Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-331

Proposal Title: Comprehensive Identification and Visualization of Sourcewater Protection Opportunities

Project Manager Information

Name: Ryan Noe

Organization: U of MN - Humphrey School of Public Affairs

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Project Basic Information

Project Summary: Comprehensive inventory and decision-support for identifying threats to sourcewater and opportunities to obtain multiple benefits to conservation. Will allow for more efficient and effective targeting of restoration and protection activities.

Funds Requested: $299,000

Proposed Project Completion: 2024-06-30

LCCMR Funding Category: Water Resources (B)

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Past investments in environmental monitoring and modeling have greatly enhanced agencies and conservation organizations ability to plan and prioritize their investments. At the same time, agencies remain siloed in their objectives, datasets are difficult to combine, and no single entity is charged with taking a holistic approach to mapping conservation opportunities and threats.

Our proposal builds on a decade of collaborative work with agencies and conservation organizations in Minnesota and leverages previous LCCMR grants. This work has advanced the science and practice of conservation and illuminated remaining gaps in our ability to efficiently and effectively allocate available funding. For example, in a review of statewide conservation programs we observed that source water protection was absent from the metrics used to prioritize conservation acquisitions (Noe et al. 2017).

If organizations remain siloed in their objectives and ignore threats such as land use change and climate change in their decision-making, we will continue to miss opportunities to generate co-benefits on our conservation investments. Our past experience working across agencies and sectors positions us to advance the science and practice of conservation decision-making, securing Minnesota's position as a national leader in natural resource management via a systematic, ecosystem services approach.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

We will focus on opportunities to protect and restore lands to improve sourcewater in Minnesota. Clean water is consistently ranked the top environmental concern in national polling and clean drinking water is the highest valued objective for water management in Minnesota (Davenport and Keeler 2019). Sourcewater protection requires a multi-scale, cross-systems approach that utilizes ecological, social, and economic data to identify opportunities and threats to clean drinking water across scales.

Our team has spent the past decade mapping and modeling the multiple ecosystem services associated with clean water in Minnesota. We recently combined this capacity with updated habitat maps and models.

Additional support will allow us to expand our data collection across multiple benefits, integrating new data on climate change, land use and wildlife habitat.. Under our project, managers would be able to search all of the parcels in the state in order to identify restoration opportunities across a suite of 15+ co-benefits (see Visual Component). Additionally, conservation managers will be able to assess large conservation portfolios by visualizing what benefits are under-protected across all programs in the state, while targeting land that fulfills their primary objective.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

The outcomes of the project include: 1) Searchable database of environmental benefits, covering all parcels in the state. 2) Web tool that helps maximize co-benefits given the priorities of the user. 3) Visualizations of what benefits are over or under represented in a conservation portfolio, and 4) Report that summarizes findings of our data collection and integration and provides recommendations for sourcewater protection strategies.

Taken together these products will allow conservation managers to visualize multiple benefits and threats when planning for sourcewater protection or other conservation activities.

Activities and Milestones

Activity 1: Mapping threats from land use change and climate change

Activity Budget: $47,000

Activity Description:
Conversion of forests and wetlands to cropland threatens water quality and other conservation objectives. Land use change interacts with climate change to produce uncertain impacts on water resources. We will produce the first statewide map of potential land conversion to agriculture and developed (built) land uses which integrates climate projections to understand the joint impacts of land use and climate change together.

Activity Milestones:

Description	Completion Date
Inventory of recent land use change using Google Earth Imagery Analysis	2022-01-31
Model and map of probabilities of conversion to cropland and urban areas statewide	2022-06-30
Analysis of potential joint impacts of climate change and land use change on water resources	2022-10-31

Activity 2: Spatial database of statewide conservation co-benefits

Activity Budget: $115,000

Activity Description:
We will create a comprehensive, searchable, inventory of restoration opportunities, threats from land use change and climate, and co-benefits in the form of multiple ecosystem services. Water quality management is fragmented between a half dozen state agencies, leaving no single group to systematically analyze multiple benefits to wildlife, public health, recreation, equity of benefit distribution, and sourcewater protection. By creating datasets, visualization tools, and performing extensive outreach, we are well positioned to improve sourcewater protection by bridging the gap between targeting single benefits, and targeting multiple benefits.

Activity Milestones:

Description	Completion Date
Database of co-benefits of sourcewater protection (eg, pheasant, lake recreation, pollination, bird habitat/watching, etc.)	2022-06-30
Map and report showing best opportunities for sourcewater protection given threats and opportunities for co-benefits	2023-01-31
Assessment of the equity and distribution of sourcewater investments statewide	2023-03-31

Activity 3: Web portal and portfolio analysis of conservation opportunities and costs

Activity Budget: $137,000

Activity Description:
We will build on a past ENRTF-funded tool that assesses the environmental benefits of easements (PEBAT, pebat.umn.edu). PEBAT was designed to assess the benefits of protecting existing natural habitats, not the benefits of restoration or best management practices. An updated tool will allow users to assess alternative portfolios of investments that include investments in restoration and protection across an expanded suite of benefits

The updated tool will be used to assess the feasibility and impact of achieving alternative conservation and water quality

goals (meeting Gulf of Mexico nutrient reduction targets, ensuring safe drinking water, protecting culturally important water bodies, and ensuring safe recreation opportunities). In contrast to siloed and one-off investments, this tool will allow users to assess the impacts of a diversified portfolio of conservation investments statewide and set expectations about how far we can advance conservation goals given current resources.

Activity Milestones:

Description	Completion Date
Scenario analysis showing the feasibility of reaching alternative water quality goals given current resources	2023-06-30
Report and fact sheets on how MN could use a "portfolio" approach to better management water resources	2024-05-31
Updated web-based tool for visualizing co-benefits of sourcewater protection	2024-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Tracy Twine	University of Minnesota	Agro-IBIS modeling of future land use scenarios	No

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?

Our proposal leverages over $1M in research funding devoted to climate projections, statewide surveys of water values, ecosystem services, and habitat modeling. These investments enabled us to build a database of environmental and social data. With funding requested here, we will be able to expand and maintain the database - allowing for new analyses, visualizations, and improved public access.

All data and code will be open source and distributed via a website and repository hosted by the University of Minnesota. We will engage agency researchers and conservation organizations in all stages of our work, with planned workshops, and tailored presentations.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Assessment of Public Benefits of Protecting Source Water	M.L. 2017, Chp. 96, Sec. 2, Subd. 03b	$320,000
Conservation Easement Assessment and Valuation System Development	M.L. 2015, Chp. 76, Sec. 2, Subd. 09k	$250,000
Understanding Water Scarcity, Threats, and Values to Improve Management	M.L. 2015, Chp. 76, Sec. 2, Subd. 04a	$234,000

Project Manager and Organization Qualifications

Project Manager Name: Ryan Noe

Job Title: Senior Scientist

Provide description of the project manager's qualifications to manage the proposed project.

Ryan Noe is a senior scientist in the Science, Technology, and Environmental Policy area of the Humphrey School at the University of Minnesota. He manages projects on water and land use, with a focus on co-developing actionable research with state agencies, conservation organizations, and policymakers in Minnesota. Ryan holds an M.S. in natural resource science and management, with a focus on geospatial analysis. His work seeks to improve the usability of spatial data on environmental benefits such as clean drinking water, game species habitat, or lake recreation. He also seeks to improve the integration of data on threats such as climate change or land use conversion into environmental decision-making.

His research over the last five years has involved extensive collaboration with state agencies and councils (CWC, LSOHC, DNR, MDH, MPCA and EQB) and the project management of three ENRTF projects (Assessment of Public Benefits of Protecting Source Water – 2017, Conservation Easement Assessment and Valuation System Development – 2015, and Understanding Water Scarcity, Threats, and Values to Improve Management – 2015). The tools (pebat.umn.edu), data (z.umn.edu/mn-climate-change-report), and expertise produced under these projects form the foundation of an

extensive research agenda supporting the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources.

Organization: U of MN - Humphrey School of Public Affairs

Organization Description:
The mission of the Humphrey School of Public Affairs is to inspire, educate, and support innovative leaders to advance the common good in a diverse world. Within the Humphrey School, the Center for Science, Technology, and Environmental Policy fosters interdisciplinary and community-engaged research on human well-being, environmental sustainability, and social justice in a complex and diverse world. The Center conducts public engagement with external partners, develops environmental leadership, and facilitates solutions-oriented projects at the nexus of science, technology, and environmental policy.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
To Be Named		PhD level Graduate Research Assistant - Academic Year			111%	0.38		$38,093
Ryan Noe, Senior Scientist		Co-PI, Project manager			36.5%	1.5		$140,787
Christina Locke, Senior Scientist		Researcher			36.5%	0.75		$74,567
Bonnie Keeler - Academic Year		Principle Investigator			36.5%	0.18		$33,926
To Be Named		PhD level Graduate Research Assistant - Summer			20%	0.12		$7,288
Bonnie Keeler - Summer		Principal Investigator			36.5%	0.02		$3,584
							Sub Total	**$298,245**
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								

							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Local mileage and parking	For giving presentations on research findings					$555
	Conference Registration Miles/ Meals/ Lodging	Conference registration	Registration fees for presenting research at conference					$200
							Sub Total	**$755**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$299,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Attachments

Required Attachments

Visual Component

File: 93757306-cc6.pdf

Alternate Text for Visual Component

Comparisons of the features currently supported in the University of Minnesota's Parcel Environmental Benefit Assessment Tool (PEBAT), and proposed features this grant would enable. Current features include, 11 protection benefit metrics (but not restoration), assess individual parcels only (but not portfolios), and fixed comparison to undeveloped parcels (cannot search parcels for specific attributes). Proposed features include, new habitat metrics for birds and mammals, new development and climate threat data, metrics for restoration opportunities,social data and equity metrics, assess portfolios of hundreds of parcels to find gaps in protection, find 'win-win' multiple benefit parcels, without compromising on primary goal. Users will be able to select which benefits they are interested in, and the map will show which parcels meet those requirements.

Optional Attachments

Support Letter or Other

Title	File
Audited Financial Report 2019	32177b80-7d3.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

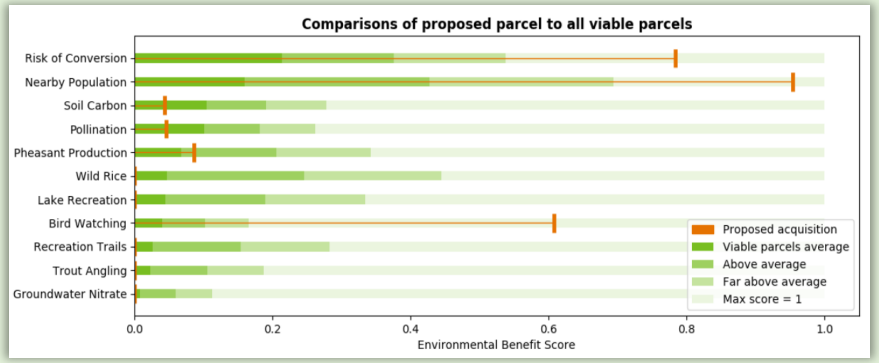
Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Current and Proposed Features of Web Tool

Current Features: pebat.umn.edu

- 11 protection benefit metrics (no restoration)
- Assess individual parcels only (no portfolios)
- Fixed comparison to undeveloped parcels (cannot search parcels for specific attributes)



Proposed Features:

- New habitat metrics for birds and mammals
- New development and climate threat data
- Metrics for restoration opportunities
- Social data and equity metrics
- Assess portfolios of hundreds of parcels to find gaps in protection
- Find ‘win-win’ multiple benefit parcels, without compromising on primary goal

Users can select and filter parcels in a statewide database. Red areas show parcels that match user priorities.

Benefit	On	Off
Pheasant habitat	•	
Sourcewater protection	•	
Lake recreation		•
Risk of ag expansion		•
15+ other co-benefits		•