

**Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 028-A

Habitat Friendly Solar Impacts: Environmental and Economic Guidance

Category: A. Foundational Natural Resource Data and Information

Sub-Category:

Total Project Budget: \$ 751,048

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

Summary:

This project will 1) measure ecosystem and economic benefits of solar installations with pollinator habitat and 2) develop guidance to accelerate the adoption of solar installations that provide these benefits.

Name: David Mulla

Sponsoring Organization: U of MN

Job Title: Dr.

Department: Department of Soil, Water & Climate; Univ. Minnesota

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St. Paul MN 55108

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Email mulla003@umn.edu

Web Address: _____

Location:

Region: Central, Metro, Southeast

County Name: Anoka, Dakota, Goodhue, Hennepin, Scott, Sherburne, Stearns, Wright

City / Township:

Alternate Text for Visual:

This visual shows potential sites in Minnesota for project activities, a flow chart for beneficial outcomes, and a visual for pollinator habitat at solar installations.

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



PROJECT TITLE: Habitat Friendly Solar Impacts: Environmental and Economic Guidance

I. PROJECT STATEMENT

The objectives of this project are to 1) measure ecosystem and economic benefits of ground solar installations with pollinator habitat and 2) accelerate the adoption of ground solar installations that provide ecosystem and economic benefits by developing guidance to ease the approval and public engagement processes that are needed before a solar project is allowed to proceed.

Solar power is our fastest growing renewable energy source. Minnesota is expected to reach over 1,000 MW of solar capacity in 2019 (which would power 750,000 homes). In ten years solar power could provide four times that amount. Ground-mounted solar power is expanding across rural landscapes. Minnesota is also a national pioneer in planting pollinator habitat beneath solar installations to provide habitat for insects and birds, reduce runoff, and improve soil quality. Local and state governments must evaluate application permits for ground solar projects to determine if they meet requirements for runoff reduction, protection of nearby wetlands, and meet Habitat Friendly Standards (HFS) for insects and birds. Local and state government officials and the communities they represent have few tools or training to determine whether solar facilities meet these requirements, often leading to denial of applications or slowing the approval process for renewable energy projects. Local governments and communities often have many unanswered questions about environmental or economic benefits when they attempt to evaluate solar project applications. This project will help local and state regulators and stakeholders better evaluate potential environmental and economic benefits associated with pollinator habitat plantings at ground solar installations, to inform the approval process.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Assessing impacts of ground solar installations on runoff and wetlands

Description: We will measure soil moisture and runoff and develop simple models and tools for local and state government to use in identifying impacts of ground based solar installations on runoff and wetland hydrology. This guidance will help local and state government speed the approval process for ground solar projects with pollinator habitat, in order to comply with requirements for runoff reduction and wetland protection according to the Minnesota Wetland Conservation Act (WCA).

Ground solar installations with established pollinator habitat will be monitored for runoff, soil moisture, soil health indicators, vegetation, and water table depth to identify impacts on stormwater runoff and wetlands based on type of collector (fixed tilt or sun tracking), type of ground cover (e.g. pollinator habitat, turfgrass or gravel), and site characteristics (soil and slope). Results will be used to develop a hydrologic model and simple spreadsheet tool that can account for runoff and infiltration as well as lateral flow to adjacent wetlands. This information will be used to assist state and local government in the permitting and approval process for new ground solar installations.

ENRTF BUDGET: \$244,793

Outcome	Completion Date
<i>1. Summarize impacts of pollinator habitat on runoff and nearby wetlands</i>	<i>June 30, 2022</i>
<i>2. Improved spreadsheet calculator for runoff from ground solar installations</i>	<i>Dec 31, 2022</i>
<i>3. Guidance for impacts of ground solar installations on wetland protection</i>	<i>Dec 31, 2022</i>



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2020 Main Proposal Template**

Activity 2: Assessing ground solar installations as habitat for birds

Description: We will evaluate and provide guidance to local and state government on how birds use ground solar installations (e.g. are HFS being met?). Impacts on bird populations and habitat quality are considered in the permitting process, without much guidance about how ground solar installations can be managed to provide bird habitat. We will assess bird abundance, richness, and species composition at ground solar installations with pollinator habitat beneath the solar panels to help guide decisions about how solar installations can be designed and managed to make them more attractive to bird communities. Local government staff will be trained to assess whether Habitat Friendly Solar standards related to birds are being met at sites.

ENRTF BUDGET: \$225,521

Outcome	Completion Date
<i>1. Summarize impacts of ground solar installations on bird populations</i>	<i>Dec 31, 2022</i>
<i>2. Guidance for assessing impacts of solar installations on birds and habitat quality</i>	<i>April 30, 2023</i>

Activity 3: Stakeholder and government engagement and education on environmental and economic impacts of low-impact ground solar development

Description: We will evaluate economic impacts of ground-mounted solar installations on local communities in Minnesota (e.g. land values, home prices, revenue streams, jobs). We will disseminate project results and train local and state government, solar developers, and the general public about how to maximize the environmental and economic benefits of ground solar installations. Government and state agency stakeholders will be engaged to provide input into the use and interpretation of results from Activity 1 and 2. Recommendations will be made to improve local ordinances and codes, and solar siting and design standards for solar pollinator projects, and speed the permit assessment and approval process. Final deliverables will include written and web-based reports and in-person dissemination to local and state government officials, decision-makers, habitat and agriculture sector stakeholders, and other interested parties.

ENRTF BUDGET: \$280,734

Outcome	Completion Date
<i>1. Assess economics of solar installations on the environment and rural communities</i>	<i>June 30, 2021</i>
<i>2. Engage local and state agencies, SWCD and Watershed Districts throughout project</i>	<i>June 30, 2022</i>
<i>3. Develop model ordinances, standards, and other recommendations for solar design</i>	<i>January 30, 2023</i>
<i>4. Disseminate results and educate stakeholders on findings for low-impact solar</i>	<i>June 30, 2023</i>

III. PROJECT PARTNERS AND COLLABORATORS: These include the Board of Water and Soil Resources; National Renewable Energy Laboratory; and the Audubon Society.

IV. LONG-TERM IMPLEMENTATION AND FUNDING: This project is being conducted in coordination with the National Renewable Energy Laboratory (NREL), which has established four sites in Minnesota to evaluate the performance of pollinator-friendly seed mixtures and other low-impact solar designs on insect populations.

V. SEE ADDITIONAL PROPOSAL COMPONENTS:

- A. Proposal Budget Spreadsheet**
- B. Map and Visual Components**
- F. Project Manager Qualifications and Organization Description**

Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet



Legal Citation:

Project Manager: Ellen Anderson and David Mulla, University of Minnesota

Project Title: Habitat Friendly Solar Impacts: Environmental and Economic Guidance

Organization: University of Minnesota

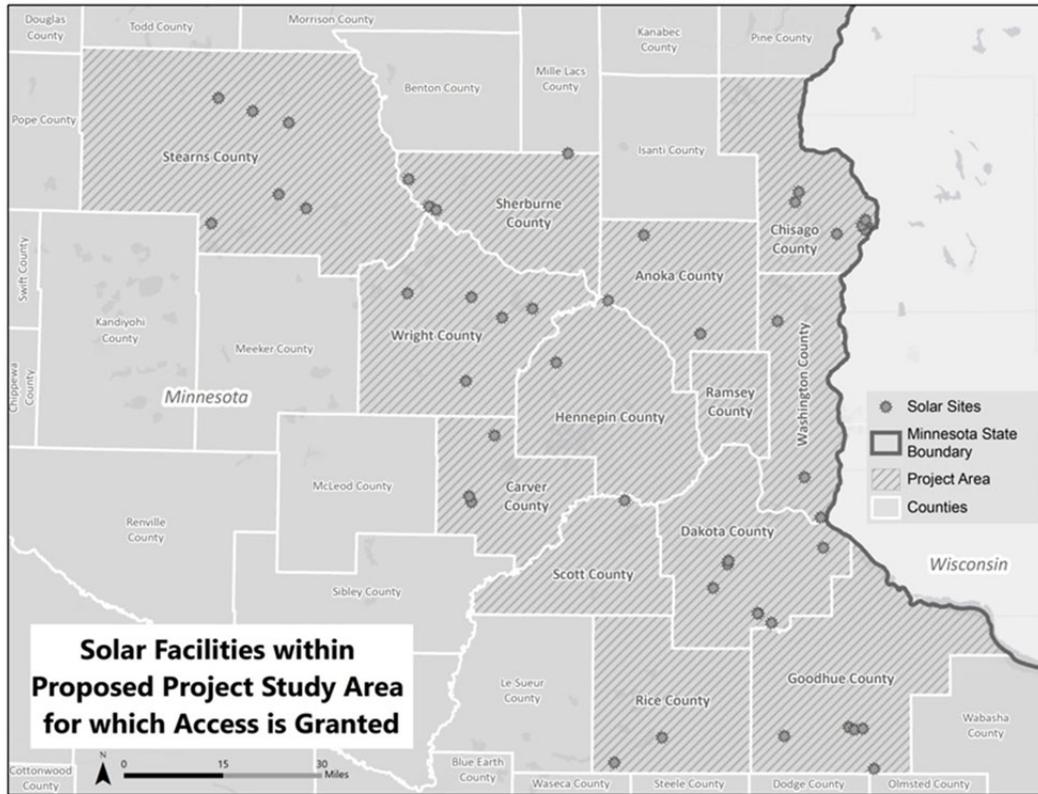
Project Budget: \$751,048

Project Length and Completion Date: 3 years, June 30, 2023

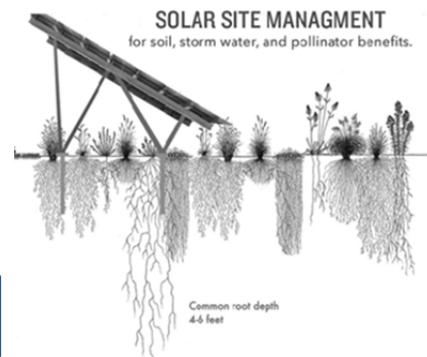
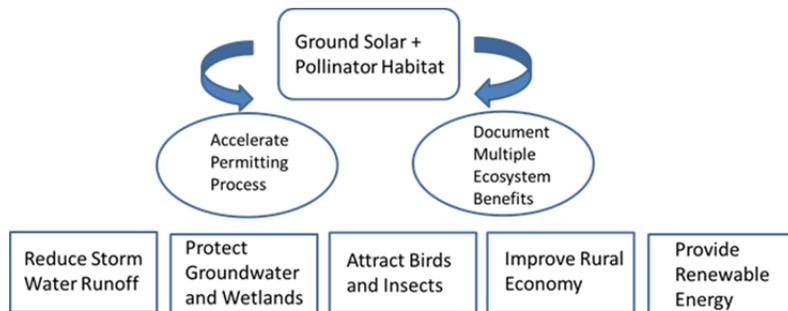
Today's Date: April 12, 2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits) SubTotal		\$ 485,808	\$ -	\$ 485,808
Jake Galzki, 75% Research Assoc. 5 (Activity 1) -Salary and 36% Fringe		\$ 139,453		
David Kuhlmann, half-time Grad RA (Activity 2) -Salary and 83.9% Fringe		\$ 119,860		
Unspecified field Technician, 25% time (Activity 2) - Salary and 36% Fringe		\$ 47,761		
Ellen Anderson, 10-15% time (Activity 3) - Salary and 36% Fringe		\$ 61,104		
Aaron Hanson, 60-68% time (Activity 3) - Salary and 29.5% Fringe		\$ 109,957		
Chris Nootenboom, 2% time (Activity 3) - Salary and 29.5% Fringe		\$ 3,177		
Dan Heins, 5-1% time (Activity 3) - Salary and 29.5% Fringe		\$ 4,496		
Sole Source Professional/Technical/Service Contracts SubTotal		\$ 183,000	\$ -	\$ 183,000
Kristine Maurer, Hennepin County (Activity 1) - She will assist with data collection at solar facilities in all counties. Data collection efforts will be related to collection of staff gauge and shallow monitoring well data.		\$ 33,000		
Soil and Water Conservation Districts (4-8 see map) (Activities 1 and 2) - One SWCD staff member from each county will conduct Rapid Floristic Quality Assessments, pollinator surveys, and general habitat assessment at each site. SWCD involvement is important for the long-term success of this project's outcomes as they are on the front-line of the permitting process for solar facilities. SWCD involvement is important for the long-term success of this project's outcomes as they are on the front-line of the permitting process for solar facilities.		\$ 30,000		
Fresh Energy (Activity 3) - Fresh Energy will convene leaders and researchers of the National Renewable Energy Laboratory's 25-site national study into pollinator-friendly solar practices at an event in Minnesota for exchange of information, insights, opportunities, and best practices. They will work closely and collaboratively with the Pheasant Forever's director of habitat education to engage key rural and statewide audiences through programming and educational display at a Pheasant Fest convention in Minnesota. Fresh Energy will lead and advise on development of public-facing science communications—including writing, photography, video, and multi-media—related to the project aims and outcomes.		\$ 60,000		
Great Plains Institute (Activities 1, 2 and 3) - GPI has been a national innovator in working with local and regional governments to address solar land use issues, including the integration of natural resource and renewable energy decision-making. GPI brings extensive model code experience and would develop design and siting criteria supported by the research. GPI would use its local/regional government network to engage local regulators/ officials during research (Activities 1 and 2) and then for dissemination of design and siting criteria and economic findings in Activity 3. GPI will engage state agencies on the interface of state and local development regulation for consistency and predictability in regulatory processes to capture co-benefits of low-impact solar development.		\$ 60,000		
Equipment/Tools/Supplies				
David Mulla (Activity 1) and David Andersen (Activity 2) - Soil moisture sensor and bird spotting		\$ 28,240	\$ -	\$ 28,240
Printing Total				
Ellen Anderson (Activity 3) -Printing final reports, community surveys, community project updates,		\$ 6,000	\$ -	\$ 6,000
Travel expenses in Minnesota				
David Mulla (Activity 1) David Andersen (Activity 2) and Ellen Anderson (Activity 3) -Travel to ground		\$ 48,000	\$ -	\$ 48,000
		\$ -	\$ -	\$ -
COLUMN TOTAL		\$ 751,048	\$ -	\$ 751,048
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:			\$ -	\$ -
State:			\$ -	\$ -
In kind: National Science Foundation Innovations for Sustainable Food, Water and Energy Supplies (INFEWS)		pending	\$ -	\$ -
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
		\$ -	\$ -	\$ -

Potential Locations in Minnesota for Developing Guidance Regarding Ground Solar Installations



Project Goals and Benefits:





Environment and Natural Resources Trust Fund (ENRTF) 2020 Main Proposal Template

F. Project Manager Qualifications and Organization Description

Project Manager Qualifications and Organization Description

Project Manager: David Mulla

Current Position: Professor and Larson Chair for Soil and Water Resources; Dept. Soil, Water & Climate; University of Minnesota. This department is ranked nationally in the top 5 for research productivity and quality on soil, water and environmental quality issues.

Education:

- Ph.D (1983) Purdue Univ.; W. Lafayette, IN
- Agronomy with emphasis on Soil Physics

- MS: (1981) Purdue Univ.; W. Lafayette, IN
- Agronomy with emphasis on Soil Chemistry

Experience:

Thirty six years experience in research on soil and water resources at two Land Grant Universities (Washington State Univ. 1983-1995; Univ. Minnesota 1995-present). Appointed Founding Fellow to Univ. MN Institute on Environment in 2007. Elected Fellow Soil Science Society of America (1997) and Fellow American Society of Agronomy (1999). Pioneer in research on Precision Agriculture and Precision Conservation. Co-leader of Energy Production and Use Team for LCCMR Statewide Conservation Plan (2008). Member, Scientific Advisory Panel for Lake Pepin TMDL Process, St. Paul, MN. (2005-present). Member, Gulf of Mexico Hypoxia Task Force for White House Committee on Environment and Natural Resources, (1998). Team Leader Environ. Quality Board GEIS Animal Agriculture Water Quality Impacts (1999-2001). Published 190 refereed articles on Soil and Water Resources in scientific journals. Awarded over \$21 million in scientific research grants. Invited to present research findings at conferences and workshops in 25 countries around the world.

--Major projects have included:

- Generic Environmental Impacts Study of Animal Agriculture. Funded by Environ. Quality Board for \$132,000 from 1999-2001.
- Paired watershed nutrient reduction strategies. Funded by USDA-CSREES for \$539,000 from 2001-2005.
- Minnesota Statewide Conservation and Protection Plan. Funded by ENRTF for \$496,000 from 2007-2008.
- Statewide ecological ranking of CRP and other critical lands. Funded by ENRTF and Emerging Issues Fund for \$275,000 from 2009-2011.
- Strategic planning for MN natural and artificial watersheds. Funded by ENRTF for \$327,000 from 2010-2012.
- Innovations for sustainable food, water and energy supplies in intensively cultivated regions. Funded by NSF for \$2,500,000 from Oct. 1, 2017 – Sept. 30, 2021.

Organization Description

The University of Minnesota is both the state land-grant university, with a strong tradition of education and public service, and the state's primary research university