Environment and Natural Resources Trust Fund
2010 Request for Proposals (RFP)

LCCMR ID: 218-G

Project Title:

Pathogen Sources in Urban Runoff and Remediation Effectiveness

LCCMR 2010 Funding Priority:

G. Creative Ideas

Total Project Budget: $ $650,000

Proposed Project Time Period for the Funding Requested: 3 years, 2010 - 2013

Other Non-State Funds: $ $0

Summary:

Research to investigate the sources, fate, and removal of viruses, bacteria, and protozoa in urban runoff to protect drinking water supplies, swimming areas, and general water quality.

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Sponsoring Organization: MPCA

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Location:

Region: Statewide

County Name: Statewide

City / Township:

_____ Knowledge Base _____ Broad App. _____ Innovation

_____ Leverage _____ Outcomes

_____ Partnerships _____ Urgency _____ TOTAL

MAIN PROPOSAL

PROJECT TITLE: Pathogen Sources in Urban Runoff and Remediation Effectiveness

I. PROJECT STATEMENT

One significant concern of many municipalities, particularly those that use surface water as a source of drinking water (Minneapolis, St. Cloud and St. Paul) and those with swimming areas (regulated beaches on lakes, wade-able creeks, and non-regulated beaches along the Mississippi River) in their jurisdiction, is the fate/removal/attenuation of pathogenic microorganisms. Pathogens include viruses (i.e. rotaviruses, hepatitis A, Norwalk-type, reoviruses), bacteria, and protozoa (i.e. *Cryptosporidium parvum, Giardia lamblia*), among others. Typically bacteria, specifically coliform bacteria, are used as a surrogate for some of the pathogens. Excessive levels of coliforms can lead to TMDL listing and beach closings. Excessive levels of harmful types of pathogens in water bodies can lead to gastrointestenal illnesses such as diarrhea, vomiting, and cramps. Recently, the Cities of St. Cloud, Minneapolis, and St. Paul have all voluntarily completed Source Water Protection Plans in cooperation with the Minnesota Department of Health.

Research is needed to investigate the sources of pathogens in urban and suburban stormwater (i.e. wild life, pets, and humans), their removals by various BMPs, including pet litter cleanup (i.e. source reduction), bioretention practices, ponds, etc. and the generation and decay of pathogens in streams and stormwater pipes. We propose to employ basic techniques (i.e. standard plate counts) and monitoring of re-growth and die-off of bacteria in select large rivers, streams, and storm sewers in the State of Minnesota to monitor total coliform, fecal coliform, and *Escherichia coli* levels. Furthermore, we plan to apply and optimize a molecular "source tracking" technique developed by Prof. Mike Sadowsky (Soil, Water, and Climate) to identify the source of the *E. coli* inputs to the watershed (e.g., humans versus animals).

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Sources of Pathogens in Minnesota Stormwater: $ 220,000

Various urban watersheds in Minnesota will be sampled to determine the levels of pathogens (*E. coli*, *Cryptosporidium, Giardia*, and selected viruses) in stormwater runoff. Pathogen concentration will be related to the presence of pathogen generators in the watershed, such as pet waste, geese, raccoons, poorly operating septic systems, etc. We will differentiate between pathogens of humans and other animals. The decay and re-growth of pathogens in the watershed will also be studied, so that accuracy in pathogen modeling is attainable. Pathogen sampling will take place in urban centers throughout the State of Minnesota.

Deliverable	Completion Date
1. Intermediate Report for background in developing bacterial TMDLs	June 30, 2011
2. Task summary report	April 30, 2013

Result 2: Effectiveness of stormwater treatment practices at removing pathogens: $ 200,000

The success of stormwater management practices at removing viable pathogens has not been sufficiently documented. Wetlands are known to decrease and increase pathogen concentration, depending upon design parameters. Infiltration facilities are known to decrease pathogen concentration in the water, but retain some pathogens in the media. Ponds have not been sufficiently studied with regard to pathogens including pond sediments as sources. There is much to be done with regard to BMP removal of viable pathogens, and this study will begin with ponds and rain gardens

(bioretention facilities), infiltration basins, underground settling devices, and filters at removing viable pathogens.

Deliverable	Completion Date
1. Intermediate Report for background in developing bacterial TMDLs	June 30, 2011
2. Task summary report	April 30, 2013

Result 3: In-stream processes that affect pathogen concentration: $ 200,000

Once pathogens get into the stream, there are still many processes that can de-activate them. This result will investigate the in-stream processes, such as water temperature, nutrient concentration, and sediment-water interaction that will affect the viable pathogen concentrations, so that prediction of pathogen concentration in streams and rivers is feasible, and conditions in pathogen–related problematic streams can be influenced. Stormwater systems will also be sampled to determine the level of bacteria growth or die-off in these systems. Preliminary focus will be upon peak summer, low-flow conditions in the Twin Cities Mississippi River corridor.

Deliverable	Completion Date
1. Task summary report	April 30, 2013

Result 4: Final Report: $ 30,000

A final report documenting results and conclusions from the study will be prepared. The report will provide recommendations for effective reduction of pathogens in Minnesota streams and lakes.

Deliverable	Completion Date
1. Final report	June 30, 2013

III. PROJECT STRATEGY

A. Project Team/Partners

The University of Minnesota has an active research program in Stormwater Assessment, and has selected members of the research team and the University of Minnesota in general to work on the pathogen issues. Drs. John Gulliver and Ray Hozalski of the Department of Civil Engineering will be the principal investigators for the project, and will have an equal role in providing guidance and leadership to graduate students and in seeing the results to completion. The project will also have extensive involvement from Dr. Tim LaPara (Civil Engineering) and/or Dr. Michael Sadowski (Dept. of Soils, Water and Climate). C. Bruce Wilson will be the Project Manager for the MPCA.

B. Timeline Requirements

July 1, 2010 – June 30, 2013. Three field seasons will be optimal.

C. Long-Term Strategy

Municipal stormwater management of pathogens presents huge challenges due to the lack of information about sources, practice effectiveness as well as in-stream processing. This proposed work will be conducted directly with municipal and watershed practitioners to begin to systematically address basic watershed management issues and alternatives. We expect to be working with a large number of partners and that many new questions will arise. However, we first need to systematically address basic questions to refine our understanding of pathogen management options.

Pathogen Sources in Urban Runoff and Remediation Effectiveness Project Budget

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

Attach budget, in MS-EXCEL format, to your "2010 LCCMR Proposal Submit Form".

(1-page limit, single-sided, 11 pt. font minimum. Retain bold text and delete all instructions typed in italics. ***Add or delete rows as necessary.*** *If a category is not applicable you may write "N/A" , leave it blank, or delete the row.)*

IV. TOTAL PROJECT REQUEST BUDGET (*[Insert # of years for project]* years)

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 13)*	**AMOUNT**
Personnel: *In this column, list who is getting paid to do what and what is the % of full-time employment for each position. List out by position or position type - one line per position/position type. For each, provide details in this column on the inputs: i.e. % dollars toward salary, % dollars toward benefits, time period for position/position type, and number of people in the position/position type.*	N/A (within contact)
Contracts: *In this column, list out proposed contracts. Be clear about whom the contract is to be made with and what services will be provided. If a specific contractor is not yet determined, specify the type of contractor sought. List out by contract types/categories - one line per type/category.*	
- University of Minnesota - Sole Source Contract	$650,000
Equipment/Tools/Supplies: *In this column, list out general descriptions of item(s) or item type(s) and their purpose - one line per item/item type.*	N/A (within contact)
Acquisition (Fee Title or Permanent Easements): *In this column, indicate the proposed # of acres and who will hold title (e.g. DNR, Non-profit).*	N/A
Travel: *Be specific. Separate in-state and out-of-state travel; explain each. Only travel essential to completing project activities can be included.*	N/A (within contact)
Additional Budget Items: *In this column, list any additional budget items that do not fit above categories. List by item(s) or item type(s) and explain how number was reached.*	N/A
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$650,000

V. OTHER FUNDS

SOURCE OF FUNDS	**AMOUNT**	**Status**
Other Non-State $ Being Applied to Project During Project Period: *Indicate any additional non-state cash $ to be spent on the project during the funding period. For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	N/A	*Indicate: Secured or Pending*
Other State $ Being Applied to Project During Project Period: *Indicate any additional state cash $ (e.g. bonding, other grants) to be spent on the project during the funding period. For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	N/A	*Indicate: Secured or Pending*
In-kind Services During Project Period: *Indicate any in-kind services to be provided during the funding period. List type of service(s) and estimated value. In-kind services listed must be specific to the project.*		
- MPCA Staff time and resources; partners have not been factored in	$60,000	
Remaining $ from Current Trust Fund Appropriation (if applicable): *Specify $ and year of appropriation from any current Trust fund appropriation for any directly related project of the project manager or organization that remains unspect or not yet legally obligated at the time of proposal submission. Be as specific as possible. Describe the status of $ in the right-most column.*	N/A	*Indicate: Unspent? Not Legally Obligated? Other?*
Funding History: *Indicate funding secured prior to July 1, 2010 for activities directly relevant to this specific funding request. State specific source(s) of funds.*	N/A	

PROJECT MANAGER QUALIFICATIONS

Present Position

Bruce Wilson is the Research Scientist for the Minnesota Pollution Control Agency's Stormwater Program. The Stormwater Program protects the states waters from rate, volume, and contaminates in runoff from construction, industrial, municipal and other sources in cooperation with federal, state, and local partners. Mr. Wilson has been with the Minnesota Pollution Control Agency for about 30 years, in various positions and projects ranging from watershed management, lake management, and remote sensing (satellite and plane based). Mr. Wilson was a LCCMR State Conservation Plan Project contributor. Mr. Wilson has developed an extensive network of scientists around the country and internationally and was asked by the Environmental Protection Agency to peer review the National Academy of Sciences recommendations for the nation's stormwater program published fall 2008.

Recent Publications

- **Maintenance of Stormwater BMPs: Frequency, Effort and Cost** By Joo-Hyon Kang, Peter T. Weiss, C. Bruce Wilson and John Gulliver.
- **The Four Levels: Improved Assessment of Infiltration/Filtration Capacity** (John S. Gulliver, Brooke C. Asleson, Rebecca S. Nestingen, Raymond M. Hozalski, John L. Nieber, and C. Bruce Wilson)
- Heiskary, S.A. and C. B. Wilson. 2007. **Minnesota's Approach to Lake Nutrient Criteria Development**. *Lake and Reserv. Manage*. Vol. x(x): 00-00

Education

Bachelor of Science degree in Biology from the Kent State University, Kent Ohio 1975.
Master of Science degree in Aquatic Ecology from Kent State University, Kent Ohio 1979

MOST RECENT LCCMR PROJECT

Mr. Wilson helped coordinate eight regional states to pool funding and developed the LCCMR proposal for updating Technical Paper – 40 (rainfall intensity) through the National Oceanic and Atmospheric Administration (NOAA).

ORGANIZATION DESCRIPTION

The Minnesota Pollution Control Agency (MPCA) was established as a state agency in 1967 to protect the air, waters and land of Minnesota. The mission of the MPCA is to work with Minnesotans to protect, conserve and improve our environment and enhance our quality of life. To continue moving Minnesota toward environmental excellence, the MPCA monitors environmental quality, offers technical and financial assistance, and enforces environmental regulations.