Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-251

Staff Lead: Tiffany Schaufler

Date this document submitted to LCCMR: June 10, 2024

Project Title: Effects of Conservation Grazing on Solar Sites Managed for Pollinator Habitat

Project Budget: $88,000

Project Manager Information

Name: Daniel Tix

Organization: Minnesota Native Landscapes

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: December 31, 2028

Final Report Due Date: February 14, 2029

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 03z

Appropriation Language: $88,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with Minnesota Native Landscapes, in partnership with Temple University, to analyze the effects of sheep grazing and mowing on the vegetation and soils of solar sites managed for pollinator habitat and to improve understanding of the environmental outcomes from the colocation of solar panels; grazing; and native, pollinator-friendly vegetation. This appropriation is available until June 30, 2029, by which time the project must be completed and final products delivered.

Appropriation End Date: June 30, 2029

Narrative

Project Summary: This research will analyze the effects of sheep grazing and mowing on the vegetation of solar sites that have been managed for pollinator habitat

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

The state of Minnesota is promoting that solar facilities install and manage native, pollinator-friendly vegetation on their new site developments. This has been promoted as an option to generate low carbon solar energy while improving soil, enhancing pollinator habitat, and reducing run-off. However, vegetation under the solar panels requires maintenance to keep the plants below the panels, ensure access, and to prevent noxious and invasive species. Solar site managers have used mowing and sheep grazing to limit the height of the vegetation. Therefore, it is important to investigate if reintroducing vegetation and managed grazing at existing solar sites can successfully restore or maintain vegetation and other ecological and hydrological functions of the soil. Considering the costs of installing and maintaining native vegetation at solar sites, it is important to consider the implications of different management techniques on vegetation and soils. Furthermore, this study will investigate how sheep grazing can be used in association with solar developments and native vegetation while also supporting local agricultural producers, sustainable food production, and rural economies.

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

To better understand the effects of management techniques on diverse native vegetation and soils under solar panels, we will investigate the changes in vegetation and in soil nutrient, physical, and hydrologic properties. Findings from these assessments can be used to optimize the environmental and financial outcomes of the co-location of solar, grazing, and native vegetation. This ultimately will determine whether the strategy is viable and will help guide the development of native seed mixes and management practices on solar sites.

Our study will compare vegetation and soils that are grazed by sheep to areas that are mown and an untreated control. In each of these treatments, we will analyze species diversity, biomass accumulation, and soil properties. Data will be used to assess the effects of treatments on native plants included in seed mixes and the impacts that biomass accumulation can have on mitigating wildfire risks. The study will also document grazing intensity and duration to understand the potential benefits to the sheep industry. The experimental design will be developed in collaboration with Temple University who will be focused on the soil physical and chemical properties.

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?

Findings from these assessments can be used to optimize the environmental and financial outcomes of the co-location of solar, grazing, and native vegetation. This ultimately will determine whether the strategy is viable and will help guide the development of native seed mixes and management practices on solar sites. In addition, this study will improve our understanding of native species, native seed mixes, and management practices in pollinator-friendly habitats. As the state continues to recommend these practices, this project will help to provide practical, scientific evidence to support future recommendations.

Project Location

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

Region(s): Central, Metro,

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

Statewide

When will the work impact occur?

In the Future

Activities and Milestones

Activity 1: Experimental Design, Set-up, and Mowing Operations

Activity Budget: $23,800

Activity Description:
MNL ecologists will develop a specific vegetation sampling protocol to collect biomass data, plant species composition, and species diversity. The protocol must provide a clear comparison of the changes in the plant community associated with the different management activities: grazing and mowing. These data must be correlated with soils data from Temple University research happening on the same site.

Sheep will be grazing 6 separate solar sites used for this research in which three vegetation treatment areas will be set-up. At each site, one of the treatments will be the majority of the site grazed by sheep, two areas will be within exclusion fencing to prevent sheep from grazing. Of the two exclusion areas, one will be mown to reduce vegetation height and the second will be untreated. Invasive species and woody plants will be controlled within all areas. Vegetation study plots will occur along transects within each treatment area and analyzed for vegetation data.

Grazing will occur regardless of this experiment as part of standard maintenance, so it is not included as an activity or expense. Mowing and construction of exclusion fencing are included as costs for the research.

Activity Milestones:

Description	Approximate Completion Date
Finalize site design and provide to fencing installation crew	July 31, 2024
Install all fencing at each site prior to grazing for the season.	July 31, 2024
Complete mowing at each site in mown experimental area each year	September 30, 2028

Activity 2: Annual Vegetation Monitoring

Activity Budget: $46,500

Activity Description:
Vegetation data from each treatment area will be collected from a minimum of 20 nested plots (1 square-meter) along two transects: under the panels and between panels. At each of the six solar sites, there will be three treatments (control, mowing, and grazing) with 2 transects of 10 plots within each treatment area. Ecologists will complete vegetation monitoring each year along all transects in July or August. Monitoring will be conducted before grazing or mowing operations, when feasible. If not, the monitoring will be completed more than 6 weeks after grazing/mowing. If monitoring occurs after the treatment for that year, that location will be a priority for earlier analysis or later treatments the following year. No site will be treated before the monitoring in two consecutive years.

Data will be summarized each year and analyzed for differences in plant frequency and abundance among treatments based on species and/or groups of species. Data will be analyzed separately using appropriate statistical methods after the final data collection. Assessments may include richness, diversity indices, and frequency of occurrence.

As part of the companion study with Temple University, soil samples will be collected in separate transects by researchers from Temple.

Activity Milestones:

Description	Approximate Completion Date
Annual vegetation monitoring in August each year	August 31, 2028
Processing annual vegetation monitoring data in each	December 31, 2028

Activity 3: Final Report and Presentations

Activity Budget: $17,700

Activity Description:
After the final year of monitoring, the data from each year will be compiled to show changes in plant communities over the course of the experiment. These data will be summarized in a final report. Scholars from Temple University will complete statistical analyses and incorporate the findings into scholarly journal articles. The findings will also be summarized in a series of presentations to be delivered to appropriate conferences and in written publications. The final report will also be made available to the Minnesota Vegetation Management Plan Working Group and other interested local officials.

It is expected that the ecologists at MNL will present findings from this study at two conferences, at a minimum. These may include industry trade shows or professional conferences that are attended by staff from state agencies, solar industry, consultants, and other contractors. The conferences are expected to occur within the state of Minnesota.

Activity Milestones:

Description	Approximate Completion Date
Conference presentations	December 31, 2028

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Sujith Ravi	Temple University	Collaborating Research, Principal Investigator	No
Jesse Puckett	Enel - North America, Inc.	Solar Array Land Manager and Owner Representative	No

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
MNL intends to disseminate research information throughout the duration of the research project. We expect to summarize and document our results annually and share the annual results in one or more of the following manners:

- Annual updates via social media posts to advertise that we are partnering with Temple University, Enel North America, and the LCCMR to complete research that will benefit renewable energy projects and natural resources in Minnesota.
- Present the intermediate results at professional or academic conferences.
- Prepare summary documents to share with industry groups, solar developers, consultants, or agency staff that work on permitting. This may include the Minnesota Vegetation Management Plan Working Group (VMPWG).

Final research results will be presented at an appropriate state or regional level professional or academic conference. Conferences of professional organizations may include one or more of the following: Minnesota Erosion Control Association (MECA), Minnesota Association of Soil and Water Conservation Districts (MASWCD), Sustainable Farming Association (SFA), Minnesota Solar Energy Industries Association, American Solar Grazing Association (ASGA), or others. In addition, through our partnership with Temple University, we expect the results will be included in peer-reviewed publications and presented at one or more national-level academic conference.
ENTRF will be acknowledged in all communications and dissemination activities. This will include use of the ENRTF logo and attribution language on all printed materials and in presentation. ENRTF will be tagged on social media posts.

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 work be funded?
The information from this study will inform management decisions, consulting guidance, seeding plans, and seed mix designs for future MNL projects. Currently MNL manages vegetation on over 2,000 acres on 150 solar sites per year, mostly in Minnesota and we direct sheep to graze over 3,000 acres per year in the Upper Midwest with our own flock and those of local cooperators. Furthermore, MNL has seeded over 5,000 acres of solar sites including sales of over 4,000 acres of pollinator-friendly seed mixes. We do not expect to need additional funding for this study.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Senior Restoration Ecologist		Project manager and lead researcher			14%	0.2		$29,100
Staff Ecologist		Data collection, processing, summarizing, and drafting reports			17%	0.4		$34,600
Field laborer		Set-up grazing exclusions, mowing operations			20%	0.1		$6,200
							Sub Total	**$69,900**
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Equipment	Fencing	exclusion for grazing animals					$12,000
	Tools and Supplies	Field tablet rental; with GPS capabilities and data collection apps; $20/day; 40 days in field total	Monitoring data collection and processing	X				$800
							Sub Total	**$12,800**
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Conference Registration Miles/ Meals/ Lodging	4 conference registrations (2 people @ 2 confences) @ $400 ea; 200 miles each @$0.655/mi; 4 overnights total @ $182.5 meals/lodging	presentation of data	X				$2,900

	Miles/ Meals/ Lodging	Mileage to sites; 200 miles total per trip; @ $0.655; 18 total trips	study sites access each year for 5 years					$2,400
							Sub Total	**$5,300**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$88,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Equipment, Tools, and Supplies		Field tablet rental; with GPS capabilities and data collection apps; $20/day; 40 days in field total	The field tablet is necessary to carefully document data, collect photos associated with the data, and collect location information to associate it with transects and points. These tablets are typically $600+ new and have a life span of about 5 years. Appropriate apps for use on the device also have a cost but are included as part of other applications with a cost of aver $700/yr. The $20/day rate is just meant to cover costs for purchase, maintenance, updates, and applications on the tablets. The use of the field tablet greatly simplifies and reduces the time associated with data management and post-processing for creating summaries..
Travel In Minnesota	Conference Registration Miles/Meals/Lodging	4 conference registrations (2 people @ 2 confences) @ $400 ea; 200 miles each @$0.655/mi; 4 overnights total @ $182.5 meals/lodging	These costs are directly related to the formal presentation and dissemination of the research findings. Conferences are the best way to disseminate findings from the research so that other solar developers, engineers, agencies, and land management professionals learn about our findings and can improve the understanding of grazing as a management tool. Two conferences are included to allow MNL to disseminate preliminary findings and final results multiple times to reach a broad audience within the solar and ecological restoration community.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	Enel - North America, Inc./ Enel Green Power	These funds will pay for MNL for grazing management of each of the project sites. These funds are estimated for 2024 through 2028 grazing management for all six sites included in the study. This value is for the full site - not limited to the study plots.	Pending	$340,100
In-Kind	Temple University	These funds will pay for Temple University staff to continue to work in partnership on the research. This pays specifically for the soil properties and includes the faculty salary (approximately 2 weeks per year) and funding for graduate students that will complete the soil collection and analysis. (This includes fringe and indirect costs)	Pending	$118,643
			Non State Sub Total	**$458,743**
			Funds Total	**$458,743**

Attachments

Required Attachments

Visual Component

File: 195237c6-45d.pdf

Alternate Text for Visual Component

Overview of Project Site Locations...

Financial Capacity

File: 0b5b3eaa-e89.pdf

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Enel North America Letter of Support	492b9cec-097.pdf
Ravi Letter of Support	16d1768d-fdf.pdf
Research Addendum revised 2024-251 final	e019ed56-a05.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

I made the changes requested for the budget. In-kind from Enel (for MNL to complete the grazing on the sites) + value from Temple Univ.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I agree to the Commissioner's Plan.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No