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

Project Title: **ENRTF ID:** **007-A**

Clean Water Benefits Tool for Smarter Resource Investments

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 347,253

Proposed Project Time Period for the Funding Requested: 3 Years, July 2014 - June 2017

Summary:

Outcomes of the proposed work are new spatial data on the economic benefits of clean water (surface and groundwater) and a decision tool to inform more strategic investments in conservation.

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Sponsoring Organization: U of MN

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Location

Region: Statewide

County Name: Statewide

City / Township:

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

PROJECT TITLE: Clean water benefits tool for smarter resource investments

I. PROJECT STATEMENT

State agencies and conservation organizations are charged with making sound investments in infrastructure, environmental protection and restoration. However, decision-makers often lack data and tools that capture the full suite of ecological, social, and economic consequences of alternative investments. ***The proposed work will investigate the multiple ecological, social, and economic benefits of clean water and develop data and tools that will lead to more strategic management of water and land resources in Minnesota.***

Water resources are among the most valuable assets in Minnesota's capital portfolio. Clean water supports healthy communities, economic development, tourism and recreation, and our sense of place and stewardship. We request funding to capture five key benefits of clean water that are largely missing from our current decision-making toolbox: 1) the value of reduced health impacts associated with drinking or water recreation, 2) the avoided infrastructure and treatment costs to maintain a supply of clean drinking water, 3) the benefits associated with aquifer storage and groundwater-dependent ecosystems, 4) the economic values of lake and stream recreation, and 5) property values for waterfront properties. Data on these five clean-water benefits will be distributed for public and agency use and integrated into a tool that can be used to evaluate the social and economic consequences of actions that impact state water resources.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: *Stakeholder engagement for data collaboration and to promote tool adoption* **Budget: $ 40,000**

The Institute on the Environment (IonE) will convene a series of workshops targeting agency staff (MPCA, MDH, BWSR, DNR) and conservation groups concerned with land and water management in Minnesota. An advisory working group will inform strategies for data collection and distribution, identify gaps where social and economic data are missing (e.g. treatment costs, health impacts, infrastructure costs, groundwater benefits, and recreation values), and increase the likelihood of adoption and integration of project outcomes into decisions.

Outcome	Completion Date
1. Report describing and cataloging existing ecological, social, and economic data on the supply and demand for clean water (inclusive of surface water and groundwater resources).	*Fall 2014*
2. Compilation of advisory board feedback on the desired format and output of a new tool to capture the benefits associated with clean water. Review of specific decision contexts where the tool could be applied including TMDL planning, watershed restoration projects, and public land management (e.g. school trust funds lands).	*Spring 2015*
3. Critical review of clean water benefits tool by the advisory board.	*Fall 2016*

Activity 2: *Documenting and mapping the benefits of clean water* **Budget: $ 140,000**

We will create an online digital database of statewide maps that capture the spatial patterns of demand for multiple clean water benefits. In a few cases these data are already available from state agencies but are not in a format that permits easy compilation and comparison necessary for effective resource management. For the majority of benefits, data are not currently available and will need to be collected and processed. We will contribute new statewide data on the costs of drinking water supply and contamination, infrastructure for water management, impacts of changes in groundwater quality and quantity on human health and other costs, maps of the distribution and vulnerability of groundwater-dependent ecosystems, and the location and preferences of lake and stream recreationists (see Visual I for list of targeted benefits and data needs). These new data will be hosted on one of the existing online data portals (DNR Data Deli or MPCA Environmental Data Access website) or via the newly-consolidated information technology agency MN.IT.

Outcome	Completion Date
1. Valuable information on the social and economic benefits of water quality and quantity distributed to online for public and agency use. These new data will be integrated with existing spatial water quality and quantity data maintained by MPCA, DNR, and MDH.	*January 2016*

Activity 3: Clean water benefits tool for informed land and water management **Budget: $ 167,000**

Existing water models used in agency planning do a poor job of capturing the economic benefits associated with water quality improvement. This activity will leverage the expertise and open-source software user interface developed by the Natural Capital Project (a collaboration between the UMN, Stanford University, the World Wildlife Fund, and the Nature Conservancy to map and model ecosystem services) to create a new tool that will link changes in water quality and quantity with social and economic approaches (see Visual I). The tool will use the spatial data generated in Activity #2 to allow managers to evaluate how alternative actions may impact the social and economic benefits of changes in water quality and quantity. For example, the tool could be used to screen alternative management scenarios for their impacts on specific groups of water-related beneficiaries (e.g. well owners, public municipalities, water recreationists) and the costs and benefits of those impacts. The tool could also be used to identify areas where investments in conservation or water resource management have the greatest potential to deliver maximum benefits to the greatest number of individuals.

Outcome	Completion Date
1. New clean water benefits tool available online for agency and public use. Tool will be available to download for free on the Natural Capital Project website.	*Fall 2016*
2. Tool applied to scenarios of alternative land and water management to evaluate returns on investments in conservation, to capture a broader suite of potential impacts of development or infrastructure proposals, and to identify high priority areas for new investments. Results of analyses will be written up as case studies for the tool user's guide.	*Winter 2016 to Spring 2017*

III. PROJECT STRATEGY

A. Project Team/Partners

The proposed work was motivated by discussions between UMN researchers, Nature Conservancy scientists, and staff at DNR and MPCA interested in better capturing the economic benefits of investments in clean water. The UMN will lead the project under the direction of Steve Polasky (Applied Economics) and an IonE postdoctoral researcher. Dr. Brent Dalzell (Dept. of Soil, Water and Climate) is a hydrologic modeler and water quality expert and will assist with data collection and tool development. A Nature Conservancy freshwater ecologist/conservation hydrologist will co-lead tool development and apply the tool to conservation investment decisions in Minnesota (Activity #3). Software, communications, and logistics support will be provided by the Natural Capital Project and the Institute on the Environment.

B. Timeline Requirements

The project will start July, 2014 and continue for 36 months to allow time for data collection, new tool development, testing, and scenario analysis. Agency and advisory team engagement will begin immediately upon release of funds and inform each of the proposed activities.

C. Long-Term Strategy and Future Funding Needs

The proposed tool will lead to more informed and strategic management of our land and water resources by enabling agency staff and conservation groups to assess a broader suite of economic, social, and ecological impacts of clean water. In addition the project will foster inter-agency collaborations and produce new spatial data for public use. We anticipate this project will generate proposals for additional research as well as multiple peer-reviewed publications. This project is a stand-alone effort and not part of a longer-term funding request, although it builds and expands on work initiated by the Natural Capital Project to quantify the goods and services provided by natural systems and distribute this information in the form of open source tools to aid decision-making.

2014 Detailed Project Budget

Project Title: Clean water benefits tool for smarter resource investments

IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel: Project will be managed by a full-time Postdoctoral Research Associate under the advisement of Steve Polasky. Postdoc salary is $50,000 per year plus fringe (UMN rate for post-docs in 2014 is 20.75%) with an assumed 2.5% annual increase in salary for a total cost of $60,375 in year 1, $61,884 in year 2, $63,432 in year 3. Postdoc effort will be allocated 15% to Activity #1, 35% to Activity #2, and 50% to Activity #3.	$185,691
Personnel: Brent Dalzell (Research Associate-UMN) will support data collection, integration of biophysical and economic tools, and development and coding of the clean water benefits tool. Dr. Dalzell requests 50% of salary ($25,500 annually for two years) with associated fringe (UMN rate for Research Associates in 2014 is 33.6%) divided equally between Activities #2 and #3.	$68,136
Personnel: Undergraduate summer research students will support data collection, outreach, and support model development and scenario analysis. Support is requested for three students working full time for 10 weeks each at $10/hour ($4000 each for three students) plus fringe (UMN rate for undergraduate research assistants is 7.4%) divided evenly between all three activities.	$12,888
Contracts: Nature Conservancy hydrologist/freshwater ecologist to co-lead advisory working groups, contribute to data collection and tool development and apply clean water benefits tool to TNC conservation investment scenarios. TNC scientist would also lead writing of a report on the impacts of conservation investments on clean water benefits in Minnesota. Support is requested for 33% time at $16,018 per year plus fringe ($6,728/year; TNC rate for scientists is 42%).	$68,238
Travel: In-state travel to meet with advisory board, agency staff, and field staff (BWSR and MPCA) and to cover transportation and lodging costs to bring out-state attendees to workshops at UMN.	$ 10,000
Additional Budget Items: Six single-day advisory board workshops at the Institute on the Environment. Funds requested include event hosting, facilities use, plus logistical and communications support (40 hours at $20/hour) and printing costs ($500)	$ 2,300
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$347,253

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
The Institute on the Environment, University of Minnesota, has supported and will continue to support research and outreach activities conducted by the Natural Capital Project with Steve Polasky. The IonE funding is not dedicated or commited specifically to this proposal, but can support personnel, software development, and complimentary activities. Total funding for this project to date is $500k, with an additional $300k projected for FY14 and FY15.		Committed
In-kind Services During Project Period: Professor Steve Polasky will contribute 1% of his time to perform project leadership duties ($1,973, fringe is 33.11% or $653 for a total of $2,626 in year 1 with a 3% annual increase in salary for years 2 and 3).	$ 8,117	Secured
In-kind Services During Project Period: The University of Minnesota's Facilities and Administrative rate is 52% of modified total direct costs (total direct less graduate student fringe, capital equipment, subawards over $25,000 and on-site facilities rental). The amount, if F&A expenses would have been allowed on the project, would be $180,572. The University will provide office space, IT services, and administrative / financial services in support of the project.	$ 180,572	Secured
Funding History: Minnesota Pollution Control Agency award ($229,230, for the period 4/23/09-6/30/12) to evaluate the evironmental and economic costs and benefits of alternative actions to meet the Lake Pepin TMDL requirements. Award from the Rockefeller Foundation to support the Natural Capital Project's efforts to better capture the impacts of environmental change on human well-being ($57,700, for the period 9/1/12-8/31/13).	$286,930	

	Biophysical Impacts			Social/Economic Impacts	
Clean Water Benefits	**Driver of change**	**Endpoint**	**Change in Valued Attribute**	**Beneficiaries**	**Valuation Approach**
Lake recreation	Phosphorus	Lakes	Water clarity	Lake recreationists Lakeshore property owners	Recreational demand model Willingness to pay for recreation Hedonic pricing
Clean drinking water	Nitrogen	Source water treatment facilities	[Nitrate] above 10ppm	Treatment facility & taxpayers	Avoided treatment costs for nitrate
Clean drinking water	Nitrogen	Groundwater	[Nitrate] above 10ppm	Well owners	Avoidance costs (bottled water) Remediation costs (treatment) Replacement costs (new well)
Clean drinking water	Nitrogen	Drinking water (surface or groundwater)	[Nitrate]	Consumers, particularly at-risk subpopulations	Increased risk of disease * value of statistical life/health Avoidance costs
Safe contact with water	Nutrients	Swimming beaches	Prevalence of aquatic pests and parasites, algal blooms	Swimmers and recreationists	Avoidance costs Irritation/health costs Willingness to pay for recreation Recreational demand model
Coldwater angling	Stream temperature	Coldwater streams	Trout abundance or habitat area	Anglers	Willingness to pay per fish or per unit area habitat Recreational demand model
Avoided sedimentation	Sediment	Reservoirs, Lakes	Amount of sediment	Taxpayers, watershed managers, commercial, navigation	Avoided costs (dredging)
Safe drinking water	Sediment, Dissolved organic carbon	Source water treatment facilities	[Dissolved Organic Carbon]	Treatment facility & taxpayers	Avoided treatment costs (DOC can react with chlorine to form suspected carcinogens)
Safe drinking water	Toxins, bacteria, or other contaminants	Drinking water (surface or groundwater)	[toxin]	Consumers	Increased risk of disease * value of statistical life/health Avoidance behavior costs
Safe contact water	Toxins, bacteria, or other contaminants	Swimming areas	[toxin]	Swimmers	Increased risk of disease * value of statistical life/health Avoidance costs
Safe consumption fish and shellfish	Toxins, bacteria, or other contaminants	Recreational or commercial fishing endpoints	[toxin]	Consumers	Increased risk of disease * value of statistical life/health
Groundwater storage and supply	Changes in water table, aquifer storage	Public and private wells	Change in water quantity	Municipalities, well-owners, industries	Increased pumping costs, new well or infrastructure costs
Groundwater-dependent ecosystems	Changes in baseflow or lake levels	Groundwater-fed lakes, trout streams, wetlands	Change in timing and quantity of water	Property owners, lake recreationists, trout anglers	Property value (Hedonic pricing), recreation values, willingness to pay

Visual I. Table listing the multiple clean water benefits considered by the proposed project. For each benefit we list the biophysical changes that impact costs and benefits, the location and groups of beneficiaries affected by changes in water quality and quantity, and the economic approaches used to value each change in benefit. For the listed benefits, we propose to integrate existing water quality and supply data (biophysical impacts) with social and economic data to better capture the multiple societal impacts of decisions that affect the supply of clean water across Minnesota. This information will be distributed in the form of online data (maps of social and economic impacts of clean water) and a decision tool for making better land and water management decisions by considering a broader suite of potential impacts. Table adapted from Keeler, Polasky, et al. 2012 *Proceedings of the National Academy of Sciences* 109:45, pg. 18622.

PROJECT MANAGER QUALIFICATIONS:

Professor Stephen Polasky holds the Fesler-Lampert Chair in Ecological/Environmental Economics at the University of Minnesota where he is a faculty member in the Department of Applied Economics and the Department of Ecology, Evolution and Behavior. He received a Ph.D. in Economics from the University of Michigan in 1986 and a B.A. from Williams College in 1979. He was elected into the National Academy of Sciences in 2010. He is also a member of the Environmental Economics Advisory Committee and the Committee on Valuing the Protection of Ecological Systems and Services for the Science Advisory Board of U.S. EPA and a member of The Nature Conservancy's Science Council. His research focuses on issues at the intersection of ecology and economics and includes work on the impacts of land use and land management on the provision and value of ecosystem services and natural capital.

Polasky is one of the founders of the Natural Capital Project, a collaboration between the University of Minnesota, Stanford University, the Nature Conservancy, and the World Wildlife Fund. The Natural Capital Project develops simple, use-driven approaches to valuing nature, works closely with decision makers, and provides free, open source ecosystem service software tools to a broad community of users.