



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2020 ENRTF Work Plan (Main Document)

Today's Date: February 26, 2020

Date of Next Status Update Report: April 1, 2021

Date of Work Plan Approval:

Project Completion Date: June 30, 2022

Does this submission include an amendment request? no

PROJECT TITLE: Healthy Prairies III: Restoring MN prairie plant diversity

Project Manager: Ruth G. Shaw

Organization: University of Minnesota-TC

College, Department, or Division: College of Biological Sciences

Mailing Address: 1479 Gortner Ave., 140 Gortner Laboratory

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

Project Manager Direct Telephone Number: 612 624 7206

Email Address: shawx016@umn.edu

Web Address: <https://ruthgshaw.wordpress.com/>

Location: W Central, SE,SW,NW

Total Project Budget: \$500,000

Amount Spent: \$0

Balance: \$0

Legal Citation: M.L. 2020, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

PROJECT STATEMENT:

We request a third funding allocation to the Healthy Prairies Project to further realize the tremendous investment in the preservation of MN prairie plant diversity, and to provide essential resources and information for prairie restoration. We will:

- Preserve diverse seed from 10 of the rarer prairie species, and develop methods for propagating them.
- Evaluate roles of beneficial microbes in improving prairie plant seedling survival and growth.
- Evaluate the decline of prairie plant survival and reproduction with distance from source.

We will build on the extensive accomplishments of two previous phases of funding (2014-2020) and garner the materials and knowledge necessary to prairie restoration that is resilient to environmental challenges. Our team at UM-TC and UM-Morris and more than 50 volunteers has devoted over 2500 hours at 66 prairie remnants, collecting seeds of 90 native prairie species, retaining extensive genetic variation while tracking locality. We have also cultured over 5000 microbes from prairie plants. Among our experimental results are a) Dalea (prairie clovers) transplanted closer to their source site establish more beneficial microbial associations and b) prairie plant adaptation depends on environmental similarity as well as proximity. All our efforts address the critical need to maintain and restore Minnesota's native prairies.

Project results will provide diverse prairie seed sources to local growers for increasing seed supply, and with the use of beneficial microbes, optimize the success of new plantings across the greatly varied environments of MN prairies.

This work is critically important because habitat loss and rapid environmental change threaten the persistence of the once vast prairie and its stunning biotic diversity that nurtures wildlife, purifying water and retaining topsoil. We actively communicate with stakeholders in prairie restoration to provide essential resources and information emerging from our work. Thus, project outcomes contribute to the economic and ecological well-being of Minnesota's public by providing information and materials supporting prairie restoration. *Together, the results of the funded research directly address the key limitations to cost-effective and sustainable restoration of the iconic Minnesota prairie biome by improving locally-sourced seed availability and diversity, increasing plant recruitment and survival rates using microbes, and providing the knowledge base by which the benefits of prairie diversity might be fully realized across Minnesota.*

II. OVERALL PROJECT STATUS UPDATES:

First Update April 1, 2021

Second Update October 1, 2021

Third Update April 1, 2022

Final Report between project end (June 30) and August 15, 2022

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Preserving prairie plant diversity for conservation and restoration

Description: Working with our partners across MN, we will increase the availability of source-identified seed for use in MN prairie restorations. New collections will target 10 species that are rarer than those we have gathered in the first two phases, and thus will entail greater time in scouting to collect. Efforts

will be evaluated via the amount and diversity of seed collected, by the number of species for which propagation methods are developed, and by the degree of partner involvement.

ACTIVITY 1 ENRTF BUDGET: \$57,348

Outcome	Completion Date
1. Increase availability and diversity of source-identified seed for use in MN prairie restorations through collection of 10 additional species from geographically widespread locations. Deposit voucher specimens at UM.	June 2022
2. Develop propagation methods for species that are currently difficult to propagate.	June 2022
3. Use material transfer agreements and transfer seed to producers for propagation to support prairie restorations and local economies.	June 2022

First Update April 1, 2021

Second Update October 1, 2021

Third Update April 1, 2022

Final Report between project end (June 30) and August 15, 2022

ACTIVITY 2 Title: Beneficial microbes: hidden partners in prairie restoration.

Description: We will use experimental plantings in the field and greenhouse to determine the beneficial impact of naturally occurring microbes for two types of plants essential to healthy prairies - legumes and grasses. Results will inform land managers about the role of beneficial microbes for successfully establishing new prairie restorations, and provide these managers with locally-sourced microbes.

ACTIVITY 2 ENRTF BUDGET: \$208,682

Outcome	Completion Date
1. Compare early seedling survivorship and establishment in Dalea spp. with and without beneficial microbe inoculation.	October 2021
2. Compare drought tolerance of little bluestem grass with and without beneficial fungal inoculation.	June 30, 2022

First Update April 1, 2021

Second Update October 1, 2021

Third Update April 1, 2022

Final Report between project end (June 30) and August 15, 2022

ACTIVITY 3: Adaptive genetic diversity of prairie plants

Description: Continue field experiments to characterize the spatial scale of local adaptation for six prairie perennials, evaluate genetic variation for survival and reproduction of little bluestem grass, and assess effects of interbreeding between its populations. Results will inform methods of prairie conservation and restoration that maintain genetic diversity and thus resiliency against varied environments.

ACTIVITY 3 ENRTF BUDGET: \$233,970

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.	June 30, 2022
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2. Evaluate pedigreed little bluestem populations in field experiments to assess their genetic capacity to adapt to varied environmental conditions.	June 30, 2022
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First Update April 1, 2021

Second Update October 1, 2021

Third Update April 1, 2022

Final Report between project end (June 30) and August 15, 2022

IV. DISSEMINATION:

Description: Information and materials gained in Healthy Prairies III will be disseminated as follows. Seed collected from 10 prairie species will be deposited at UM and NCGRP (Activity 1). Information on microbial collections and their effects on prairie plant survival and reproduction will be communicated as written reports. Microbial collections will be maintained at UM and USDA (Activity 2). Information on the survival, and reproduction of 6 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. The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the [ENRTF Acknowledgement Guidelines](#).

First Update April 1, 2021

Second Update October 1, 2021

Third Update April 1, 2022

Final Report between project end (June 30) and August 15, 2022

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: None

Explanation of Use of Classified Staff: None

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

Enter Total Estimated Personnel Hours for entire duration of project: 15,440	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 7.4
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Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: 0	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0
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VI. PROJECT PARTNERS:

- A. Partners outside of project manager's organization receiving ENRTF funding: Dr. Margaret Kuchenreuther, UM-Morris; Dr. Shelby Flint, Southwest Minnesota State University, Marshall MN
- B. Partners outside of project manager's organization NOT receiving ENRTF funding: The Nature Conservancy, MN DNR

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

With LCCMR funding 2014 and 2017, the Healthy Prairies team committed their efforts to build this project over at least 10 yr because the conservation of these long-lived perennials is necessarily a long-term effort. We will now translate the information and materials developed through previous funding into contributions to successful prairie preservation and restoration – methods to improve propagation of source-identified seed collections for 90 prairie species and of microbial symbionts that promote prairie plant establishment, improved practices widely disseminated through our extensive outreach, and continued evaluation of plant survival and reproduction in experimental plantings. The HPP serves four major MN geographic regions across the native prairie through our active outreach to citizens, the TNC, the DNR, and seed suppliers. Increasing supply of source-identified seed and beneficial microbes, while addressing open questions, the project will help restore and conserve the diversity of MN prairies and of their associated wildlife and pollinators, and improve soil and water quality.

The HP project leverages funding and expertise from seed collection infrastructure developed with NSF funding (Shaw and colleagues), from NSF-funded microbial research (May and colleagues), and from cooperative agreements with TNC and MN DNR. Continuation of this work will greatly expand the knowledge base and improve the guidance to land managers and our outreach to the MN public. Future research to address basic questions may be funded through NSF, while the production of locally sourced and certified seed is facilitated through our material transfer agreements with local producers of native plant seed. The production of inoculum for beneficial microbes will be funded through the USDA or contracts with commercial providers.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted April 1 and October 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2022

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

- A. Budget Spreadsheet**
- B. Visual Component or Map**
- C. Parcel List Spreadsheet**
- D. Acquisition, Easements, and Restoration Requirements**
- E. Research Addendum**

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



Legal Citation:

Project Manager: Dr. Ruth Shaw

Project Title: Healthy Prairies III: Resources for restoring MN prairie plant diversity

Organization: Dept. Ecology, Evolution and Behavior, U. Minnesota

Project Budget: \$500,000

Project Length and Completion Date: 2 years, completion June 30, 2022

Today's Date: February 26, 2020

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)		\$ 437,299	\$ -	\$ 437,299
Dr. Ruth Shaw, Co-PI, UMN-Twin Cities, \$18,632 (75% salary, 25% benefits), 4% FTE each year for 2 years (0.5 months per year)				
Dr. Georgiana May, Co-PI, UMN-Twin Cities, \$17,505 (75% salary, 25% benefits), 4% FTE each year for 2 years (0.5 months per year)				
Dr. Margaret Kuchenreuter, collaborator, UMN-Morris, \$19,660 (75% salary, 25% benefits), 6% FTE each year for 2 years (0.75 months per year)				
1 Postdoctoral Associate, \$130,845 (81% salary, 19% benefits); 100% FTE - Two years of support is requested. One postdoc for Activity 3.				
2 Graduate Students, \$100,130 (53% salary, 47% benefits during the academic year & 85% salary, 15% benefits during the summer); 50% FTE - Two academic years and one summer of support is requested.				
4 Undergraduate Students, \$54,415 (100% salary, 0% benefits); 28% FTE in Year 1 and 25% FTE in Year 2.				
Lab Tech, \$96,112 (78% salary, 22% benefits), 100% FTE for 2 years.				
Professional/Technical/Service Contracts			\$ -	\$ -
Consultants - Jeff Shraub (Northern MN seed collections)				
		\$ 6,000		\$ 6,000
Equipment/Tools/Supplies			\$ -	\$ -
Supplies (\$11,200) - field and lab (microbial and molecular) supplies				
		\$ 11,200		\$ 11,200
				\$ -
Travel expenses in Minnesota			\$ -	\$ -
Travel - Travel to field sites for seed collection (Activity 1) and microbial sampling (Activity 2), establishing and monitoring experimental plots (Activities 2, 3), and seed increase plots in Rosemount. Total travel estimated: 30K mi in MN, w/ 180-hotel person overnights, over 2 yrs. All travel to be conducted per UMN Policy as required in Guidelines On Allowable Expenses.				
		\$ 28,000		\$ 28,000
Other			\$ -	\$ -
Lab Analyses (\$8,000) - UM Genomics Center - sequencing, 5.7 analyses @ \$1,400 each				
		\$ 8,000		\$ 8,000
Greenhouse Fees (\$3,301) - UM GH - 800 sq. ft for 12 months over 2 years, at \$0.8 per sq. ft. per month, per current UMN greenhouse rental rates				
		\$ 3,301		\$ 3,301
Publications (\$6,000) - page fees - dissemination through appropriate journals and publications				
		\$ 6,000		\$ 6,000
Mailing or Courier Fees (\$200) - send seeds collected by collaborators at outstate sites to UM				
		\$ 200		\$ 200
COLUMN TOTAL		\$ 500,000	\$ -	\$ 500,000
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:				
		\$ -	\$ -	\$ -
State:				
		\$ -	\$ -	\$ -
In kind: Indirect costs (54% MTDC) associated with this proposal		secured	\$ 253,236	\$ -
				\$ 253,236
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
HP I: 2014-2017		\$ -	\$ 600,000	\$ 600,000
HP II: 2017-2020 obligated funds are for salary and fringe of project personnel		\$ 225,754	\$ 900,000	\$ 490,300
				\$ 409,700