



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2015 Work Plan

Date of Report: October 15, 2014

Date of Next Status Update Report: January 1 2016

Date of Work Plan Approval:

Project Completion Date: June 30, 2020

Does this submission include an amendment request? No

PROJECT TITLE: Minnesota State University Moorhead Prairie and Riparian Restoration and Monitoring

Project Manager: Brian Wisenden

Organization: Minnesota State University Moorhead

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Location: Clay County, MSUM Regional Science Center, Buffalo River State Park (DNR), Bluestem Scientific and Natural Area (TNC), Minnesota State University Moorhead,

Total ENRTF Project Budget:	ENRTF Appropriation:	\$527,000
	Amount Spent:	\$0
	Balance:	\$527,000

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 08g

Appropriation Language:

\$527,000 the first year is from the trust fund to the Board of Trustees of the Minnesota State Colleges and Universities System for Minnesota State University Moorhead in cooperation with the Department of Natural Resources to restore and monitor 160 acres of prairie and riparian habitat and develop and disseminate monitoring protocols. This appropriation is contingent upon the donation of a 60-acre parcel to Minnesota State University Moorhead from the Minnesota State University Moorhead Alumni Foundation and is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Minnesota State University Moorhead Prairie and Riparian Restoration and Monitoring

II. PROJECT STATEMENT: Minnesota State University Moorhead's Science Center will restore and monitor 160 acres of prairie and riparian forest habitat resulting in the development and dissemination of monitoring protocols for understanding long-term ecological recovery.

a) Basic project background or context

The Lake Agassiz beach ridge forms a north-south line in the prairie region of western Minnesota. The Minnesota Prairie Conservation Plan identified the Blue Stem Prairie complex (The Nature Conservancy, TNC) as one of the Core Focus Areas for prairie conservation, with recommended actions of acquisition, restoration and enhancement of lands adjacent to remnant areas. The Bluestem Prairie complex occupies an area of 23,637 acres and is adjacent to Buffalo River State Park (Department of Natural Resources, DNR) and the Regional Science Center (Minnesota State University Moorhead, MSUM). Because ecological resiliency of preserved land increases with the size of area and the connectivity of the area to other natural areas, restoration and enhancement of MSUM land contributes to the ecological functioning of the entire complex. The educational mission of MSUM will provide generations of students with a living outdoor laboratory in which to engage in monitoring the success of restored areas in comparison against reference sites in remnant prairie, and in so doing, will contribute to the development of monitoring protocols for restoration efforts across the state of Minnesota and beyond.

b) Major project objectives

The Minnesota Prairie Conservation Plan recommends several strategies: (1) Protection, (2) Restoration and Enhancement and (3) Monitoring and Assessment.

Our project has three objectives that address all three of these strategic activities:

- (1) **Restoration** of (a) 100 acres of abandoned agricultural field to mesic prairie habitat, including experimental **enhancement** of half of that area to promote abundance and diversity of pollinators important to prairie ecosystem health and (b) 60 acres of mesic prairie mixed with terrace riparian forest that includes 17 acres of golf course turf. The golf course business has leased this land from the MSUM Alumni Foundation. That lease expires March 31, 2015. The Alumni Foundation will gift the land to MSUM when LCCMR funding for this restoration project receives final approval (see attached letter). The restoration of these lands is the realization of long-held goals of MSUM consistent with the institutional educational mission and in compliance with memoranda of understanding for land stewardship among MSUM, TNC and the DNR. Funds requested in this proposal will be used to **restore natural ecological function of these lands and protect them** in perpetuity. Archaeological properties will be documented and considered in restoration plans. Restoration of these lands not only brings these areas back to ecological functioning, but also contributes to the ecological resiliency of the entire complex that includes the Bluestem Prairie Science and Natural Area (TNC) and the Buffalo River State Park (DNR).
- (2) **Monitoring and Assessment** of the restored areas will be conducted by MSUM faculty through faculty-mentored student research during the summer months and through incorporation of the restoration project into the curriculum of multiple courses during the regular academic year. Standardized metrics for assessment and monitoring of restoration projects are not well developed. We will fill this gap by monitoring the ecological health of our restored areas and disseminate the methodological tools developed to measure restoration success for the benefit of ongoing and future restoration projects in MN and elsewhere. A core of faculty in the Anthropology and Earth Sciences Department and the Biosciences Department at MSUM will oversee establishment of a GIS data base and track plant community diversity, soil microbial diversity, pollinator abundance and diversity, and small mammal diversity and compare those data to reference sites in the Bluestem Scientific and Natural Areas (SNA) and Buffalo River State Park. We will be in full

communication with local resource agencies doing similar work thereby enhancing the impact of the project by linking our data with data collected by others in the region.

(3) **Education** is the central mission of Minnesota State University Moorhead. This project will provide direct training to summer research students working under faculty mentorship, and expose large numbers of undergraduate students during the regular academic year through class projects on prairie restoration assessment. Because the regular academic year is not dependent on the funding of this proposal we will be able to sustain the educational benefits (and collect long-term data on restoration assessment) long after the life of the grant. In addition, as a regional center serving the Moorhead metro area, we offer educational programming for K-12 students and to the general public that use the Regional Center as a place for recreational hiking in cooperation with Buffalo River State Park. The restoration project will be incorporated into new signage and programming to disseminate the value of ecological restoration.

c) General project activities and methods

Activity 1: Restoration

Restoration will be led by Cindy Lueth, DNR Parks and Trails resource specialist
Archaeological survey and assessment will be led by MSUM Anthropology faculty

Activity 2: Monitoring and undergraduate education

Monitoring and assessment of the effectiveness of the restoration will be conducted two ways: (1) faculty-mentored student research in the summer and (2) class activities incorporated into the regular Aug-May academic curriculum.

Activity 3: Dissemination

Dissemination will be achieved by (1) direct interactions with TNC, DNR and ecologists working on prairie restoration in this region, (2) presentation of progress and data from our project at regional and national meetings of restoration ecologists, (3) publication of our monitoring protocols in national and international peer-reviewed publications, and (4) public education programming at the Regional Science Center interacting with area K-12 groups and adults and families in the general public that use the facility.

d) Overall project significance

This project will

1. contribute to the MN Prairie Conservation Plan through permanent protection, restoration, enhancement and monitoring of a Core Focus Area.
2. develop and disseminate monitoring protocols for assessing restoration.
3. educate generations of undergraduate students that will help build capacity in the region for restoration ecology through development of future restoration ecologists and, significantly, building an educated citizenry that understands the importance of conserving Minnesota's natural resource heritage.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 1 2016:

Project Status as of July 1 2016:

Project Status as of January 1, 2017:

Project Status as of July 1 2017:

Project Status as of January 1, 2018:

Project Status as of July 1 2018:

Project Status as of January 1, 2019:

Project Status as of July 1, 2019

Project Status as of January 1, 2020

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Restoration of 143 acres of prairie and 17 acres of riparian terrace forest

Archaeological survey and assessment will be led by MSUM Anthropology faculty

Description: Prairie restoration of units consisting of 100 acres of old brome field that will be restored to mesic prairie and 60 additional acres gifted to MSUM from the MSUM Alumni Foundation comprising 43 acres of mesic prairie and 17 acres of terrace forest within the Buffalo River floodplain. The Alumni Foundation property contains cultured turf as part of a golf course that operated on the property until the end of the 2014 season. Cindy Lueth from Department of Natural Resources Parks & Trails will oversee the restoration process.

Restoration timeline

Year	Season	Action	Notes
2015	Late summer/early fall	Chemical site prep of 100 acres Archaeological inventory, pedestrian survey, shovel testing Consider management of archaeological sites in restoration planning removal of golf turf irrigation system Chemical site prep, as needed	Apply during active growing season of brome Under Phase I Reconnaissance Permit Site data filed with SHPO Sod removal
	Late summer, fall	Seed collection	Combine, hand harvest
2016	Spring	Chemical site prep	
	May-June	Seed, drill/broadcast	
2016 - 2019	June-July-Aug-Sept-Oct	Seed collection, as needed	Collect early species missed during 2015; collect additional seeds of species of interest or that were collected in limited quantities during 2015
	August 2016	mow to 4-6 inches	
2017 - 2019	as needed	weed control	Includes both broad leaf and cool season grasses
2017	June and Aug	mow 4-6 inches	As needed--once natives are established abundantly, mowing stops; mowing keeps light levels high for emerging seedlings
2020	April	plant tree seedlings/whips; add deer protection	Floodplain forest

Summary Budget Information for Activity 1:

ENRTF Budget: \$246,620
Amount Spent: \$ 0
Balance: \$ 246,620

Outcome	Acres	Completion Date
1. Archaeological survey	140	August, 2015
2. Woody stem removal, herbicide, pile burn	160	October, 2018
3. Prairie seed harvest/cleaning, planting	143	October, 2018
4. Tree/shrub seed harvest & propagation	17	June, 2020
5. Weed control, mowing, prescribed fire	143	June, 2020
6. Buckthorn and invasive control	17	June, 2020
7. Plant trees, deer protection, add herbs	17	June, 2020

Project Status as of January 1 2016:

Project Status as of July 1 2016:

Project Status as of January 1, 2017:

Project Status as of July 1 2017:

Project Status as of January 1, 2018:

Project Status as of July 1 2018:

Project Status as of January 1, 2019:

Project Status as of July 1 2019:

Project Status as of January 1, 2020:

Final Report Summary:

ACTIVITY 2: Post-Restoration Monitoring by Minnesota State University Moorhead faculty and undergraduate students

Description: Undergraduate students will collect foundational data on species distribution and genetic diversity in adjacent references sites of remnant prairie in the Bluestem Prairie Complex. Faculty-mentored research students will conduct surveys of ecosystem health and indicator species to assess the progress and success of the restoration. These activities will use a customized GIS database to facilitate the development of restoration monitoring strategies and protocols and the assessment effort. During the summer of 2015 the restoration work will be primarily in the form of site preparation and an archaeological survey of the areas to be restored (as described above). George Holley from the Anthropology and Earth Sciences (AES) Department will conduct the archaeological survey. Concomitantly, AES Faculty Kirk Stueve will establish the GIS database for organizing and integrating ecological data collected throughout the ecological monitoring and assessment. AES faculty Rinita Dalan will assist in this effort, incorporating the archaeological data into a GIS layer and management plan with respect to the restoration, and building interactive maps and capabilities using mobile apps for monitoring and data sharing. The GIS piece is a critical part of the monitoring effort because it will ensure that the data collected will be accessible and retrievable long into the future and by restoration ecologists working in other regions of the state and beyond.

Year	Season	Action	Notes
2015	October	Contact MN DNR, Nature Conservancy, and other partners with overlapping activities	Bryan Bishop and Laura Aldrich-Wolff from Concordia University Moorhead have overlapping research activities
	October	Coordinate collection of raster-based geospatial data from local, regional, and national agencies	LiDAR, high-res aerial photography, etc.

	October	Coordinate collection of vector-based geospatial data from local, regional, and national agencies	Existing boundaries, existing field sites, soil types, etc.
	October	Perform spatial analyses and classifications to produce derivatives from collected geospatial data	Solar radiation exposure, slope aspect, slope angle, wetness index, proximity to forest edge, proximity to field edge, proximity to stream, patchiness index, habitat site classifications, etc.
	October	Develop custom spatially weighted sampling strategy for quantifying species composition of restoration efforts at landscape-scales Build interactive maps for data collection Train Faculty Team Members	Using Esri Collector app Collector app and basic map making and analytic tools
	October	Create online group for data sharing	LCCMR group in MSUM online ArcGIS organization
2017	October	Coordinate with field crews regarding the integration of data into the existing GIS database.	

In 2015 the restored areas will be undergoing preparation work (see activity 1 above). Faculty in the Biosciences Department (Sara Anderson, Chris Chastain, Alison Wallace, Brian Wisenden, Donna Stockrahm) will use 2015 as a time to establish reference sites on adjacent remnant prairie reference sites and work with students to develop monitoring protocols. In the summers of 2016 and 2017 Biosciences faculty and their research students will extend monitoring to include the restored areas for direct comparisons. Each faculty member will contribute a unique component to the monitoring effort. Sara Anderson: metagenomics of soil bacterial communities as indicators of soil and ecosystem health; Chris Chastain: environmental physiology of C3 and C4 photosynthetic plants in prairie ecosystems; Alison Wallace: seed germination rates as a function of storage time, plant community structure; Brian Wisenden: pollinator/plant interactions, diversity and phenology; and Donna Stockrahm: abundance, diversity and movements of small mammals.

Starting in the fall semester of 2015, and continuing indefinitely, AES and Biosciences faculty will incorporate the restoration project into the curriculum of the regular academic year (Aug-May). This is easily done because the Regional Science Center is only 15 miles from the main campus thus, a typical 3-hour lab period can be structured around 30 min transportation to and from the site and 2 hours of on-site activity. There is no better form of learning than learning by doing. Using this pedagogical model AES and Biosciences faculty can leverage the impact of the restoration project to augment the learning experience of thousands of undergraduates. Moreover, we will be able to extend this benefit long past the 3-year life of the grant because faculty salary is part of the regular academic year and students work for academic credit. The focused summer research efforts will develop the data collection techniques to be incorporated into the regular curriculum during the regular academic year. The data collection methods will be, by necessity, streamlined (GIS automated) and efficient to collect by undergraduates given only basic orientation. The goal is that we will be able to use undergraduate education as a vehicle to generate long-term data sets for monitoring and assessing the fate of the restored areas on MSUM property. Because the data collection methods we develop will be streamlined, we expect that the methods we develop will be easy to adopt, adapt and apply to other restoration projects in Minnesota and

beyond where any trained organizer can effectively oversee and manage restoration assessment. The methods we develop and perfect will be communicated at conferences attended by resource managers and published in conservation journals (see Activity 3).

Summary Budget Information for Activity 2:

ENRTF Budget: \$240,000
Amount Spent: \$ 0
Balance: \$ 240,000

Outcome	Completion Date
1. Customized GIS database development and management	October, 2017
2. Development and application of protocols and faculty-mentored student research on: a) microbial metagenomic diversity in soil (Anderson) b) environmental physiology of C4-dominant photosynthesis of plants (Chastain) c) seed germination rates as a function of seed storage duration (Wallace) d) pollinator diversity, phenology and pollinator- plant associations (Wisenden) e) diversity and movements of small mammals (Stockrahm)	October, 2017
3. Incorporation of restoration ecology into field based curricula for Organismal Biology, Ecology, MN Plant ID, Principles of Genetics, Wildlife Ecology, Water, Land, and People, GPS Field Techniques, Introduction to GIS, Spatial Analysis, Geoarchaeology, Arch/Geoarch field schools	Fall 2015 – indefinite future

Project Status as of January 1 2016:

Project Status as of July 1 2016:

Project Status as of January 1, 2017:

Project Status as of July 1 2017:

Project Status as of January 1, 2018:

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ACTIVITY 3: Interpretation of restoration project

Description: Project data will serve as a guide for ongoing restoration efforts and provide broader state-wide impact as a case study for future restoration projects elsewhere. Our results and curricular protocols appropriate at the undergraduate level will be published in peer-reviewed journals in restoration ecology and education. Example target journals include, but are not limited to: *Biological Conservation, Conservation Biology, Bioscience, Ecological Applications, Journal of Applied Ecology, Environmental Monitoring and Assessment, The American Biology Teacher, International Journal of Science Education, and the Journal of Biological Education*. Brian Wisenden, as project manager, and also as author and co-author of 76 peer-reviewed scientific publications and book chapters, and serves as managing editor of the international peer-reviewed journal *Behaviour*, will lead this effort.

Site specific interpretive signage consistent with MSUM and MN DNR signage guidelines will educate and inform the reader of complexities related to restoration ecology. Signage will also acknowledge Minnesota’s commitment to protect, conserve, preserve, and enhance Minnesota’s "air, water, land, fish, wildlife, and other natural resources" for the benefit of current citizens and future generations as per the Environment and Natural Resources Trust Fund mission.

The Science Center will host monthly public “field day” programs that involve visitors in the restoration process by collecting native seed, monitoring plant phenology, assisting with plant surveys and helping to remove and control noxious plants. These programs will engage visitors side by side with our science faculty and undergraduate students to gain firsthand experience working through the intricacies of field work related to ecological restoration and monitoring.

Third grade students attending the Center’s K-12 science programming (~600 annually) will participate in restoration activities by collecting native seed during a fall visit. Students will grow selected native seedlings in their classroom through the winter months that will be transplanted in restoration plots the following spring visit.

Design work on initial signage will begin July of 2015 with fabrication and installation in April 2016. Signage updates will occur each summer with necessary updated signage installed in April of 2017 and 2018. Public field day programs will begin in August 2015 and occur monthly through October 2015. Subsequent field day programs will be held monthly from May through October in 2016, 2017 and May through June of 2018. Third grade seed collection and planting activities will occur during the 2015/2016, 2016/2017 and 2017/2018 academic school years.

Signage design and cost will be \$1500 the first year and \$600 during years 2 & 3. Science Center will pay this cost. Public field day programming cost: The student salary/mileage related to activity 3 will be spread out over the field day activities. Third grade seed collection and planting activities will be incorporated into the center’s on-going science education programming. Program development and implementation cost will be covered by Science Center.

Our only budget request for Activity 3 is one month salary per summer for the project manager and 2 student interns and mileage for assistance in signage and other aspects of project maintenance.

Summary Budget Information for Activity 3:

ENRTF Budget: \$40,380
Amount Spent: \$ 0
Balance: \$ 40,380

Outcome	Completion Date
1. Signage installed and public programming delivered	October, 2016
2. Citizen monitoring and seedling program established	October, 2016
3. Project management, publication of manuscripts	October, 2018

- Project Status as of January 1 2016:**
- Project Status as of July 1 2016:**
- Project Status as of January 1, 2017:**
- Project Status as of July 1 2017:**
- Project Status as of January 1, 2018:**
- Project Status as of July 1 2018:**
- Project Status as of January 1, 2019:**
- Project Status as of July 1 2019:**
- Project Status as of Jan 1 2020:**

Final Report Summary:

V. DISSEMINATION:

Description:

The assessment protocols, results of monitoring, ongoing conclusions from the evolving long-term data and the pedagogical benefits of experiential learning will be published in the aforementioned journals. The results of this project will be presented at academic meetings specializing in each faculty member’s area of expertise in addition to local and national meetings for resource management agencies. We will also make our data publicly available on a web site, complete with GIS reference points and links to various reports.

- Project Status as of January 1 2016:**
- Project Status as of July 1 2016:**

Project Status as of January 1, 2017:
Project Status as of July 1 2017:
Project Status as of January 1, 2018:
Project Status as of July 1 2018:
Project Status as of January 1, 2019:
Project Status as of July 1 2019:
Project Status as of Jan 1 2020:
Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 282,360	All faculty at MSUM are on 9-month appointments. Summer salary requests are calculated for 20 days (=160 hours = 0.0769 FTE) per summer. George Holley: \$9,180 x 1 = \$9,180; Kirk Stueve: \$7,080 x 3 summers = \$21,240; Rinita Dalan \$9,400 x 3 summers = \$28,200; Sara Anderson \$7,080 x 3 summers = \$21,240; Chris Chastain \$9,400 x 3 summers = \$28,200; Alison Wallace \$9,180 x 3 summers = \$27,540; Brian Wisenden \$9,180 x 3 summers = \$27,540; Project Manager (Wisenden) \$9,180 x 3 summers = \$27,540; Donna Stockrahm \$11,360 x 3 summers = \$34,080; 9 student interns for 3 years and 3 interns for 1 year: 10 x \$12/h x 40h/wk x 4 wk/yr x 3 yr = \$57,600
Professional/Technical/Service Contracts:	\$240,240	\$231,240 to Cindy Lueth, Department of Natural Resources Parks & Trails. This cost includes all equipment, seed and personnel costs. Specific activities: Woody stem removal, herbicide, burns: \$59,240 Prairie seed harvest, cleaning, planting: \$60,000 Weed control, mowing, prescribed burn: \$66,000 Plant trees, deer protection, add herbs: \$17,000 \$3000/yr x 3 yrs = \$9000 for genetic sequencing services needed for analysis of soil metagenomics.
Travel Expenses in MN:	\$4,400	Mileage: (3 cars x 32mi x 25 trips x \$0.55/mi x 3 summers=\$3,960) + (1 car for 1 year=\$440) = \$4,400
Other:	\$0	
TOTAL ENRTF BUDGET:		\$527,000

Explanation of Use of Classified Staff: N/A

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

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 4.23

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 0

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state:	0	0	
State			
MSUM	\$250,000 in-kind	\$250,000	Club house removal, salaries for Anthony Bormann and research faculty during the academic year, MSUM research facilities
TOTAL OTHER FUNDS:	\$250,000	\$250,000	

VII. PROJECT STRATEGY:

A. Project Partners:

Cindy Lueth, MN DNR Parks and Trails, will oversee the restoration;

Not receiving funds

Sue Galatowitsch, University of Minnesota has/will continue to provide consultation for the monitoring effort; Dan McEwen, Biosciences MSUM will assist with data analysis, and include restoration ecology in his course in *Principles of Ecology and Evolution* during the academic year

Receiving funds:

- George Holley: Archeologist, to conduct archeological survey of areas to be restored
- Kirk Stueve: GIS expert, to develop and maintain GIS database for monitoring data
- Rinita Dalan: Geoarcheologist, to incorporate archeological data into the GIS layer, build interactive maps, develop iPad app for data entry
- Sara Anderson: Landscape geneticist, to design and research changes in soil microbial communities in response to restoration
- Chris Chastain: Plant Physiologist, to design and research environmental physiology of C3 and C4 plant photosynthesis in response to restoration
- Donna Stockrahm: mammalogist, the design and research effects of resotration on small mammal communities
- Alison Wallace: Plant Ecologist, to design and research seed viability in response to storage conditions
- Brian Wisenden: Behavioral Ecologist, the design and research plant-pollinator interactions in response to restoration; also serves as overall project manager

B. Project Impact and Long-term Strategy:

Prairie habitat once covered one third of Minnesota but now only 2% of that natural heritage remains intact. These natural areas provide ecological services and habitat for rare and endangered species that depend on prairie habitat. The Minnesota Prairie Conservation Plan (2011) outlined urgent strategies to protect existing remnant prairie and to acquire land to restore it to its original condition. In that report, the Lake Agassiz beach ridge was identified as one of priority areas where conservation efforts should be focused. Property owned by Minnesota State University Moorhead (100 acres) and the MSUM Alumni Foundation (60 acres) is in this focus area. One of the reasons why this area is of great ecological value is that it connects to existing remnant prairie in Buffalo River State Park (DNR) and the Bluestem Scientific and Natural Area (TNC). The proposed project will restore these 160 acres to 143 acres of mesic prairie habitat and 17 acres of terrace forest habitat. Upon approval of funding for this project, the Alumni Foundation will transfer ownership of their parcel of land to the University. Thus, one significant impact of this project is to acquire land, protect it, and restore it to natural prairie habitat. Because the MSUM land is adjacent to DNR and TNC land, this restoration effort will indirectly

contribute to the value and ecosystem stability of lands managed by DNR and TNC. Large patches of habitat are inherently more diverse and resistant to local extirpation than small patches of habitat. The second and third activities described in this proposal will develop and disseminate protocols for assessing and monitoring the fate of restored lands relative to reference sites in nearby remnant habitat. The fate of restoration projects is generally poorly known. This project will fill this gap with protocols in several important aspects of ecosystem health using undergraduates. This not only provides a rich educational experiences for generations of our students, the methods we develop will be easily replicated elsewhere because they will be designed to be conducted by anyone with only one or two years of college. Thus, this project will impact the field of restoration ecology in general. The protocols developed here will be easily adopted, adapted and applied in many restoration projects.

The long term strategy is to 1) create a functioning prairie ecosystem, 2) provide hands-on experiential learning opportunities for MSUM students, 3) coordinate and link with other agencies engaged in restoration research in the region, and 4) offer the MSUM lands as a case study in restoration monitoring and assessment. The funds for summer salary for faculty and students will initiate a new focus of research activity at the MSUM Regional Science Center and facilitate the establishment of the Center as a field station for study of restoration ecology and research on prairie ecosystem functioning on the combined lands of the Bluestem Prairie ecosystem.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
none		\$

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

A. Parcel List: see attached

B. Acquisition/Restoration Information:

Restoration

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.

MSUM administration is committed to retaining the lands at the Regional Science Center in their natural state in perpetuity for the education of MSUM students, students and researchers in the region, and the general public. There are two parcels of land to be restored by funds provided by this proposal. The first parcel is a 100-acre old brome field, which is currently owned by MSUM. The second parcel is an 89-acre parcel owned by the Alumni Foundation, which will be gifted to the University upon final approval of funding of this proposal. Sixty acres of the Alumni Foundation land will be restored by funds in this proposal. MSUM is committed to long-term conservation of lands to be gifted by the Alumni Foundation.

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.

Restoration: The 100-acre brome field will be restored to mesic prairie habitat. Part of this area will receive an extra forb seed mixture to enhance pollen and nectar sources for native pollinator species. The 60 acres to be restored on the parcel gifted from the Alumni Foundation contains 43 acres suitable to be restored to mesic prairie while 17 acres are suitable to be restored to terrace forest.

Management plans: Activities 2 and 3 focus on the monitoring and dissemination of protocols we will develop to assess ecosystem health and the success of the restoration effort, including informing decisions about future

amelioration efforts. From the onset we will have a well-developed GIS database of the restored areas and adjacent reference sites that will be maintained by MSUM faculty in the Department of Anthropology and Earth Sciences.

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.

Cindy Lueth, Restoration Specialist with the DNR Parks and Trails, will oversee the restoration. She is expert in methods of prairie and forest restoration to achieve ecological integrity, including 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.

Monitoring of restored areas will be monitored in perpetuity by undergraduates as part of the regular curriculum during the academic year. No additional financing is anticipated at this time.

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

Cindy Lueth is widely recognized for her expertise in restoration ecology and uses the Conservation Corps of Minnesota when and where appropriate.

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.

Evaluation will be implemented immediately after the restoration is begun, and will continue annually through ongoing incorporation of monitoring by undergraduates into the regular academic curriculum. Assessment of success of the restoration will be done by comparing ecosystem diversity with data collected concurrently from reference sites. The assessment protocols developed in our project will be disseminated through conferences and publications to inform restoration workers across the state of Minnesota and elsewhere.

IX. VISUAL COMPONENT or MAP(S):

We have included two maps:

- 1) The map that was included in the proposal of the region of the bluestem prairie complex showing the juxtaposed areas of Buffalo River State Park, TNC Bluestem Science and Natural Area and the MSUM Regional Science Center. Within the MSUM property the inset indicates the areas to be restored.
- 2) This map shows only the MSUM Regional Science Center land, the areas to be restored to mesic prairie and terrace forest and a dashed border denoting the boundaries of the parcel to be gifted to the University by the Alumni Foundation.

X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than January 1 2016, July 1 2016, January 1 2017: July 1 2017, January 1 2018, July 1 2018, January 1 2019, July 1 2019, and January 1 2020.

A final report and associated products will be submitted between June 30 and August 15, 2020.

**Environment and Natural Resources Trust Fund
M.L. 2015 Project Budget**



Project Title: Minnesota State University Moorhead Prairie and Riparian Restoration and Monitoring
Legal Citation: Fill in your project's legal citation from the appropriation language - this will occur after the 2015 legislative session.
Project Manager: Brian Wisenden
Organization: Minnesota State University Moorhead
M.L. 2015 ENRTF Appropriation: \$527,000
Project Length and Completion Date: 5 years, June 30, 2020
Date of Report: October 15, 2014

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	Restoration and Archeological Survey			Develop and apply monitoring protocols			Interpretation of restoration project				
Personnel (Wages and Benefits) add boders	\$14,940	\$0	\$14,940	\$228,360	\$0	\$228,360	\$39,060	\$0	\$39,060	\$282,360	\$282,360
George Holley, conduct archeological survey, 20 days summer salary \$9,180 (86.35% salary, 13.65% benefits); 7.7% FTE											
3 student interns to assist in archeological survey @ \$12/h x 40h/wk x 4 wk = \$5,760 (100% salary)											
Kirk Stueve, will design, create and manage GIS database, 20 days summer salary \$7,080 (86.35% salary, 13.65% benefits); 7.7% FTE X 3 summers = \$21,240											
Rinita Dalan, integrate GIS with archeological data, build interactive maps, mobile apps for data logging by ecologists, 20 days summer salary \$9,400 (86.35% salary, 13.65% benefits); 7.7% FTE, x 3 summers = \$28,200											
Sara Anderson, geneticist, document soil microbial diversity and community metagenomics, 20 days summer salary \$7,080 (86.35% salary, 13.65% benefits); 7.7% FTE x 3 summers = \$21,240											
Chris Chastain, monitor C3 and C4 photosynthetic plants and environmental physiology, 20 days summer salary \$9,400 (86.35% salary, 13.65% benefits); 7.7% FTE, x 3 summers = \$28,200											
Alison Wallace, plant ecologist to study seed germination, floral community structure, 20 days summer salary \$9,180 (86.35% salary, 13.65% benefits); 7.7% FTE, x 3 summers = \$27,540											
Brian Wisenden, pollinator/plant interactions, 20 days summer salary \$9,180 (86.35% salary, 13.65% benefits); 7.7% FTE x 3 summers = \$27,540											
Donna Stockrahm, mammalogist, 20 days summer salary \$11,360 (86.35% salary, 13.65% benefits); 7.7% FTE, x 3 summers = \$34,080											
Brian Wisenden, project manager, 20 days salary \$9,180 (86.35% salary, 13.65% benefits); 7.7% FTE x 3 years = \$27,540											
7 student interns @ \$12/h (100% salary) x 40h/wk x 4 wk x 3 summers											
2 student interns @ \$12/h (100% salary) x 40h/wk x 4 wk x 3 summers											
Professional/Technical/Service Contracts	\$231,240	\$0	\$231,240							\$231,240	\$231,240
Cindy Lueth, Restoration Specialist, DNR Parks and Trails											
Woody stem removal, herbicide, pile burn = \$59,240											
Prairie seed harvest/cleaning, planting = \$60,000											
Tree/shrub seed harvest & propagation = \$5,000											
Weed control, mowing, prescribed fire = \$66,000											
Buckthorn and invasive control = \$24,000											
Plant trees, deer protection, add herbs = \$17,000											
Genetic sequencer services: \$3000 x 3 summers				\$9,000	0	\$9,000				\$9,000	\$9,000
Travel expenses in Minnesota											
Mileage: (3 cars x 32mi x 25 trips x \$0.55/mi x 3 summers=\$3,960) + (1 car for 1 year=\$440) = \$4,400	\$440	\$0	\$440	\$2,640	\$0	\$2,640	\$1,320	\$0	\$1,320	\$4,400	\$4,400
COLUMN TOTAL	\$246,620	\$0	\$246,620	\$240,000	\$0	\$240,000	\$40,380	\$0	\$40,380	\$527,000	\$527,000

Environment and Natural Resources Trust Fund

M.L. 2015 Parcel List

Project Title: Minnesota State University Moorhead Prairie and Riparian Restoration and Monitoring

Legal Citation: Fill in your project's legal citation from the appropriation language - this will occur after the 2015 legislative session.

Project Manager: Brian Wisenden

Organization: Minnesota State University Moorhead

M.L. 2015 ENRTF Appropriation: \$ 527,000

Project Length and Completion Date: 5 Years, June 30, 2020

Date of Report: 10/15/14

#	Acquisition or Restoration Parcel Name	Geographic Coordinates Format: [Deg.]° [Min.]' [Sec.]" [Hemis.]		Estimated Cost	Estimated Annual PILT Liabilities	County	Site Significance	Activity Description	# of Acres	# of Shoreline Miles	Type of Landowner	Proposed Fee Title or Easement Holder (if applicable)	Status
		Latitude	Longitude										
1	Brome field	46.864825 N	-96.439035 W	\$ 125,137	\$ -	Clay	Contiguous with bluestem prairie SNA (TNC), remnant bluestem prairie in MSUM Regional Science Center and Buffalo River State Park (DNR)	Restoration to mesic prairie	100	0	Owned by MSUM, a non-profit organization	0	Owned by MSUM
2	Alumni Foundation Land	46.870242 N	-96.445539 W	\$ 106,103	\$ -	Clay	Riparian terrace forest habitat along ~1800 ft of Buffalo River, and contiguous with bluestem prairie SNA (TNC), remnant bluestem prairie in MSUM Regional Science Center and Buffalo River State Park (DNR)	Restoration of 43 acres to mesic prairie habitat and 17 acres to terrace forest habitat. The remaining 29 acres are intact.	89	0.34	Alumni Foundation of MSUM, also a non-profit organization, to be gifted to MSUM.	0	Gift of ownership will occur when funding is approved.

NOTES: Cost per acre for prairie = \$3,076.13 and for forest = \$1,251.37

Minnesota State University Moorhead Prairie and Riparian Restoration and Monitoring

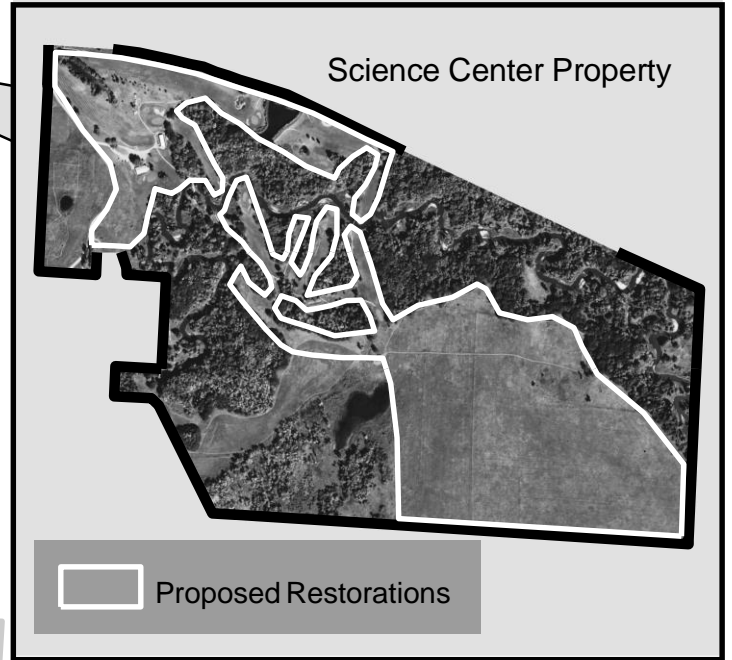
Moorhead 15 Miles

Detroit Lakes 31 Miles

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Bluestem Prairie Complex
(Buffalo River State Park
and Nature Conservancy)

Science Center Property



Moorhead Science Center

Subd. 08g

MSUM Science Center Bluestem Prairie Proposed Restorations

