# Environment and Natural Resources Trust Fund
# 2011-2012 Request for Proposals (RFP)

## LCCMR ID: 018-A2

**Project Title:** InVEST in Minnesota

**Category:** A2. Natural Resource Data and Information: Distribution, Application, and Training

**Total Project Budget: $** $424,928

**Proposed Project Time Period for the Funding Requested:** 2 yrs, July 2011 - June 2013

**Other Non-State Funds: $** 0

**Summary:**

InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) for applications in Minnesota will be developed and made available to state agencies, local government and the public.

**Name:** Stephen Polasky

**Sponsoring Organization:** U of MN

**Address:** 1954 Buford Ave

Saint Paul MN 55108

**Telephone Number:** 612-625-9213

**Email** polasky@umn.edu

**Web Address** www.environment.umn.edu

**Location**

**Region:** Statewide

**Ecological Section:** 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 _____% |

# 2011-2012 MAIN PROPOSAL

**PROJECT TITLE: InVEST in Minnesota**

## I. PROJECT STATEMENT

Land-use and land-management decisions have major impacts on ecosystem processes and the goods and services they provide ("ecosystem services"). These goods and services include crop production, timber production, carbon sequestration, nutrient retention and erosion control important for soil fertility and water quality, regulation of water flows important for flood and drought mitigation, recreational opportunities, among others. Ideally, decisions about land use and land management would take account of the impact of these decisions on the joint provision of multiple ecosystem services and the potential tradeoffs between services.

While the general notion of tradeoffs in land use and land management is understood in principle, we have, until recently, lacked the tools and methods necessary to quantify and value the provision of multiple ecosystem services. The lack of such tools prevents managers from being able to readily assess the relative benefits of alternative choices. To fill this void, researchers with the Natural Capital Project (www.naturalcapitalproject.org), a partnership between the University of Minnesota, Stanford University, The Nature Conservancy, and World Wildlife Fund, have developed InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs; http://invest.ecoinformatics.org/) to provide managers with tools and methods capable of predicting the provision and value of ecosystem services under alternative land use and land-management scenarios. InVEST uses "ecological production functions" to predict the provision of ecosystem services as a function of ecosystem conditions that are determined both by land-use and land-management decisions along with environmental conditions (e.g., soil and climate information). InVEST then combines the biophysical analysis of provision of ecosystem services with economic analysis to generate predictions about the use and value of ecosystem services. InVEST can be used to assess overall net benefits to society as well as analyzing the spatial and temporal pattern of ecosystem services and the distribution of benefits and costs across different groups in society. InVEST has been used, or is currently in use, to study joint provision of ecosystem services from landscapes in California, Delaware, Hawaii, Oregon, in a number of other countries (China, Columbia, Ecuador, Indonesia, Tanzania). A preliminary analysis was done in Minnesota during the past few months.

In this project, we will develop InVEST for applications in Minnesota and make it readily available for use by state agencies, local governments, and the interested public. Having a tool like InVEST will allow state and local agencies, industry, environmental and citizen's groups to better evaluate policy and management alternatives with the ultimate goal of providing better factual information into decision-making so that choices provide maximum possible benefits for the citizens of the state of Minnesota.

## II. DESCRIPTION OF PROJECT ACTIVITIES

Making InVEST readily available and user-friendly requires accomplishing the following set of tasks.
**Activity 1: Incorporating existing data layers for Minnesota into InVEST**. Extensive data layers, from state and federal agencies as well as the University of Minnesota can be loaded into InVEST to provide a rich set of information on which to model both ecological production functions and economic valuation. Important sources of data include the Minnesota County Biological Survey, Soil Surveys (STATSGO and SSURGO), National Land Cover Database, Minnesota Land Value Database, US Forest Service Forest Inventory Analysis, USDA National Agricultural Statistics Services, among others. The graduate student research assistant on the project will collect data and put it into a compatible format for use in InVEST. The budget for this activity is (25% of the project total) $106,232.00
**Activity 2: Developing new ecosystem service modules important in Minnesota**. InVEST has been developed as a general tool that can be applied to any geographic region. While many ecosystem services are important everywhere (e.g., water quality and carbon sequestration), some are more idiosyncratic and

specific to a particular place. For example, fishing for walleye, duck hunting, and spending time at the lake cabin, all staples of Minnesota outdoor recreation, are not things that can be readily modeled currently in InVEST but require development of new modules. Further, even services that InVEST currently includes, such as water quality and agricultural production, can be better tailored to provide a better fit for Minnesota circumstances. The post-doc researcher, with input from the PI, will develop and improve ecosystem service modules important in Minnesota. The budget for this activity is (25% of the project total) $106,232.00.

**Activity 3: Make InVEST in Minnesota user friendly**. Currently, the Natural Capital Project provides an on-line user's guide and is developing a user-friendly software interface. As part of this project, the post-doc researcher and the graduate research assistant would work closely with Natural Capital Project personnel to develop a user guide and other materials that are specifically designed to meet the needs of users in Minnesota. The budget for this activity is (20% of the project total) $84,985.60.

**Activity 4: Providing user support and training**. Most new users of computer software typically require extensive help to become proficient. As part of the goal of making the InVEST tool readily accessible we will hold periodic training sessions as well as providing user support. The training sessions will be patterned after Natural Capital Project training sessions that have been designed to help users gain proficiency with InVEST. Both the post-doc researcher and the graduate student research assistant, along with occasional assistance from the PI, will be responsible for this task. The goal of the user support and training is to build a network of InVEST users that can be largely self-supporting by the end of the project. On-going user support beyond the life of the project could be provided by personnel at the University of Minnesota, the Natural Capital Project or trained agency personnel. The budget for this activity is (30% of the project total) $127,478.40.

## III. PROJECT STRATEGY

### A. Project Team/Partners

The formal project team will consist of the PI, a post-doctoral researcher and a graduate student research assistant. The project team will work closely with research personnel working on existing on-going projects including the Natural Capital Project, "Accounting for Nature" a project funded by the Institute on the Environment at the University of Minnesota to further develop aspects of InVEST, and "Integrated Modeling of Future Agricultural Change in the Northern Great Plains: Biophysical Potential, Sustainability, and Economic and Environmental Consequences" a NASA funded project between the University of Minnesota and USGS. Research collaboration across projects will be mutually beneficial and no additional funding is needed for collaboration with these on-going projects. .

### B. Timeline Requirements

| Task | Time period | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | July-Sept 2011 | Oct-Dec 2011 | Jan-Mar 2012 | Apr-June 2012 | July-Sept 2012 | Oct-Dec 2012 | Jan-Mar 2013 | Apr-June 2013 |
| (1) | X | X | X | X | | | | |
| (2) | X | X | X | X | X | X | | |
| (3) | | | X | X | X | X | X | X |
| (4) | | | X | X | X | X | X | X |

### C. Long-Term Strategy and Future Funding Needs

This project builds on extensive existing work done as part of the Natural Capital Project and related research efforts including an existing grant to the University of Minnesota from the Minnesota Pollution Control Agency to study how land-use changes designed to meet water quality standards impact on the provision of other ecosystem services. The goals of this project, however, are meant to be completed in the life of this project and not to require continuing funding.

# 2011-2012 Detailed Project Budget

*INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)*

*Attach budget, in MS-EXCEL format, to your "2011-2012 LCCMR Proposal Submit Form".*

*(1-page limit, single-sided, 10 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 write "N/A" , leave it blank, or delete the row.)*

## IV. TOTAL TRUST FUND REQUEST BUDGET *[Insert # of years for project]* **years**

| **BUDGET ITEM** *(See list of Eligible & Non-Eligible Costs, p. 13)* | **AMOUNT** |
|---|---|
| **Personnel: Two Research Associates: 2 year position 7/01/11 – 6/30/13 100% employment Salary: $129,217 Fringe: $43,028 (each) One Graduate Research Assistant: 2 year position 7/01/11 – 6/30/13 100% employment Salary: $61,817 Fringe: $18,621** | $ 424,928 |
| **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 row per type/category.* | $ - |
| **Equipment/Tools/Supplies:** *In this column, list out general descriptions of item(s) or item type(s) and their purpose - one row per item/item type.* | $ - |
| **Acquisition (Fee Title or Permanent Easements):** *In this column, indicate proposed # of acres and and name of organization or entity who will hold title.* | $ - |
| **Travel:** *Be specific. Only in-state travel essential to completing project activities can be included.* | $ - |
| **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. One row per type/category.* | $ - |
| **TOTAL ENVIRONMENT & NATURAL RESOURCES TRUST FUND $ REQUEST** | $ 424,928 |

## 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.* | $ - | *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.* | $ - | *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.* | $ - | |
| **Remaining $ from Current ENRTF Appropriation (if applicable):** *Specify $ and year of appropriation from any current ENRTF 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.* | $ - | *Indicate: Unspent? Not Legally Obligated? Other?* |
| **Funding History:** *Indicate funding secured prior to July 1, 2011 for activities directly relevant to this specific funding request. State specific source(s) of funds.* | $ - | |

**Project Manager Qualifications and Organization Description**

**Project manager: Professor Stephen Polasky**

Fesler-Lampert Professor of Ecological/Environmental Economics, Univ. of Minnesota
Resident Fellow of the Institute on the Environment, Univ. of Minnesota,
Senior Staff Economist, President's Council of Economic Advisers, 1998 - 1999
Fellow of the American Academy of Arts and Sciences
Fellow of the American Association for the Advancement of Science
Ph.D. Economics, University of Michigan, 1986
B.A. Williams College, cum laude, 1979

*Selected Research Publications*


Polasky, S. et al. 2010. The impact of land-use change on ecosystem services, biodiversity and returns to landowners: a case study in the state of Minnesota. *Environmental and Resource Economics* (forthcoming).

Polasky, S. and K. Segerson. 2009. Integrating ecology and economics in the study of ecosystem services: some lessons learned. *Annual Review of Resource Economics* 1: 409-434.

Walker, B.W., S. Barrett, S. Polasky et al. 2009. Looming global-scale failures and missing institutions. *Science* 325(11): 1345-1346.

Nelson, E., G. Mendoza, J. Regetz, S. Polasky, et al. 2009. Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. *Frontiers in Ecology and the Environment* 7(1): 4–11.

Daily, G., S. Polasky et al. 2009. Ecosystem services in decision-making: time to deliver. *Frontiers in Ecology and the Environment* 7(1): 21-28.

Sander, H. and S. Polasky. 2009. The value of views and open space: estimates from a hedonic pricing model for Ramsey County, Minnesota, USA. *Land Use Policy* 26(3): 837-845.

Tallis, H. and S. Polasky. 2009. Mapping and valuing ecosystem services as an approach for conservation and natural resource management. *Annals of the New York Academy of Sciences* 1162: 265–283.

United States Environmental Protection Agency, Science Advisory Board. 2009. *Valuing the Protection of Ecological Systems and Services*. EPA-SAB-09-012. US EPA.

Nelson, E., S. Polasky, et al. 2008. Efficiency of incentives to jointly increase carbon sequestration and species conservation on a landscape. *Proceedings of the National Academy of Sciences* 105(28): 9471-9476.

Polasky, S., et al. 2008. Where to put things? Spatial land management to sustain biodiversity and economic returns. *Biological Conservation* 141(6): 1505-1524.

Fargione, J., J. Hill, D. Tilman, S. Polasky and P. Hawthorne. 2008. Land clearing and the biofuel carbon debt. *Science* 319: 1235-1238.

National Research Council. 2005. *Valuing Ecosystem Services: Towards Better Environmental Decision-making*. Washington, DC, National Academies Press.


**Organization Description: Institute on the Environment, University of Minnesota**

The project will be housed in the Institute on the Environment, a university-wide institute dedicated to finding solutions to environmental challenges. The Institute will supply office space for the post-doc researcher and the graduate student research assistant.