

2010 Environment and Natural Resources Trust Fund (ENRTF) Work Program

Date of Report: November 24, 2009
Date of Next Progress Report: January, 2011
Date of Work Program Approval:
Project Completion Date: June 30, 2013

I. PROJECT TITLE: Understanding Sources of Aquatic Contaminants of Emerging Concern

Project Manager: Deborah L. Swackhamer, PhD
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Location: Zumbro River watershed, Rochester, Olmstead County

Total ENRTF Project Budget:	ENRTF Appropriation	\$	640,000
	Minus Amount Spent:	\$	0
	Equal Balance:	\$	640,000

Legal Citation: M.L. 2010, Chp. 362, Sec. 2, Subd. 5a

Appropriation Language:

\$640,000 is from the trust fund to the Board of Regents of the University of Minnesota to identify chemical markers to characterize sources of endocrine disruptors and pharmaceuticals entering surface waters in the Zumbro River Watershed. This appropriation is available until June 30, 2013, by which time the project must be completed and final products delivered.

II. PROJECT SUMMARY AND RESULTS:

Pharmaceuticals, hormones, and other contaminants of emerging concern (CECs) are found in surface waters in Minnesota and nationally. CECs can cause adverse ecological and human health impacts, and occur as complex mixtures in the environment. One of the greatest barriers to addressing the problem of CECs is a lack of understanding of where these compounds come from and which sources dominate in different locations and at different times.

We hypothesize that different land uses result in the presence of unique marker compounds, relative concentrations of compounds, and temporal occurrence patterns that will differentiate agricultural sources (crop and livestock production) from non-agricultural sources (residential septic, wastewater treatment effluent). These markers can be used to determine the comparative load of CECs to water, which can in turn be used to help policy-makers and stakeholders develop strategies to reduce their occurrence. The Zumbro River watershed in southeastern Minnesota provides a unique opportunity to study CECs because each of its sub-

watersheds has a single dominant land use. We will use field data collected from each sub-watershed to develop a suite of markers for source discrimination and load determination. Ultimately, this “source signature” will be applied to other water bodies in the state for similar source characterization.

This project will address three major objectives:

- Determine what CECs are associated with specific land-uses
- Identify indicator compounds to be used as a monitoring tool to determine sources and loads of CECs
- Work with policy-makers to develop science-based recommendations for prevention, reduction, and remediation strategies

III. PROGRESS SUMMARY AS OF:

IV. OUTLINE OF PROJECT RESULTS:

RESULT/ACTIVITY 1: Characterization of CECs from different land uses

Description:

Water samples will be collected from 7 sub-watersheds of the Zumbro River watershed in the spring, summer, and fall over two years. These 7 sub-watersheds include Cascade Creek, South Fork of the Zumbro River at Hwy14, South Fork of the Zumbro River downstream of the WWTP, Willow Creek, Badger Run, Bear Creek, and Silver Creek. They have land uses differing in percent and type of agriculture and percent of urban sewer or suburban septic-systems. All relevant land uses can be sampled upstream of the wastewater treatment plant. Samples will be analyzed for ~30 selected target compounds associated with wastewater discharge, personal care product use, human pharmaceutical use, pesticide application, animal agriculture, and row crop agriculture. Surface water samples will be collected in accordance with the protocols and procedures as outlined in the USGS National Field Manual for the Collection of Water-Quality Data. Sample collection techniques, quality control/quality assurance, contaminant prevention, sample preservation and handling, chain-of-custody procedures will be conducted in accordance with USGS and University of Minnesota protocol. Analysis will be performed with established methods developed and used by the USGS that are validated in our laboratory. Sample analyses will be conducted using equipment made available by the USDA laboratory at the University of Minnesota.

Summary Budget Information for Result/Activity 1: ENRTF Budget: \$361,221
Amount Spent: \$ 0
Balance: \$361,221

Deliverable/Outcome	Completion Date	Budget
1. Collection of field samples from subwatersheds (yrs 1 and 2)	Fall 2012	\$207,216
2. Analysis of field samples (yrs 1 and 2)	Spring 2012	\$127,096

3. Data compilation and analysis	Spring 2012	\$26,909
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Result Completion Date: Spring, 2012
Result Status as of January 2011:
Result Status as of July 2011:
Result Status as of January 2012:
Result Status as of July 2012:
Result Status as of January 2013:
Final Report Summary:

RESULT/ACTIVITY 2: Development of “source signature” for CECs in water

Description:

Results of water sample analyses will be interpreted using the diverse expertise and experience of our research team. We anticipate the detailed characterization of contaminant concentrations and temporal occurrences for each subwatershed (Result 1) will reflect the surrounding land use and provide contaminant signatures associated with specific land uses. By this we mean that specific contaminants will show up in samples associated with specific land uses and thus serve as markers for that land use. A variety of statistical methods will be used to facilitate identification of “grouped” CECs associated with particular land uses. Source signatures (unique combinations of target chemicals that are specific to a given source) and individual chemical markers will be developed that can be used by others to characterize the sources of CECs to additional surface waters.

Summary Budget Information for Result/Activity 2: ENRTF Budget: \$207,758
Amount Spent: \$ 0
Balance: \$207,758

Deliverable/Outcome	Completion Date	Budget
1. Interpretation of water sample data to determine source signature & marker compounds associated with specific land uses	Fall 2012	\$207,758

Result Completion Date: Fall, 2012
Result Status as of January 2011:
Result Status as of July 2011:
Result Status as of January 2012:
Result Status as of July 2012:
Result Status as of January 2013:
Final Report Summary:

RESULT/ACTIVITY 3: Development of recommendations to policy-makers

Description:

We will engage policymakers, resource managers, and regulatory communities in discussions where our findings will be the scientific basis of recommendations for strategies (legislative, voluntary, incentive-based, etc) to reduce sources, mitigate sources, and remediate sources of CECs in the state. These discussions will be conducted in a facilitated workshop that includes state agency regulators and managers, water resource managers at the county and watershed scale, selected NGOs, and legislative policymakers.

Summary Budget Information for Result/Activity 3: ENRTF Budget: \$ 71,021
 Amount Spent: \$ 0
 Balance: \$ 71,021

Deliverable/Outcome	Completion Date	Budget
1. Develop recommendations for CEC source reduction, and hold workshop with policymakers to discuss strategies	Spring 2013	\$36,862
2. Final Project Report	August 2013	\$34,159

Result Completion Date: August 1, 2013

Result Status as of January 2011:

Result Status as of July 2011:

Result Status as of January 2012:

Result Status as of July 2012:

Result Status as of January 2013:

Final Report Summary:

V. TOTAL ENRTF PROJECT BUDGET:

UM Personnel:

D Swackhamer (\$28,541)

P Novak (\$24,017)

W Arnold (\$21,221)

B barber (\$98,174)

Students (\$303,229)

TOTAL:

\$ 475,183

Contracts: (to be determined by RFP)

\$ 50,000

Equipment/Tools/Supplies:

Includes supplies associated with sample collection; laboratory supplies for sample extractions; supplies needed for instrumental analyses and instrument maintenance; supplies associated with data analysis and report preparation; supplies needed for policymaker workshop

\$ 111,697

Acquisition (Fee Title or Permanent Easements):

\$ -

Travel:

includes in-state travel, such as mileage between

UM-TC to SE MN watersheds and food and lodging
for overnights as needed \$ 3,120
Additional Budget Items: \$ -

TOTAL ENRTF PROJECT BUDGET: \$640,000

Explanation of Capital Expenditures Greater Than \$3,500: N/A

VI. PROJECT STRATEGY:

A. Project Partners:

All investigators are from the University of Minnesota, and include the following (project funding in parentheses).

Deborah Swackhamer, Project Manager, Water Resources Center, School of Public Health, and Hubert H. Humphrey Institute of Public Affairs. (\$381,566; includes salary and portion of supplies, students and travel budgets; also contract costs which will be administered by WRC)

Pamela Rice, Department of Soil, Water and Climate, and USDA Agricultural Research Service. (\$56,060; includes portion of costs associated with sample analysis and interpretation)

William Koskinen, Department of Soil, Water and Climate, and USDA Agricultural Research Service. (\$56,060; includes portion of costs associated with sample analysis and interpretation)

Paige Novak, Civil Engineering. (\$74,555; includes salary and portion of supplies, students and travel budgets)

William Arnold, Civil Engineering. (\$71,759; includes salary and portion of supplies, students and travel budgets)

We will be issuing a Request for Proposals for two specific tasks (funds currently included under Swackhamer), including \$10,000 for hydrologic flow measurements (water volume per time) at each site at the time of sampling, and \$40,000 for GIS mapping (to relate the contaminant analyses back to the land use via maps and illustrate the source signature findings).

B. Project Impact and Long-term Strategy:

This project grew out of previous work demonstrating the role that wastewater treatment plants (WWTP) play as a source of CECs and in reducing estrogenicity during certain processes. This project is part of a larger initiative to expand the capacity for CEC research in Minnesota, and to build capacity for synthesis of information coming from many different efforts (well monitoring data from MPCA, data from USGS, newly published toxicology information, etc). Our long term goal is to characterize all CEC sources and place this knowledge into a larger context (fate, transport, effects) so that more effective management strategies for the state can be developed.

C. Other Funds Proposed to be Spent during the Project Period: none

D. Spending History: none

VII. DISSEMINATION:

The results of this study will be disseminated through professional and non-professional oral presentations, briefings to LCCMR as requested, peer-reviewed publications, and our website. The data will be freely shared and posted on our website after acceptance for publication. We will also present progress on the project periodically in the quarterly newsletter of the Water Resources Center, the Minnegramp. The project will have a web presence through the Water Resources Center website (wrc.umn.edu). The results will also contribute to the graduate theses of 2-3 graduate students.

VIII. REPORTING REQUIREMENTS: Periodic Work Program progress reports will be submitted not later than January 31, 2011; July 30, 2011; January 31, 2012; July 30, 2012; January 31, 2013. A final Work Program report and associated products will be submitted between June 30 and August 1, 2013.

IX. RESEARCH PROJECTS: Please refer to the appended Research Addendum.

Attachment A: Budget Detail for 2010 Projects											
Project Title: Understanding Sources of Aquatic Contaminants of Emerging Concern											
Project Manager Name: Deborah Swackhamer											
Trust Fund Appropriation: \$ 640,000											
1) See list of non-eligible expenses, do not include any of these items in your budget sheet											
2) Remove any budget item lines not applicable											
2010 Trust Fund Budget	Result 1 Budget:	Amount Spent (date)	Balance (date)	Result 2 Budget:	Amount Spent (date)	Balance (date)	Result 3 Budget:	Amount Spent (date)	Balance (date)	TOTAL BUDGET	TOTAL BALANCE
	Characterization of CECs from different land uses			Development of "source signature" for CECs in water			Development of recommendations to state policy-makers				
BUDGET ITEM											
PERSONNEL: wages and benefits											
Deborah Swackhamer, PI (4%)	\$ 9,210	\$ -	\$ 9,210	\$ 14,230	\$ -	\$ 14,230	\$ 5,102	\$ -	\$ 5,102	\$ 28,541	\$ -
Paige Novak (4%)	\$ 7,750	\$ -	\$ 7,750	\$ 11,974	\$ -	\$ 11,974	\$ 4,293	\$ -	\$ 4,293	\$ 24,017	\$ -
William Arnold (4%)	\$ 6,848	\$ -	\$ 6,848	\$ 10,580	\$ -	\$ 10,580	\$ 3,793	\$ -	\$ 3,793	\$ 21,221	\$ -
Brian Barber (50%)	\$ 98,174	\$ -	\$ 98,174	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 98,174	\$ -
3 graduate students (50% each)	\$ 97,718	\$ -	\$ 97,718	\$ 150,975	\$ -	\$ 150,975	\$ 54,536	\$ -	\$ 54,536	\$ 303,229	\$ -
Contracts											
Professional/technical (for hydrology and GIS; TBD by RFP)	\$ 50,000	\$ -	\$ 50,000		\$ -	\$ -		\$ -	\$ -	\$ 50,000	\$ -
Other direct operating costs (instrumental analyses costs and maintenance costs, data interpretation costs, workshop costs)	\$ 20,000	\$ -	\$ 20,000	\$ 20,000	\$ -	\$ 20,000	\$ 3,000	\$ -	\$ 3,000	\$ 43,000	\$ -
Printing	\$ 400	\$ -	\$ 400		\$ -	\$ -	\$ 297	\$ -	\$ 297	\$ 697	\$ -
Supplies (sampling supplies, laboratory sample extraction supplies)	\$ 68,000	\$ -	\$ 68,000		\$ -	\$ -		\$ -	\$ -	\$ 68,000	\$ -
Travel expenses in Minnesota	\$ 3,120	\$ -	\$ 3,120		\$ -	\$ -		\$ -	\$ -	\$ 3,120	\$ -
COLUMN TOTAL	\$ 361,221	\$ -	\$ 361,221	\$ 207,758	\$ -	\$ 207,758	\$ 71,021	\$ -	\$ 71,021	\$ 640,000	\$ -

