Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2017 LCCMR Work Plan

Date of Submission: Sept. 14, 2016

Date of Next Status Update Report: Jan. 1, 2017

Date of Work Plan Approval:

Project Completion Date: June 30, 2020

Does this submission include an amendment request? No

PROJECT TITLE: Healthy Prairies II: Preserving MN prairie plant diversity

Project Managers: Ruth G. Shaw, Georgiana May

Organization: Department of Ecology, Evolution and Behavior, University of Minnesota

Mailing Address: 100 Ecology Bldg.
1987 Upper Buford Circle
University of Minnesota

City/State/Zip Code: St. Paul, MN 55108

Telephone Number: (612) 624-7206 (Shaw)

Email Address: shawx016@umn.edu

Web Address: https://ruthgshaw.wordpress.com/research/

Location: WCentral, SE,SW,NW

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$900,000**
	Amount Spent:	**$0**
	Balance:	**$900,000**

Legal Citation: M.L. 2017, Chp. xx, Sec. xx, Subd. xx

Appropriation Language: *[To be inserted following the MN Legislative Session in Spring 2017. This will be blank for the initial submission and will be provided to you at a later date.*

I. PROJECT TITLE: Healthy Prairies II: Preserving Prairie Plant Diversity

II. PROJECT STATEMENT:

Minnesota prairies harbor an extraordinary diversity of plant and microbial life, while also nurturing wildlife, retaining water and topsoil, and beautifying rural landscapes. Yet habitat loss and environmental variability threaten the persistence of the once immense prairie landscape and its stunning biotic diversity. Moreover, limited understanding of this diversity and insufficient seed availability hinder cost-effective and sustainable management of this iconic Minnesota biome.

Healthy Prairies (HP) Phase II will build on the accomplishments under current funding (2014-2017). Our team and volunteers spent over 1000 hours scouting 27 prairie remnants and cataloging locations over MN prairie regions for 40 of the more common and widespread native prairie species. We collected seed from thousands of individuals, retaining extensive genetic variation while tracking locality. For experimental work, we have cultured over 5000 plant-associated microbes. We established seed-increase plots for 6 plant species (from 12 sites) and used these in experimental plantings at three locations spanning the latitudinal range of MN prairies. To realize this investment in the preservation of MN prairie plant diversity, while providing essential resources and information for prairie restoration, we will:

- Preserve diverse seed from 20 of the rarer prairie species.
- Obtain and maintain cultures of an additional 5000 naturally occurring microbial partners for grasses.
- Determine the geographic scale important to plant survival and reproduction in a varying environment.

Four major MN geographic regions across the native prairie will be served. Providing locally-sourced seed, the project will help restore and conserve the diversity of MN prairies and their associated wildlife, pollinator and microbial diversity.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of *Dec. 1, 2018***:**

Project Status as of *June 1, 2018***:**

Project Status as of *Dec. 1, 2019***:**

Project Status as of *June 1, 2019*

Project Status as of *Dec. 1, 2020*

Overall Project Outcomes and Results: *July 15, 2020*

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Preserving prairie plant diversity for conservation and restoration

Description: We will increase availability of source-identified seed for use in MN prairie restorations by working with partners to increase seed collection, distribution, and to develop transfer agreements. Twenty of the less common but important prairie species, in addition to the 40 species obtained in 2014-17, are targeted, and these will entail greater time and scouting to collect. Efforts will be evaluated via the amount and diversity of seed collected and by the level and quality of partner involvement.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 113,500
Amount Spent: $ 0
Balance: $ 113,500

Outcome	Completion Date
1. *Increase availability of diverse, source-identified seed for prairie restorations by expanding our network of collectors and collection locations. Collect seed for 20 additional, relatively common species.*	October, 2019

2. *Implement material transfer agreements with producers.*	December, 2019
3. *Collect source-identified seed for 20 rarer prairie plant species. Deposit voucher specimens at UM herbaria, deposit seed at USDA facility for long-term storage, transfer seed to producers.*	June, 2020

Activity 1 Status as of *Dec. 1, 2018***:**

Activity 1 Status as of *June 1, 2018***:**

Activity 1 Status as of *Dec. 1, 2019***:**

Activity 1 Status as of *June 1, 2019***:**

Activity 1 Status as of *Dec. 1, 2020***:**

Final Report Summary:

Activity 2: Finding your friends in unlikely places – beneficial microbes for prairie plants
Description: We will assess the diversity and effect of naturally occurring plant-associated microbes for two types of plants essential to healthy prairies – legumes and grasses. Results will inform land managers about the use of microbes to improve prairie plant establishment in restorations, a practice common in agriculture but not widely applied to natural systems.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 405,000
Amount Spent: $ 0
Balance: $ 405,000

Outcome	Completion Date
1. *Use previously collected microbes to determine beneficial microbes' potential for enhancing prairie clover (*Dalea spp.*) survival and reproduction in experimental plantings and greenhouse studies.*	November, 2019
2. *Determine the diversity of microbial communities associated with little bluestem grass (*Schizachyrium scoparium*) and collect 5000 new microbes. Store living cultures at UM and USDA.*	December, 2019
3. *Determine effects of plant-associated microbes on little bluestem establishment and reproduction in experimental plantings and in greenhouse studies.*	June, 2020

Activity 2 Status as of *Dec. 1, 2018:*

Activity 2 Status as of *June 1, 2018***:**

Activity 2 Status as of *Dec. 1, 2019***:**

Activity 2 Status as of *June 1, 2019***:**

Activity 2 Status as of *Dec. 1, 2020***:**

Final Report Summary:

ACTIVITY 3: Adaptive genetic diversity of prairie plants

Description: Continue field experiments established under Phase I to characterize the spatial scale of local adaptation for 6 prairie perennials. Evaluate genetic variation for survival and reproduction of little bluestem grass. Results will inform methods of prairie conservation and healthy prairie restoration that maintain diversity of prairie plant species.

Summary Budget Information for Activity 3:

ENRTF Budget: $ 381,500
Amount Spent: $ 0
Balance: $ 381,500

Outcome	Completion Date
1*. Monitor survival, growth, and reproduction in established experiments with 6 species and over 6000 plants to evaluate effect of seed source on establishment and success of prairie plants in restorations.*	October, 2020
2. *Plant pedigreed little bluestem seed into field experiments to assess its capacity to adapt to varied environmental conditions, and the role of microbes (identified in Activity 2) in that process.*	October, 2020

Activity 3 Status as of Dec. 1, 2018:

Activity 3 Status as of *June 1, 2018***:**

Activity 3 Status as of *Dec. 1, 2019***:**

Activity 3 Status as of *June 1, 2019***:**

Activity 3 Status as of *Dec. 1, 2020***:**

Final Report Summary:

V. DISSEMINATION:

Description: Information and materials gained in Healthy Prairies II will be disseminated as follows. Seed collected of 20 prairie species will be deposited at UM and NCGRP (Activity 1). Information on microbial collections and their effects on prairie plant survival and reproduction Information on the establishment will be communicated as written reports. Microbial collections will be maintained at UM and USDA (Activity 2). Information on the survival, and reproduction of six prairie plants in 3 outstate locations will be communicated to the MN-DNR, The Nature Conservancy, private land managers, and seed companies as written reports (Activity 3). The research findings will be disseminated through peer-reviewed papers published in major journals of evolution and ecology. A publicly accessible website giving collection locations and approximate population densities for prairie species will be maintained. In addition, public outreach will be conducted for all three Activities via Market Science, a program of UM presenting results at farmers markets throughout the Twin Cities.

Status as of *Dec. 1, 2018:*

Status as of *June 1, 2018***:**

Status as of *Dec. 1, 2019***:**

Status as of *June 1, 2019***:**

Status as of *Dec. 1, 2020***:**

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview:

***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	$ Amount	Overview Explanation
Personnel:	$ 811,500	Labor intensive field work, lab analyses
Professional/Technical/Service Contracts:	$ 23,000	Sequencing (microbes, Activity 2), greenhouse
Equipment/Tools/Supplies:	$ 45,000	Field and lab supplies, postage
Capital Expenditures over $5,000:	$	
Fee Title Acquisition:	$	
Easement Acquisition:	$	
Professional Services for Acquisition:	$	
Printing:	$	
Travel Expenses in MN:	$ 20,500	Travel to experimental and seed collection sites
Other:	$	
TOTAL ENRTF BUDGET:	**$ 900,000**	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than $5,000: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:
14.1

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: N/A

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
	$	$	
State			
Indirect costs – In kind services 53% of total direct costs	$477,000	$	Office, lab, and meeting space, accounting and secretarial services, phone & office equipment, security, and library access, for all project personnel.
TOTAL OTHER FUNDS:	**$**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners:

Partners receiving ENRTF funding

- UMN-TC faculty and Project Managers - Drs. R. Shaw ($52,000, summer salary), G. May ($49,000, summer salary); Collaborator Dr. Margaret Kuchenreuter, UM Morris ($37,000, outstate seed collections); 2 post-doctoral fellows ($157,500 each; plant adaptation, beneficial microbes); 2 graduate students ($91,500 each, plant adaptation, beneficial microbes); 4 undergraduate students ($32,000, field assistance, lab and greenhouse studies of plant – microbe interactions); Coordinator of Personnel ($103,000, recruit, train, and work with volunteers, field assistance); Technical assistant ($81,000, conduct lab and field research, maintain cultures, ordering, equipment management). *Amounts shown reflect 3 years funding.*

Partners NOT receiving ENRTF funding

- UMN-TC faculty Drs. D. Wyse, D. Moeller, P. Tiffin; UM-D faculty Dr. J. Etterson; MN-DNR; The Nature Conservancy. USDA NCGRP (Drs. C. Walters, C. Richards).

B. Project Impact and Long-term Strategy: The impact of the proposed work will be to preserve MN prairie plant diversity, and to provide a knowledge base for restoration and maintenance of prairie plant diversity, for future generations' use. The project will enhance land management efforts that maintain prairie lands for wildlife, provide sources of new plant and microbial products, and provide databases on distributions and abundances of many iconic prairie plant species.

The strategy for accomplishing these goals is to:

- Collect seed from 20 plant species, additional to those collected in the previous project and to include those considered more rare. This will be accomplished by the Healthy Prairies team, and our outstate collaborators.
- Determine survivorship, growth, and reproduction of 6 prairie plant species at experimental plots established under previous funding at three outstate locations. These locations represent a north-south gradient across the western prairie area of MN (see Visual). We will continue seed increase plots at the Rosemount Research and Outreach Center (UM)
- Investigate the role of beneficial microbes in plant survival and reproduction. Make collections of microbial isolates, identify these, and use in experimental greenhouse studies. Beneficial microbes will be deposited at UM and USDA culture collections for public use.
- Determine the scale of genetic variation for plant survival and reproduction across the varied MN landscape as represented by the experimental plots. The results will be communicated in publications, to the public such as native plant groups, and to prairie seed companies.

  Together, the results and information generated in Healthy Prairies II will have the intended impacts as we work with land managers, seed companies, and collections resources to increase the production and success of seed sources for prairie plantings across Minnesota.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
Healthy Prairies I: Seed storage, beneficial microbes, and adaptation	7/1/14 - 6/30/2017	$ 600,000
		$
		$

VIII. REPORTING REQUIREMENTS:

- **The project is for 3 years, will begin on 07/01/2017, and end on 06/30/2020.**
- **Periodic project status update reports will be submitted** *Dec. 1* **and** *June 1* **of each year.**
- **A final report and associated products will be submitted between June 30 and August 15, 2020**.

IX. VISUAL COMPONENT or MAP(S):

X. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List:

B. Acquisition/Restoration Information:

<u>Fee Title Acquisition</u>

1. **Describe the selection process for identifying and including proposed parcels on the parcel list, including explanation of the criteria and decision-making process used to rank and prioritize parcels.**

2. **List all adopted state, regional, or local natural resource plans in which the lands included in the parcel list are identified. Include a link to the plan if one is available.**

3. **For any parcels acquired in fee title, a restoration and management must be prepared. Summarize the components and expected outcomes of restoration and management plans for parcels acquired by your organization, how these plans are kept on file by your organization, and overall strategies for long-term plan implementation, including how long-term maintenance and management needs of the parcel will be financed into the future.**

4. **For each parcel to be conveyed to a State of Minnesota entity (e.g., DNR) after purchase, provide a statement confirming that county board approval will be obtained.**

5. **If applicable (see M.S. 116P.17), provide a statement confirming that written approval from the DNR Commissioner will be obtained 10 business days prior to any final acquisition transaction.**

<u>Conservation Easement Acquisition</u>

1. **Describe the selection process for identifying and including proposed parcels on the parcel list, including explanation of the criteria and decision-making process used to rank and prioritize parcels.**

2. **List all adopted state, regional, or local natural resource plans in which the lands included in the parcel list are identified. Include a link to the plan if one is available.**

3. **For any conservation easement acquired, a restoration and management must be prepared. Summarize the components and expected outcomes of restoration and management plans for parcels acquired by your organization, how these plans are kept on file by your organization, and overall strategies for long-term plan implementation, including how long-term maintenance and management needs of the parcel will be financed into the future.**

4. **For each parcel to be conveyed to a State of Minnesota entity (e.g., DNR) after purchase, provide a statement confirming that county board approval will be obtained.**

5. **If applicable (see M.S. 116P.17), provide a statement confirming that written approval from the DNR Commissioner will be obtained 10 business days prior to any final acquisition transaction. A copy of the written approval should be provided to LCCMR.**

6. **Provide a statement addressing how conservation easements will address specific water quality protection activities, such as keeping water on the landscape, reducing nutrient and contaminant loading, protecting groundwater, and not permitting artificial hydrological modifications.**

7. **Describe the long-term monitoring and enforcement program for conservation easements acquired on parcels by your organization, including explanations of the process used for calculating conservation easement monitoring and enforcements costs, the process used for annual inspection and reporting on monitoring and enforcement activities, and the process used to ensure perpetual funding and implementation of monitoring and enforcement activities.**

<u>Restoration</u>

1. **Provide a statement confirming that all restoration activities completed with these funds will occur on land permanently protected by a conservation easement or public ownership.**

2. **Summarize the components and expected outcomes of restoration and management plans for the parcels to be restored by your organization, how these plans are kept on file by your organization, and overall strategies for long-term plan implementation.**

3. **Describe how restoration efforts will utilize and follow the Board of Soil and Water Resources "Native Vegetation Establishment and Enhancement Guidelines" in order to ensure ecological integrity and pollinator enhancement.**

4. **Describe how the long-term maintenance and management needs of the parcel being restored with these funds will be met and financed into the future.**

5. **Describe how consideration will be given to contracting with Conservation Corps of Minnesota for any restoration activities.**

6. **Provide a statement indicating that evaluations will be completed on parcels where activities were implemented both 1) initially after activity completion and 2) three years later as a follow-up. Evaluations should analyze improvements to the parcel and whether goals have been met, identify any problems with the implementation, and identify any findings that can be used to improve implementation of future restoration efforts at the site or elsewhere.**

Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget

Project Title: Healthy Prairies II: Preserving MN prairie plant diversity

Legal Citation: *Fill in your project's legal citation from the appropriation language - this will occur after the 2017 legislative session.*

Project Manager: Dr. Ruth Shaw

Organization: Regents of the University of Minnesota

M.L. 2017 ENRTF Appropriation: $ *Fill in your appropriation amount (this is the amount recommended for funding by LCCMR)*

Project Length and Completion Date: 3 Years, June 30, 2020

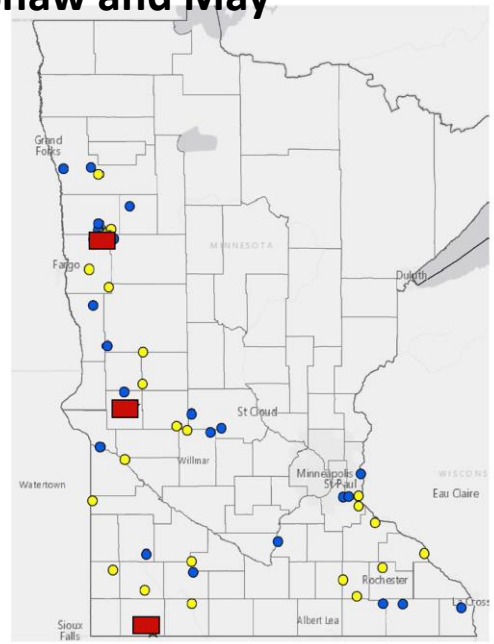
Date of Report: *Fill in the date of report submission (this will be updated for each status update report)*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	***Fill in your activity title here.***			***Fill in your activity title here.***			***Fill in your activity title here.***				
Personnel (Wages and Benefits)	$57,000	$0	$57,000	$396,000	$0	$396,000	$399,000	$0	$399,000	$852,000	$852,000
Dr. Ruth Shaw, Co-PI: $52,000 (75% salary, 25% benefits); 8% FTE. 1 month per year for three years.											
Dr. Georgiana May, Co-PI: $49,000 (75% salary, 25% benefits); 8% FTE. 1 month per year for 3 years.											
Dr. Margaret Kuchenreuter, UM Morris, collaborator: $37,000 (75% salary, 25% benefits); 8% FTE. 1 month per year, for 3 years.											
2 Postdoctoral Associates: $315,000 (82% salary, 18% benefits); 100% FTE, 3 years											
2 Graduate Students: $183,000 (51% salary, 49% benefits during the academic year & 85% salary, 15% benefits during the summer); 50% FTE, 2 years.											
4 Undergraduate Students: $32,000 (100% salary, 0% benefits); 2 @ 8% FTE (UM Twin Cities) and 2 @ 15% FTE (UM Morris), 3 years.											
Coordinator of personnel: $103,000 (79% salary, 21% benefits); 100% FTE, 2 years.											
Technical assistant: $81,000 (79% salary, 21% benefits); 100% FTE, 2 years.											
Equipment/Tools/Supplies	$0	$0	$0	$24,000	$0	$24,000	$18,000	$0	$18,000	$42,000	$42,000
Lab Supplies: $24,000. Supplies for microbial culturing and storage (~ 6000 cultures per year), microbial detection in plant materials and identification of organisms using molecular methods and microscopy.											

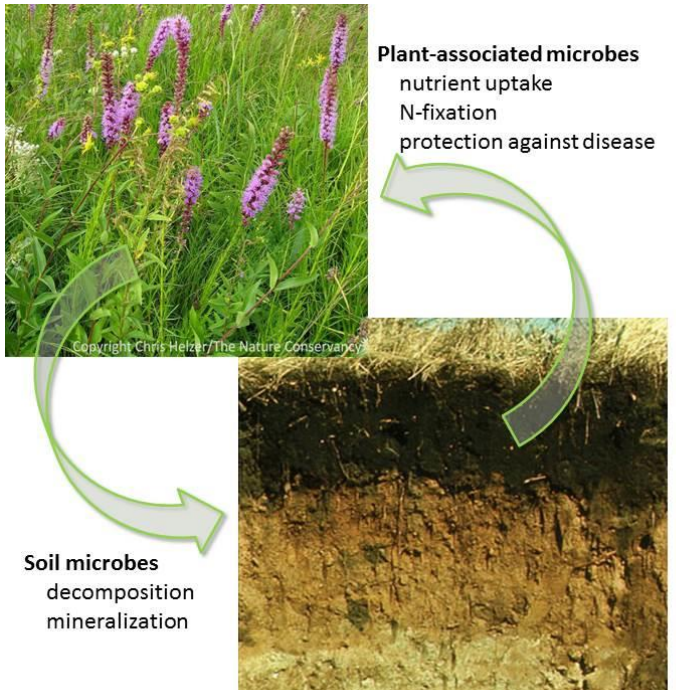
Field supplies and prep work: $18,000. Envelopes and bags, blaze hats and vests, galvanized nails and landscape staples, tape measures, fencing materials, knee pads, mallets, field notebooks, etc.											
Travel expenses in Minnesota	$3,000	$0	$3,000	$8,500	$0	$8,500	$8,500	$0	$8,500	$20,000	$20,000
Travel to field sites for seed collection (Activity 1), and microbial sampling (Activity 2). Monitoring experimental plots (Activities 2, 3), and seed increase plots in Rosemount. Total travel estimated: 25,000 miles in MN, with 150 hotel-person overnights, over 3 years.											
Other	$0	$0	$0	$16,000	$0	$16,000	$8,000	$0	$8,000	$24,000	$24,000
Postage/Shipping Fees: $2,000. Shipping seeds to Nat'l Center for Genetic Resources Preservation (NCGRP), USDA facility in Ft. Collins, CO. $100 per shipment x 20 shipments.											
Sequencing: $10,000. Detection, indentification, and distribution of naturally occurring microbes in native prairie plants using rapid, cutting edge "metagenomics" approaches.											
Greenhouse space rental: $12,000. Evalutating microbial effects on plant growth and reproduction (Activity 2), seedlings for outplanting, plant genetic variation analyses (Activity 3). 500 s x $0.81/sqft per month x 30 months. Seed increase plot fees.											
COLUMN TOTAL	**$60,000**	**$0**	**$60,000**	**$444,500**	**$0**	**$444,500**	**$433,500**	**$0**	**$433,500**	**$938,000**	**$938,000**

004-A Healthy Prairies II: Preserving MN Prairie Plant Diversity

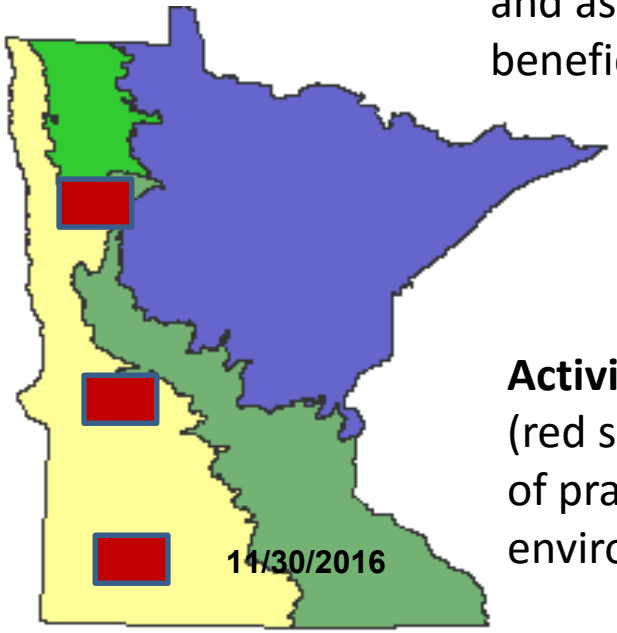
Shaw and May



Activity 1 – Continued seed collections of 20 prairie species across MN



Activity 2 – Collection, identification and assessment of microbes beneficial to prairie plants



Activity 3 – Experimental plantings (red squares) to assess adaptation of prairie species to the varied environments of MN.