Environment and Natural Resources Trust Fund

M.L. 2021 Approved Work Plan

General Information

ID Number: 2021-308

Staff Lead: Rory Anderson

Date this document submitted to LCCMR: July 21, 2021

Project Title: Creating Cost-Effective Forage And Management Actions For Pollinators

Project Budget: $198,000

Project Manager Information

Name: Daniel Cariveau

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Project Reporting

Date Work Plan Approved by LCCMR: July 20, 2021

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

Project Completion: June 30, 2024

Final Report Due Date: August 14, 2024

Legal Information

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 08n

Appropriation Language: $198,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to evaluate pollinator forage across time and in response to burning and mowing and to design an open-access web-based tool to share these data for land managers across Minnesota to inform restoration seed mix selection.

Appropriation End Date: June 30, 2024

Narrative

Project Summary: We will collect long-term, species-specific plant data on pollinator forage quality and quantity. These data will be used to design an open-access web-based tool for land managers in Minnesota.

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

Planting flowers is the most effective method to conserve pollinators. For example, the first goal in the 2019 Minnesota State Agency Pollinator Report is that “lands throughout Minnesota support healthy, diverse, and abundant pollinator populations”. The key output of this goal is to provide “More food sources for pollinators”. However, pollinator habitat is incredibly expensive with seed mixes alone often costing over $1,000 per acre. Further, to ensure that habitats provide forage for multiple years, land managers often carry out costly management actions. The high cost of seeds and management limits the ability of public and private landowners to increase and maintain healthy pollinator landscapes.

A critical next step in creating habitat is to determine how to maximize benefits for pollinators while minimizing costs. There are three main knowledge gaps. First, there is a lack of information on the forage (nectar and pollen) quality and quantity of different plants used in pollinator seed mixes. Second, we lack detailed information on how forage resources change across years. Third, we do not understand how different management regimes influence forage quality and quantity. Finally, it is critical that this information is easily accessible to land managers.

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.

To fill these knowledge gaps, we will measure the forage (nectar and pollen) quantity and quality of 30 different flowering plant species. We will also collect data on the amount of flowers blooming and the number and species of bees visiting these plants. Second, we will use this information to help design and disseminate a web-based seed mix optimization tool. Third, we will conduct a study in which we randomly assign burning, mowing, or no treatment (control) to the experimental plots.

To accomplish this, we will leverage an ongoing study. We established a large-scale seed mix experiment in 2018. In total, we installed 288 - 9x9’ plots that vary in the types and number of flowering plant species. In 2019 and (hopefully) 2020 we collected flower abundance and bee data on these plots. In addition, the seed mix tool is currently in development. Both the field study and the seed mix tool are funded by the Foundation for Food and Agriculture Research.

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?

We will generate species-specific plant data that will enable land managers to create seed mixes that maximize the benefit to pollinators while minimizing the costs. Habitat is critical for native pollinators - including the over 400 species of bees native to Minnesota. This proposal will directly benefit the state's natural resources by increasing the quantity of pollinator habitat by reducing the cost per acre while also increasing habitat quality. For example, results from the project will help meet the output of the first goal of the Minnesota State Agency Pollinator Report: to provide "more food resources for pollinators".

Project Location

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

Region(s): SE

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

Activities and Milestones

Activity 1: Measure the quantity and quality of pollinator forage (nectar and pollen) over time.

Activity Budget: $121,795

Activity Description:
In the late fall of 2018, we planted a large-scale experimental study to determine how to maximize benefits to pollinators while minimizing costs. In particular, we planted 288 - 9x9' plots. Each plot contains a plant community in which we varied the number and type of plant species as well as the density of seeds. Prior to this current ENRTF proposal, we will have collected 2 full years of data on floral abundance and bee use. We will use ENRTF funds to complete 2 additional field seasons. This is critical as prairie plants take 3-4 years to establish. In particular, we will measure how floral abundance changes through time. Further, we will collect data on the nectar and pollen produced by the plants in this experiment. This will include sugar content of nectar, amount of nectar and pollen produced, and protein content of pollen. This information is critical as it will allow us to quantify the value of different plant species in regards to forage resources for pollinators. We can then link this forage value with the seed costs (see Activity 2) and will disseminate this information to land managers in Minnesota (see Activity 4).

Activity Milestones:

Description	Completion Date
First field season data collection	October 31, 2021
Collect data on bee diversity and abundance	September 30, 2022
Summarize results in outreach materials for land managers in Minnesota	April 30, 2023

Activity 2: Evaluate the effects of burning and mowing on pollinator forage quality and quantity

Activity Budget: $26,831

Activity Description:
Land management actions, specifically mowing and prescribed fire, are costly methods used to promote growth of native plant species and reduce growth of invasive plants. Despite the large effects that mowing and burning have on plant communities, we do not know how these management actions impact the quantity and quality of pollinator forage. With our existing experimental setup of 288 seed mix plots, we are in a perfect position to test this. We will mow one-third of our plots, burn one-third using an experienced tallgrass prairie restoration management company, and designate the remaining one-third as control (unmanaged) plots. We will then quantify floral abundance, bee use, and forage quantity and quality in these different treatments.

Activity Milestones:

Description	Completion Date
Mow one-third of the experimental plots	September 30, 2021
Burn one-third of the experimental plots	February 28, 2022
Incorporate results into outreach materials	March 31, 2023

Activity 3: Design and implement online, publicly accessible seed mix tool

Activity Budget: $35,154

Activity Description:
We are collaborating with researchers at the UMN Institute on the Environment (IonE) to create an online seed mix tool. This tool will allow a user to input their site characteristics (e.g. soil moisture, sun/shade), county, and pollinator

conservation program generate a seed mix that is optimized to support the greatest number of pollinators for a given budget. Currently, the model underlying the web-based interface uses basic data on a limited suite of plant species. We will use the results from Activity 1 to provide more detailed data and include more plant species. Further, we will incorporate seed costs data into the model. Our experimental results will enable land managers to create highly effective seed mixes at minimal costs. We will deliver our data to the primary model developer, Peter Hawthorne (IonE), and assist with model trouble-shooting and stakeholder engagement. We will organize stakeholder meetings to test and refine the tool with land managers in government agencies and conservation groups. We had already held a preliminary stakeholder meeting to get initial feedback on this tool that included participants from BWSR, DNR, and Minnesota offices of The Nature Conservancy, Xerces Society, and United States Fish and Wildlife Service.

Activity Milestones:

Description	Completion Date
Delivery of field season 1 data to IonE collaborator	January 31, 2022
First virtual stakeholder meeting to test version of the tool with experimental data	May 31, 2022
Delivery of field season 2 data to IonE collaborator	January 31, 2023
Second virtual stakeholder meeting to test version of the tool with experimental data	May 31, 2023
Seed mix tool place online with publicly available data collected from Activity 1	June 30, 2023

Activity 4: Communicating experimental results and introducing the seed mix tool to land managers

Activity Budget: $14,220

Activity Description:

In addition to the virtual stakeholder meetings with MN land managers described in Activity 2, we will hold an in-person outreach event to communicate our results with MN land managers and introduce a larger audience to our seed mix tool. We propose a 1-day workshop at the Rosemount Extension and Outreach Center consisting of the following activities: 1) Overview of the experimental design and main results, 2) Guided tour of our experimental plots, 3) Walk-through of the seed mix tool by the software developer, and 4) Working session for attendees to work with the software developer to create seed mixes for their own project needs. This workshop will be free to all attendees. In addition, we will create instructions that will enable new users to access the web-based tool.

Activity Milestones:

Description	Completion Date
Create outreach materials - online and in print	February 28, 2023
Hold workshop to disseminate results to land managers	April 30, 2023

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Peter Hawthorne	Institute on the Environment	Develop web-based tool	Yes

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.
One of the main objectives of this project is to develop a free, open-access, easy to use tool that land managers and seed suppliers can use to build seed mixes (Activity 3). This tool will be built and data will be populated by Peter Hawthorne. We will hold stakeholder meetings with MN land managers to develop the tool. We will hold an in-person outreach event in May 2023 to communicate our results with MN land managers and introduce a larger audience to our seed mix tool. We propose a 1-day workshop at the Rosemount Extension and Outreach Center (location of experiment) consisting of the following activities: 1) Overview of the experimental design and main results, 2) Guided tour of our experimental plots, 3) Walk-through of the seed mix tool by the software developer, and 4) Working session for attendees to work with the software developer to create seed mixes for their own project needs. This workshop will be free to all attendees. In addition, we will create instructions and an online tool that will enable users to access the web-based tool.

We will include the ENRTF logo in all signs, outreach materials, and the tool website. As we have in the past, we will also include the ENRTF logo on all talks and state this explicitly during acknowledgements. For peer-reviewed papers, we will acknowledge the ENRTF and include the grant identification number.

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?
The web-based tool will be available in the middle of the project and we will continue to update as results become available. The website will be run by the Institute on the Environment at the University of Minnesota. We will continue to seek funding to maintain and update this website into the future. We predict that once this seed mix tool is adopted by land managers, we will be able to generate funding for this tool into the future.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Data-Driven Pollinator Conservation Strategies	M.L. 2016, Chp. 186, Sec. 2, Subd. 03a	$520,000
Pollinator Research and Outreach	M.L. 2017, Chp. 96, Sec. 2, Subd. 03n	$500,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Software Developer		Develop Seed Mix Tool			37%	0.16		$19,766
Field Technician		Data collection, entry, and management			7%	0.52		$21,507
Field Technician		Data collection, entry, and management			7%	0.26		$10,753
Principle Investigator		Oversee Projects, Financial Management, and Supervise Postdocs and PhD Student			37%	0.08		$13,187
PhD Student - Summer and two semesters at 1-credit status		Data Analysis, Field Work, Supervising Field Technicians			20%	0.1		$26,550
Postdoctoral Research Associate		Project Management, Report Writing, Data Management, Hiring and Supervising Field Technicians			25.4%	1.4		$87,694
							Sub Total	**$179,457**
Contracts and Services								
TBD	Professional or Technical Service Contract	The contractor will burn half of the 3 x 3 yard treatment plots.				0.25		$10,000
Rosemount Research and Outreach Center (UMN)	Professional or Technical Service Contract	This is for renting the plots at the Rosemount Research and Outreach Center (part of University of Minnesota).				-		$1,500
							Sub Total	**$11,500**

Equipment, Tools, and Supplies								
	Tools and Supplies	Collecting nets (4), plot markers (1000), collection vials (2000), pin flags	Collecting bees, marking plots before and after burn					$1,500
							Sub Total	**$1,500**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel to field sites approximately 3 times per week during the 2022 field season. We will be able to fit 2-3 people in a vehicle. This is based on $0.56 per mile federal rates ~ 3 times per week for 16 weeks. (55 miles round trip from saint paul campus x approximately 3 trips per week x 16 weeks = $1,543	This will pay for rental car to visit field site. Field site is at UMN Rosemount Research and Outreach Center					$1,543
							Sub Total	**$1,543**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Publication Costs	Cost of publishing peer reviewed research					$2,000
	Printing	Outreach materials for land managers.	Printing of outreach materials for land managers to highlight the seed mix tool.					$500
							Sub Total	**$2,500**

Other Expenses								
		The budget will include the following: printing materials specifically for event ($500), tent and chair set up and rental for 32 attendees ($500), travel to site for set-up ($100), 2 outdoor toilet rentals ($240), Refreshments ($160).	This will be a field day for land managers. We will show them how to use the seed mix tool.	X				$1,500
							Sub Total	**$1,500**
							Grand Total	**$198,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Other Expenses		The budget will include the following: printing materials specifically for event ($500), tent and chair set up and rental for 32 attendees ($500), travel to site for set-up ($100), 2 outdoor toilet rentals ($240), Refreshments ($160).	While refreshments are generally ineligible, this event would be a multi-hour event and would take place in the summer. Refreshments are needed to make attendees comfortable and attentive during the workshop.

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: 3d75fe13-aaa.pdf

Alternate Text for Visual Component

Visual showing a schematic of the project....

Optional Attachments

Support Letter or Other

Title	File
Hawthorne_SupportLetter	8c62cd93-359.pdf
UMN Proposal Letter	c8d4e0f8-f4f.pdf
Research Addendum	76303831-340.docx
Background Check	f12480f8-aee.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

For some reason, the activities were out of order. I changed it to the correct order. They should be as follows: Activity 1: Measure the quantity and quality of pollinator forage (nectar and pollen) over time, Activity 2: Evaluate the effects of burning and mowing on pollinator forage quality and quantity, Activity 3: Design and implement online, publicly accessible seed mix tool, Activity 4: Communicating experimental results and introducing the seed mix tool to land managers. Please note, no wording or budgets were changed.

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, or sale of products and assets?

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?

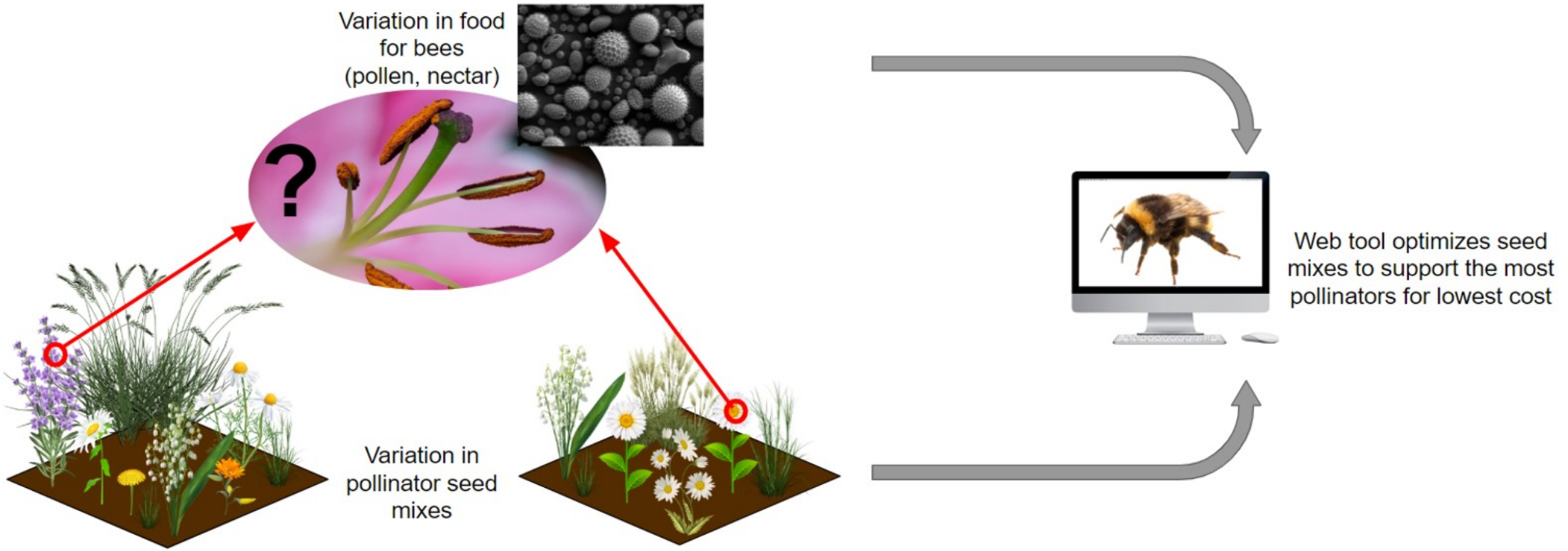
N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration


Variation in food for bees (pollen, nectar)
?
Variation in pollinator seed mixes
Web tool optimizes seed mixes to support the most pollinators for lowest cost