Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)

Project Title: **ENRTF ID:** **237-FH**

Combating Woody Encroachment with Grazing after Mechanical Clearing

Category: H. Proposals seeking $200,000 or less in funding

Sub-Category: F. Methods to Protect, Restore, and Enhance Land, Water, and Habitat

Total Project Budget: $ 199,704

Proposed Project Time Period for the Funding Requested: June 30, 2022 (3 yrs)

Summary:

We will evaluate the potential for cattle grazing to reduce woody vegetation regrowth following mechanical clearing and to enhance biodiversity of grassland species in the Agassiz Beach Ridge core area.

Name: Christopher   Merkord

Sponsoring Organization: Minnesota State University - Moorhead

Title: Assistant Professor

Department: Biosciences Department

Address: 1104 7th Ave S

   Moorhead   MN   56563

Telephone Number: (218) 477-5008

Email christopher.merkord@mnstate.edu

Web Address

Location

Region: Central, Northwest

County Name: Clay, Norman, Otter Tail, Polk, Red Lake, Wilkin

City / Township:

Alternate Text for Visual:

Visualization showing map of study area and experimental study design.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%
	_____ If under $200,000, waive presentation?		

PROJECT TITLE: Combating woody encroachment with grazing after mechanical clearing.

I. PROJECT STATEMENT

The goal of this project is **to evaluate the potential for combined treatments of mechanical removal and prescribed cattle grazing to control woody vegetation and support biodiversity** in grasslands in the Agassiz Beach Ridge (ABR) core area. The outcomes of the project will include quantitative assessments of the following:

1. The **efficacy of grazing to control woody regrowth after mechanical removal of trees and shrubs**.
2. The **effects of this combination of treatments on grassland indicator species abundance**.
3. **Recent rates of land cover change** on grasslands in the ABR core area, especially growth of woody vegetation.

To rigorously evaluate the impact of cattle grazing on woody regrowth and biodiversity, we will implement the following activities:

1. **Mechanically remove woody** vegetation from treatment plots slated for grazing in subsequent years.
2. **Establish cattle exclosures** to monitor the rate of woody vegetation regrowth with and without grazing.
3. **Survey for indicator species** (plants, birds, mammals, pollinators) on treated and untreated grasslands.
4. **Map recent land cover change** including woody growth using high-resolution aerial imagery.

Woody encroachment has become a huge problem across Minnesota's grasslands due to the loss of large-scale processes such as fire and grazing. Woody encroachment threatens the unique biodiversity of the already exceedingly rare tallgrass prairie ecosystem and is likely to worsen as climate change is predicted to cause more favorable conditions for tree growth. Land managers are losing ground to woody encroachment in many areas as budgets are limited and traditional management techniques are time- and money- intensive. Once a prairie has become heavily invaded by woody vegetation, it is difficult to reduce woody cover with fire alone. Woody removal with mechanical treatments becomes necessary. However, even after woody removal, it takes intense effort over many years to control resprouting and discourage regrowth.

Given the expense and difficulty of fire, **land managers are eager to find alternative means to control woody regrowth after mechanical treatments**. Cattle grazing is an alternative, but it is unknown to what extent grazing can control woody regrowth and whether grasslands managed in this way perform the same ecosystems services, such as biodiversity provisioning, as grasslands managed with prescribed fire. This project will **provide land managers with rigorous evidence regarding the effectiveness of grazing as a method to reduce woody regrowth and support biodiversity in heavily encroached grasslands**, allowing them to **accelerate the improvement of habitat quality on 1,000s of acres of grassland in Minnesota.**

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: *Evaluate the effectiveness of grazing to control woody encroachment after mechanical treatment.*
Description: Already secured funding and in-kind donations will allow us to install eight cattle exclosures on four management units in spring 2018. This proposal will allow us to add the same number in spring 2020, and to conduct field data collection beginning in summer 2019. On each management unit, we will remove woody vegetation using mechanical methods (cutting) prior to the construction of the cattle exclosures. Field data collection will be conducted on two spatial scales. First, we will measure woody stem density and woody leaf cover on sample plots inside each exclosure and on matched control (grazed) plots nearby. This will clearly evaluate the effectiveness of grazing at reducing woody regrowth. Second, we will survey grassland species known to be indicators of high-quality grassland, including plants, birds, small mammals, and pollinators. Surveys will be conducted on management units with various management histories including a) the mechanical + grazing treatment we are testing, b) mechanical treatment with no grazing, and c) prescribed fire but no mechanical treatment. We will use appropriate occupancy or abundance models for each indicator species to

1

estimate the relative importance of treatment type, as well as other variables like vegetation structure, area of nearby woody vegetation cover, grassland patch size, and other site- and landscape-level metrics. The outcomes of the indicator species surveys will include inference about the effect of management type on biodiversity, as well as baseline natural history data (occurrence data) for many sites across the ABR core area. Occurrence data will be submitted to appropriate open-access archives (e.g,. eBird/Avian Knowledge Network for bird data).

ENRTF BUDGET: $ 170,064

Outcome	Completion Date
1. *Quantify the effectiveness of mechanical treatment followed by grazing for reducing woody regrowth on grasslands in the ABR core area.*	*2020-07*
2. *Provide baseline occurrence data on grassland indicator species (plants, birds, mammals, pollinators)*	*2022-11*
3. *Measure effect of woody encroachment on indicator species (modeling)*	*2022-12*

Activity 2: *Classify land use and land cover in the Agassiz Beach Ridge core area (~617,000 acres) using high-resolution aerial imagery to document recent encroachment of woody vegetation in grasslands.*
Description: We will use heads-up digitizing to classify land use and land cover (LULC) in the Agassiz Beach Ridge core area (~617,000 acres) using 1-m resolution 4-band (color and near infrared) aerial imagery from the National Agriculture Imagery Program (NAIP) in 2010 and 2017. We will compare 2010 and 2017 land cover to identify areas of unusually high conversion from grassland to woody vegetation. We will also use the LULC maps to derive landscape metrics related to woody encroachment for use in the species distribution models for the indicator species mentioned above. Work will be conducted by two research assistants each in the fall and winter each year.

ENRTF BUDGET: $ 29,640

Outcome	Completion Date
1. *Produce land use and land cover maps for Agassiz Beach Ridge*	*2021-07*
2. *Summarize recent land use and land cover change*	*2022-07*

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding : none

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Marissa Ahlering; Matt Mecklenburg	Prairie Ecologist; Land Steward	The Nature Conservancy	Collaborators

IV.   LONG-TERM- IMPLEMENTATION AND FUNDING:
We anticipate seeking additional funding after the completion of this project to re-measure woody growth in the grazing exclosures in future years as the effects of grazing vs. non-grazing become more pronounced.

V.   TIME LINE REQUIREMENTS:
Activities will be completed in three years.

2

2019 Proposal Budget Spreadsheet

Project Title: Combating woody encroachment with grazing after mechanical clearing
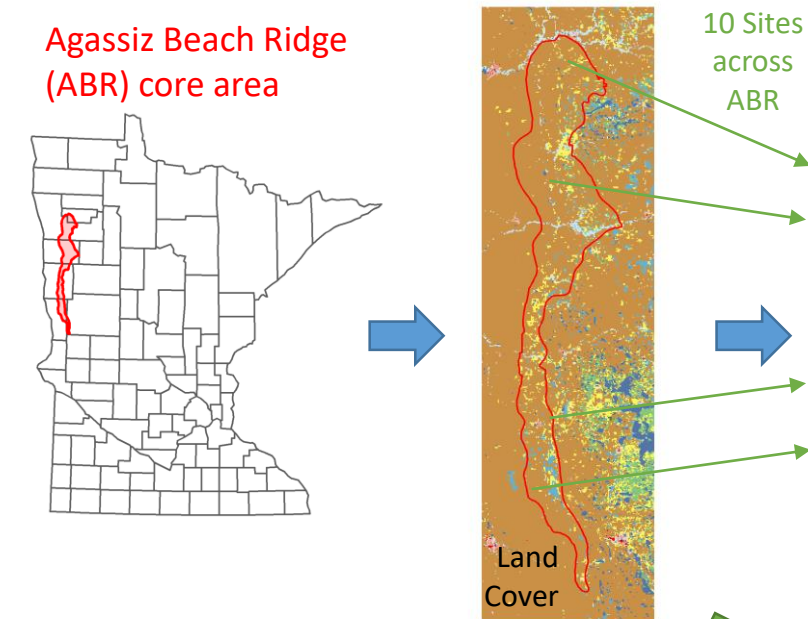
IV. TOTAL ENRTF REQUEST BUDGET *3* **years**

BUDGET ITEM (See "Guidance on Allowable Expenses")	AMOUNT
Personnel: All faculty at MSUM are on 9-month appointments. Summer salary requests are calculated for 20 days (=160 hours = 0.0769 FTE) per summer for C. Merkord and 15 days (=120 hours = 0.0577 FTE) per summer for A. Wallace and D. Stockrahm Chris Merkord: $7,053 x 3 summers = $22,014; Alison Wallace $9,180 x 3 summers = $21,423; Donna Stockrahm $11,360 x 3 summers = $26,514; Project Manager (Merkord) $7,053 x 3 summers = $22,014; 6 student interns per year: 6 x $13/h x 38h/wk x 10 wk/yr x 3 yr = $88,920	$ 180,885
Professional/Technical/Service Contracts:	$ -
Equipment/Tools/Supplies: Equipment: 10 cattle exclosures x $600=$6,000	$ 6,000
Acquisition (Fee Title or Permanent Easements):	$ -
Travel: Mileage: (80mi x 7 trips/wk x 14 wks/yr x 3 yrs x $0.545/mi = $12819)	$ 12,819
Additional Budget Items: none	$ -
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 199,704

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*
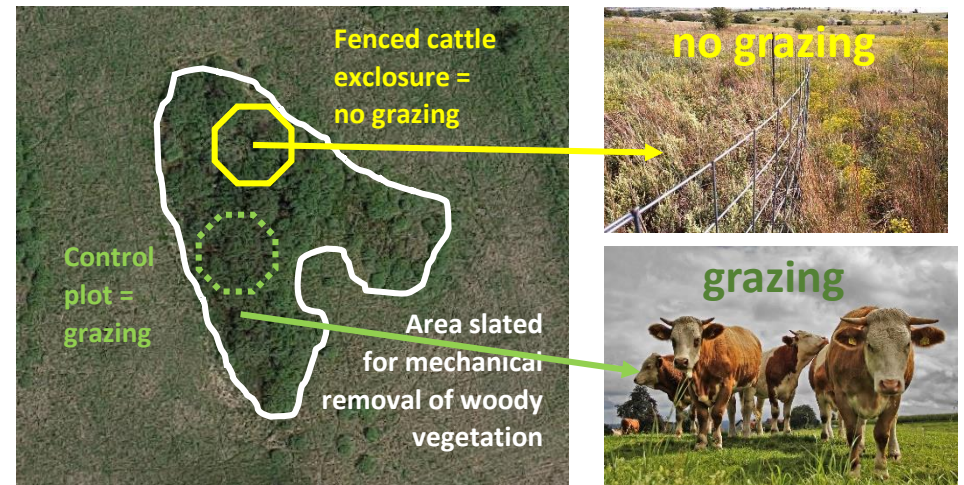
SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	$ -	*N/A*
Other State $ To Be Applied To Project During Project Period:	$ -	*N/A*
In-kind Services To Be Applied To Project During Project Period: salaries for research faculty during the academic year ($89K) MSUM research facilities	$ 89,000	*Secured*
Past and Current ENRTF Appropriation:	$ -	N/A
Other Funding History: MSUM internal research funding (summer 2018): $1000	$ 1,000	*Secured*
MSUM Strong Internship: 1 student intern for 1 years (summer 2018): 4,000	$ 4,000	*Secured*
MSUM Strong Internship: 3 student intern for 3 years: 3 x $12/hr x 40h/wk x 10 wk/yr x 3 yr	$ 43,200	*Pending*

PROJECT TITLE: Combating woody encroachment with grazing after mechanical clearing.
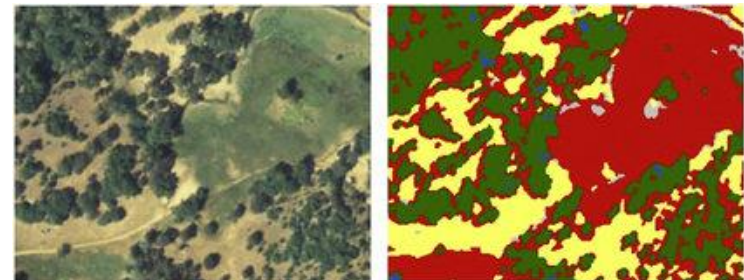
PI: Christopher Merkord

Agassiz Beach Ridge (ABR) core area

10 Sites across ABR

Land Cover

1. At 10 sites: clear woody vegetation, install cattle exclosure, graze cattle, <u>monitor vegetation</u>

Fenced cattle exclosure = no grazing

no grazing

Control plot = grazing

grazing

Area slated for mechanical removal of woody vegetation

3. Classify land cover, model indicator species abundance, determine effect of woody vegetation on indicators

2. Select 20 control sites receiving alternative management regime (e.g., fire but no grazing); <u>survey all 30 sites for indicator species</u>

Example of land cover classification (Shapero et al. 2017)

4. Provide results to land managers for incorporation into management strategies

05/08/2018

ENRTF ID: 237-FH

F. Project Manager Qualifications and Organization Description

Christopher Merkord is an Assistant Professor in the Biosciences Department at Minnesota State University Moorhead where he conducts research in the field of ecology and teaches courses in ecology and biostatistics. Dr. Merkord's research addresses both fundamental and applied questions related to the conservation, management, and ecology of terrestrial ecosystems from grasslands to forests using a variety of taxa including birds, small mammals, amphibians, and vascular plants. Dr. Merkord has extensive background in modeling and statistical applications and has several years of experience working with remotely-sensed earth observation data to study land cover change and for public health applications.

Minnesota State University Moorhead (MSUM) is a four-year, public university located in Moorhead, Minnesota whose mission is to serve as a caring community promising all students the opportunity to discover their passions, the rigor to develop intellectually and the versatility to shape a changing world. MSUM faculty are teacher-scholars who conduct top-level research in their fields who engage in their local communities to address important issues.