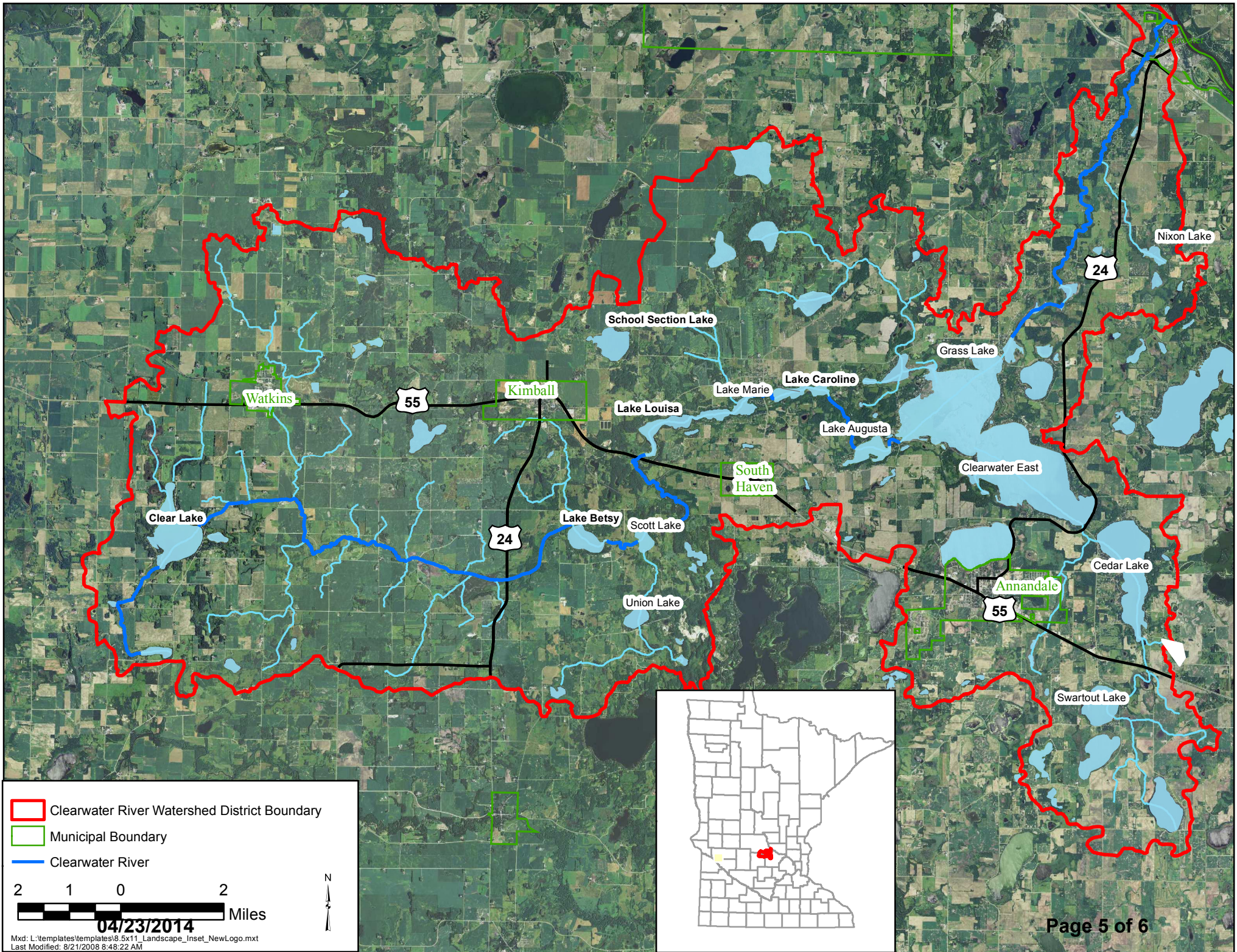
Project Title: Develop Internal Load Management Strategies in Minnesota Lakes

IV. TOTAL ENRTF REQUEST BUDGET 2 years

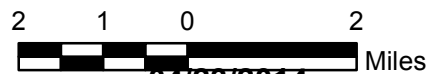
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel: District staff (district administrative staff and district engineering staff), working under existing employment agreements, will administer the grant at the direction of the Board of Managers and function as the technical lead on the project. They will coordinate with St. Cloud State University and facilitate the technical advisory review process and prepare the technical portions of the guidance documents and the screening procedure as well as engineering assistance with developing the hypolimnetic withdrawal use and design criteria.	\$102,000
Contracts: CRWD will contract with licensed laboratory to analyze water quality data collected. The District will seek competitive quotes for these in accordance with state requirements.	\$52,000
Contracts: CRWD will contract with St. Cloud State University, an organization that will bring a multiplicity of disciplines to bear. They will assist technically in developing the guidance document and screening procedure. The University will bring two internationally recognized experts in the field: Dr. Gertrud Nurnberg and Bill James. They provide unmatched third party expert review and input for the guidance document, screening tool and for further development of hypolimnetic withdrawal with irrigation as a tool in Minnesota. SCSU graphic design and technical writing professors will coordinate design, layout and electronic publication of the guidance manual and screening tool. This ensures that the document is useful for the target audiences.	\$79,900
Equipment/Tools/Supplies: None expected.	NA
Acquisition (Fee Title or Permanent Easements): None	NA
Travel:	NA
Additional Budget Items:	NA
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 233,900

V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ To Be Applied To Project During Project Period: CRWD will pay for the travel expenses incurred to bring out of state experts in on the project, as well as travel by employees to and from the site and to and from technical advisory meetings and all other expenses.	\$ 15,000	<i>Preliminary approval granted by CRWD Board.</i>
Other State \$ To Be Applied To Project During Project Period:	NA	NA
In-kind Services To Be Applied To Project During Project Period: District staff will provide coordination and facilitation of the technical process as in-kind services technical/ engineering work relating to the development of the guidance document as well as the screening procedure.	\$ 50,400	<i>Preliminary approval granted by CRWD Board.</i>
Funding History: The CRWD has already implemented \$2.7 million in water quality and hydrologic monitoring, projects and programs geared towards managing external (watershed loads) in the test watershed. We have a robust data set for the watershed which includes lake and stream water quality as well as hydrology. We restored the Kingston Wetland and upper Clearwater River which drains to the test watershed. We implemented a targeted fertilizer application project and urban stormwater retrofits. Having collected most of the information/ data needed for optimum management of the water resources, internal load management represents the next step to improving lake water quality in this watershed and many others in Minnesota.	\$ 2,700,000	Funding secured, implementation 65% complete
Remaining \$ From Current ENRTF Appropriation:	NA	NA

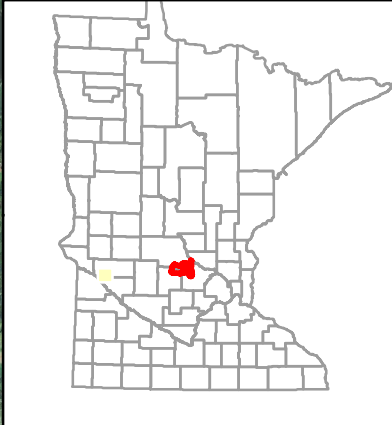


- ▭ Clearwater River Watershed District Boundary
- ▭ Municipal Boundary
- ▬ Clearwater River



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The CRWD has successfully implemented \$2.7 million in projects and programs geared towards managing watershed loading from agricultural and urban sources to improve and protect our lakes and streams. We were awarded the DNR's Watershed District of the Year in 2004. Our mission is to promote, preserve and protect water resources within the boundaries of the District in order to maintain property values and quality of life. When requesting state funding, we seek to implement our mission and incorporate ways to use what we have learned at the District to help others across Minnesota with similar missions. We believe in this way we can utilize state and local resources most wisely.

The Clearwater River Watershed District (CRWD) is a local unit of government operating under the authority given by Minnesota Statutes 103D. It was established by citizen petition on April 9, 1975 by the Minnesota Water Resource Board (now the Minnesota Board of Water and Soil Resources).

Our staff includes administrative and technical experts. They are experts at fostering public involvement and working with stakeholders and state and local partners to gain participation and buy-in. We will also work with St. Cloud State University, leveraging a multiplicity of disciplines coordinated by Dr. Voelz.

District Administrator Dennis Loewen: Dennis has worked for the CRWD for 6 years and served on the Board of Managers prior to that for 4 years. He has 24 years of experience in the public sector administering public funds. He is respected by the local and state stakeholders and has been the administrator of successful grant projects totaling \$2.7 million dollars in the past 5 years.

District Engineer Rebecca Kluckhohn: Rebecca has 14 years of experience working with the Clearwater River Watershed District in particular, and 16 years of experience in the field of water resource management. She was the technical lead for the CRWD on \$2.7 million in projects in programs in the past 5 years. She recently completed a restoration of the Clearwater River and 500-acre Kingston Wetland that data shows will result in improved ecological habitat and a river meeting water quality targets. Rebecca has a deep understanding of the lake and stream systems that will serve as the demonstration area, as well as an expertise in working with managing internal loads. She also knows and is trusted by the local and state stakeholders who will be involved.

Limnologist Joe Bischoff: Joe has 16 years of experience in lake restoration. He has served as project manager and technical lead for numerous multidisciplinary projects in lake and watershed restoration. His project and technical experience includes the following: water quality planning and analysis, water quality modeling, watershed assessment, wetlands ecology, stream ecology and restoration, lake restoration & internal load management.

Dr. Neal Voelz, St. Cloud State University: Dr. Voelz is a Professor of Biology at St. Cloud State University. He has a B.A. from Saint Olaf College, an M.A. from St. Cloud State University and a Ph.D. from Colorado State University. His research interests include: Aquatic ecology, streams, invertebrates.