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

LCCMR ID: 037-A3

Project Title:

Targeting and Tailoring Landscape Management to Reduce Polluton

LCCMR 2010 Funding Priority:

A. Water Resources

Total Project Budget: $ $229,370

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

Other Non-State Funds: $ $15,000

Summary:

We will develop an approach to target and tailor landscape management to reduce pollution, develop a web-based education manual, and disseminate concepts learned via train-the-trainer workshops throughout the state.

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Sponsoring Organization: U of MN - Water Resources Center

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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: <u>**TARGETING AND TAILORING LANDSCAPE MANAGEMENT TO REDUCE POLLLUTION**</u>

I. PROJECT STATEMENT

<u>**The problem:**</u> Lawn runoff is often highly polluted and a major source of pollutants, notably sediments, nutrients, and pesticides in residential watersheds. Nutrient and sediment levels in lawn runoff are sometimes comparable with runoff from cropland on a per-acre basis. Furthermore, most of the P in lawn runoff is in the soluble form, which is not effectively removed in stormwater ponds. Pollutants in lawn runoff could be reduced through (1) improved landscape design, and (2) improved landscape management. Unfortunately, we lack the predictive tools to quantify pollutant reductions from these practices. This greatly limits the effectiveness and of these measures and their acceptability in stormwater programs.

<u>**The Goal:**</u> Our proposal seeks to greatly improve the ***predictability*** of efforts to reduced landscape pollution by (1) improved landscape design (including terracing, installation of rain gardens, and buffer strips); and (2) improved homeowner education, which would lead to more sustainable use of fertilizer, irrigation, and pesticides. The types of pollution to be predicted include sediments, nutrients, and common pesticides.

<u>**How:**</u> (1) We will refine a runoff model (WATER) developed by co-PI Bruce Wilson to include predictions of loadings of nutrients, sediment, and common pesticides. One very important aspect of this study is that we would use data from a unique, six-year experimental lawn runoff study conducted by co-PI Brian Horgan to calibrate and verify the model. This would give the predictive model a very high level of scientific credibility and allow pinpoint ***targeting*** of vulnerable landscapes subject to high pollution loads. In a parallel effort (funded by the National Science Foundation), we are analyzing results regarding homeowner landscape management for 3,000 homes in Ramsey and Anoka counties. This survey includes both management practices (e.g., fertilization rate, mulching) and underlying motivations (knowledge, social norms, control beliefs). Results from this study will provide highly specific information on ***tailoring*** homeowner education programs. (2) We will use knowledge gained in these studies to develop a web-based homeowner lawn education manual, in collaboration with the Mississippi River Watershed Management Organization. The manual will include predictions of pollutant loadings for landscapes under a variety of physical settings (slope; soil type) for various landscape design practices (e.g., installation of rain gradients) and landscape management practices (e.g., fertilization, irrigation, mulching). (3) In year 3, we will conduct about six "train-the-trainer" workshops, to disseminate findings throughout the state.

The Mississippi Watershed Management Organization (MWMO) is our partner in this project.

II. DESCRIPTION OF PROJECT RESULTS

<u>**Result 1: Development of WATER-LANDSCAPE model.**</u>   **Budge**t: <u>**$174,858**</u>

This result would include development of the WATER-LANDSCAPE model, including calibration and verification. The report would include predictions of loadings of various pollutants (nutrients, sediments, pesticides) in tabular form, to be used in result 2. One chapter of this report would also include a vulnerability map of a watershed within the MWMO, based on GIS layers, to demonstrate use of the approach for targeting vulnerable landscapes

<u>Deliverable 1</u>: Report on model predictions.   <u>Completion Date:</u> Dec. 2111

Result 2. Manual for lawn homeowner education.   Budget: <u>$65,364</u>

This manual will be based on Result 1, developed in collaboration with the MWMO's education and outreach specialists and a broader technical advisory group. The manual will be web-based, for access by education and outreach specialists throughout the state.

<u>Deliverable 1</u>: Manual on homeowner lawn education.   <u>Completion date:</u> June, 2112

Result 3. Training-the-trainer workshops throughout Minnesota.   Budget: <u>$44,582</u>

This result would be a series of "train-the-trainer" workshops delivered in at least six locations throughout the state. The trainers being trained would include staff from U of M Extension and Sea Grant, watershed and lake improvement districts, Soil Water Conservation Districts, etc.

<u>Deliverable 1</u>: Training materials; documentation of workshop attendance, etc. Completion Date: Dec. 2112,

III. PROJECT STRATEGY AND TIMELINE

A. Project Partners

Our partner is the Mississippi Watershed Management Organization (MWMO). They will participate heavily in the development of the tailored homeowner education program, working in collaboration with U of M outreach staff (esp. the U of M's Brian Horgan, who has an Extension appointment). The in-kind contribution from the MWMO is $15,000 (letter attached)

C. Timeline Requirements.

Development of the WATER-LANDSCAPE model will take approximately 1.5 years and is an essential first step. We anticipate that the landscape management thesis (supported by NSF) will be completed at approximately the same time. Development of the landscape management manual will follow, taking about 0.5 years (end of year 2). The train-the-trainer workshops will occur in year 3.

D. Long-Term Strategy

We plan to follow up this project with an on-the-ground demonstration project in a residential watershed within the MWMO using the tools developed in this project. The follow-up project will include extensive monitoring to evaluate the idea that a homeowner lawn education program can actually measurably improve water quality. This type of evaluation would demonstrate the validity of the model-based evaluation of homeowner lawn education programs developed in the proposed project.

Project Budget
INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)
Attach budget, in MS-EXCEL format, to your "2010 LCCMR Proposal Submit Form".

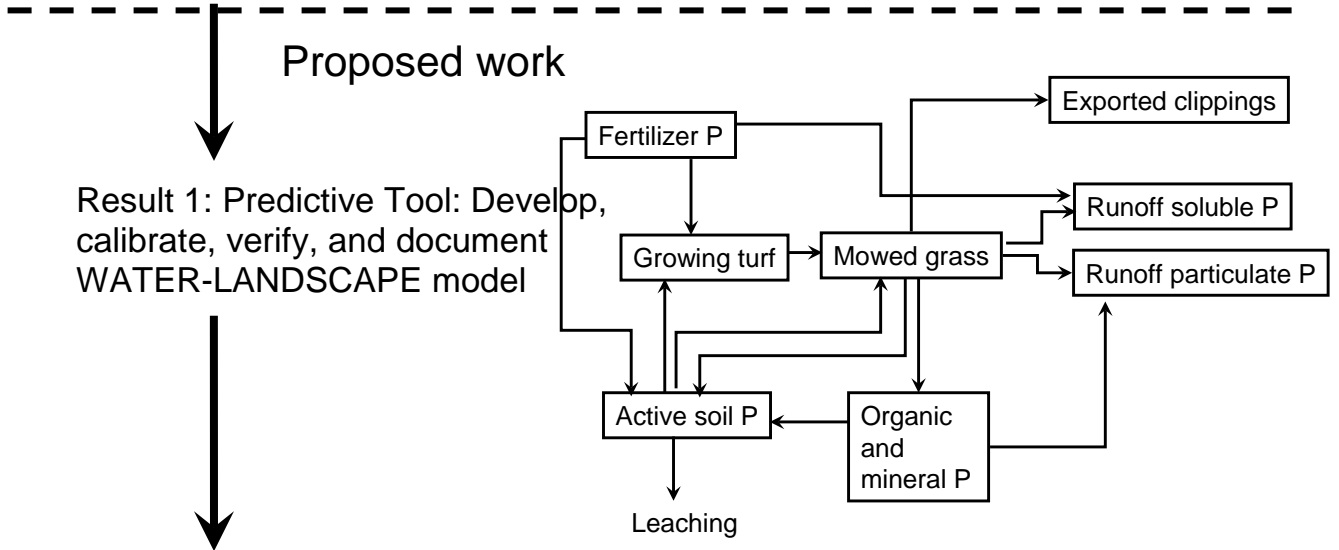## IV. TOTAL PROJECT REQUEST BUDGET (*3* years)

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 13)*	AMOUNT	
Personnel:		
Baker (PI). Overall project management; development of model and model report; contribution to manual. Ave. 16% FTE for 3 years; 76% salary;24% fringe	$	69,585
Post-doc. Model development. 58% FTE. 76% salary; 24% fringe	$	105,525
Grad student,13% FTE for one year, 57% salary, 43% fringe	$	12,180
Undergraduate student, 5% FTE per year for 3 years; 93% salary, 7% fringe	$	3,330
Contracts: *In this column, list out proposed contracts.*		
Edting and illustrating for manual, TBD	$	16,000
Train-the-trainer workshop contractor	$	15,000
Equipment/Tools/Supplies:		
Computer	$	2,500
Computer software	$	2,000
Publication costs	$	2,000
Acquisition (Fee Title or Permanent Easements): *In this column, indicate the proposed # of acres and who will hold title (e.g. DNR, Non-profit).*	$	-
Travel: *Be specific. Separate in-state and out-of-state travel; explain each. Only travel essential to completing project activities can be included.*		
Attendance at MN Water Conference (over 3 years)	$	1,250
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.*	$	-
TOTAL PROJECT BUDGET REQUEST TO LCCMR	**$**	**229,370**

V. OTHER FUNDS

| SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period: In-kind personnel effort from Mississippi River WMO	**$ 15,000**	*Secured*
Other State $ Being Applied to Project During Project Period:	$ -	
In-kind Services During Project Period: *Salary matches (plus fringe) for Brian Horan and Bruce Wilson (U of M faculty), 5% FTE per year for 3 years*	$ 40,434	*Secured*
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.*	$ -	
Funding History: Development of WATERs model (est. $200,000); 6-year turf experiment (est. $500,000); lawn component of NSF survey (80000)	$780,000	spent

Prior/ongoing work

- ➢ Six year turf experiment (Horgan)
- ➢ Development of WATERS hydrologic model (Wilson)
- ➢ Twin Cities Household Ecosystem Project (Baker)

Proposed work

Result 1: Predictive Tool: Develop, calibrate, verify, and document WATER-LANDSCAPE model

Result 2: Develop homeowner landscape management manual, incorporating model predictions in tabular form.

Result 3: Disseminate to MN urban centers via "train-the-trainer" workshops
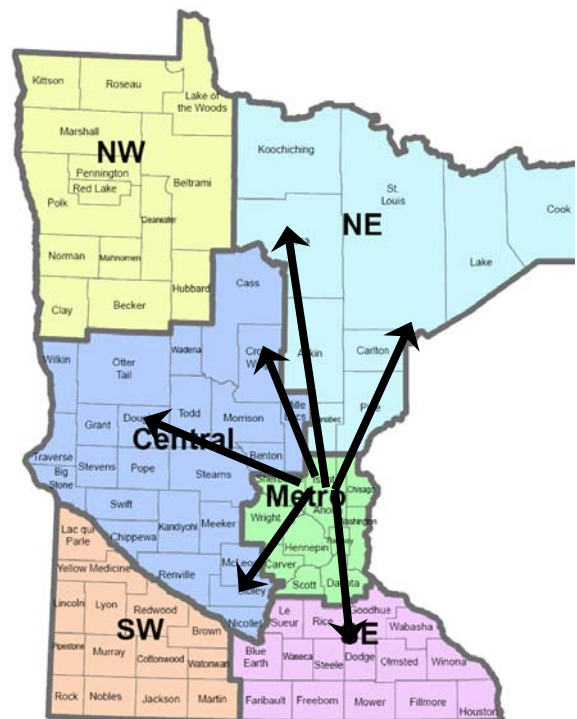
PROJECT MANAGER QUALIFICATIONS
Dr. Lawrence A. Baker is a Senior Fellow in the Minnesota Water Resources Center. Dr. Baker has managed or co-managed about 25 research projects over the past 20 years. A hallmark of his research is the development of multidisciplinary teams to seek solutions to environmental problems. He has authored or co-authored more than 100 technical papers and two major environmental assessment reports. His latest edited book, *The Water Environment of Cities*, was published in 2009. He has taught the Water Policy course at the University of Minnesota for the past six years, and previously taught an array of environmental engineering courses while on the faculty of the Civil and Environmental Engineering Department at Arizona State University. He is also a member (Senior Standing) of the University of Minnesota's Water Resources Science Program.

His is currently the Principle Investigator of the NSF-supported Twin Cities Household Ecosystem Project, which has compiled surveys for 3,000 homes in Ramsey and Anoka counties. The purpose of this project is to understand the relationship between underlying behavioral motivations and actual consumption – hence pollution (CO_2 emissions, runoff of phosphorus and nitrogen, etc.). A thesis on the "lawn" component of this project will inform the proposed LCCMR project.

Interest in the proposed project arose from a study of stormwater source reduction, which led to authorship of several chapters in the Water Resources Center's on-line manual *Assessment of Stormwater Best Management Practices.* Ideas regarding source reduction of pollutants have also been published by the PI in *Storm Water Magazine* and in a peer-reviewed journal article.

In his private life, he is Chairman of the Board of Friends of the Sunrise River (Chisago County) and is a member of the Citizens League Water Policy Study Committee (nearly complete!). In the past few years he has greatly expanded his public engagement efforts, making frequent presentations to watershed districts, professional groups and citizen groups, in addition to scientific audiences. He has also written numerous articles for the *Minnesota Star and Tribune*, *Minnesota Journal*, and several professional magazines.

University of Minnesota professors involved in this project include Dr. Bruce Wilson and Dr. Brian Horgan. Bruce Wilson is a leading Minnesota expert on erosion modeling and has developed the "WATERS" model that we will build upon in this study. Dr. Brian Horgan studies turf grass. He has compiled one of the most extensive studies of turf grass runoff in an experiment involving multiple management practices, studied over a six-year period, throughout the entire year (winter and summer). This unique data base will be used to calibrate and verify our proposed WATERS-LANDSCAPE model.

The University of Minnesota's Water Resource Center
The WRC, the main water-related outreach center of the University of Minnesota, specializes in projects with large outreach and education components, such as the one we are proposing.