

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

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**Project Title:**

**ENRTF ID: 213-F**

Promoting and Restoring Oak Savanna Using Silvopasture

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

**Sub-Category:**

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**Total Project Budget: \$** 1,270,910

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

**Summary:**

Oak savanna is imperiled and threatened ecosystem with only 0.2% remaining of historically 5.5 million acres in Minnesota. This project will demonstrate the use of silvopasture to restore this ecosystem.

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**Name:** Diomy Zamora

**Sponsoring Organization:** U of MN

**Title:** \_\_\_\_\_

**Department:** \_\_\_\_\_

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**Location**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

The map shows the area in the US and in Minnesota in particular where oak savanna ecosystem once dominates but such ecosystem is now almost gone.

_____ 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:** Promoting and Restoring Oak Savannas using Silvopasture

### **I. PROJECT STATEMENT**

Oak savanna is a rare shifting-mosaic plant community. Once covering nearly 5.5 million acres in Minnesota (Fig. 1) it is now reduced by approximately 99.8%, making it one of the most threatened habitats in Minnesota (Minnesota Historical Society, 1974). Historically, grazing by large herbivores such as bison and elk maintained the health and structure of these ecosystems. Restoring and protecting these natural communities is critical to preserving natural services, including rare wildlife habitat, enhanced water quality, and soil health.

Ecosystem decline, caused by agricultural expansion/conversion as well as forest succession, has altered soil composition, hydrological processes, and vegetation composition and regeneration patterns (Anderson et al. 1999). This has resulted in the encroachment of invasives and diseases, and altered water quality. In 2014, over 640,000 acres (USDA-ERS, 2014) of unmanaged wooded pasture existed in Minnesota, mostly within the historical oak savanna region. Silvopasture, the practice of intentionally combining intensive management of trees, forage, and livestock as one integrated practice has been successfully used to restore environmental and economic functions of oak savannas around the world, including the Dehesa system in Spain, and within the U.S. (e.g., Oklahoma, Tennessee, California). However, its potential has not been assessed in Minnesota.

This project has two major objectives: a) to assess the impacts of silvopasture as an approach to restore oak savanna ecosystems and native species in Minnesota, as well as improve soil health and water quality for Minnesotans; and b) to scale up the use of silvopasture for oak savanna restoration through outreach activities and development of a Silvopasture Learning Network (SLN) to facilitate farmer-to-farmer learning, promotion, and information sharing to expand natural resource conservation.

This study will examine the effects of silvopasture on plant/animal and pollinator diversity and distribution, soil health, and water quality characteristics at Sherburne National Wildlife Refuge, Princeton in the Anoka Sand Plain (Fig. 2). This region of historical oak savanna communities serves as a critical aquifer for east-central Minnesota. We hypothesize that use of silvopasture methodology will demonstrate a significant increase in restored oak savanna acreage. The results will be developed into case studies to form the core of a Minnesota focused SLN.

### **II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Establish and demonstrate oak savanna restoration using Silvopasture methodology at Sherburne National Wildlife Refuge.** Twelve 10-acre plots will be established at the Sherburne National Wildlife Refuge. Species diversity (plants, animals, birds, and insect – pollinators), soil health and water quality data collected as a baseline and annually thereafter. **Budget: \$796,762**

Outcome	Completion Date
1. Twelve 10-acres plots selected and established and baseline data collected	September 2019
2. Ecological parameters assessed, data analyzed and findings reported	Annually

**Activity 2: Establish Silvopasture Learning Network and silvopasture oak savannah volunteer program.** Following implementation of a survey to assess knowledge and best implementation approaches, a peer-to-peer learning network will be established. A volunteer program will be initiated with Great River Greening and the Sustainable Farming Association to facilitate adoption of silvopasture for oak savanna restoration. **Budget: \$126,132**

Outcome	Completion Date
1. Surveys completed to assess knowledge and implementation approaches	May 2020

2. Silvopasture-Oak savanna volunteer program initiated	June 2021
3. Silvopasture Learning Network developed	June 2022

**Activity 3: Scale up the use of silvopasture across Minnesota through volunteerism, outreach/extension activities and educational materials**

**Budget: \$ 205,966**

Outcome	Completion Date
1. Two camps/ field workshops each year, beginning in year 2	June 2021, June 2022
2. One silvopasture forum offered with government agencies, and stakeholders to advance silvopasture adoption for oak savanna restoration	March 2021
3. One webinar per year, beginning in year 2, to reach stakeholders	Mar 2021; Mar 2022
4. 2 volunteerism events offered to train volunteers on silvopasture	May 2021, July 2021
5. 2 training sessions to coach farmers and NR professionals using Silvopasture for oak savanna restoration	May 2021, May 2022
6. Community meeting series offered (3 per year beginning in year 2), led by farmers trained in 5 above to introduce others to silvopasture, share experiences, provide information and resources	Annually
7 An array of knowledge products and training materials produced	Jan 2022
8 At least 4 video-documented case studies created as a part of the SLN.	Jan. 2022
9. Final Project Report written	June 2022

**Activity 4. Conduct economic analyses to understand costs to restore oak savanna with silvopasture and compare to traditional restoration approaches**

**Budget: \$142,050**

Outcome	Completion Date
1. Cost comparison of restoring oak savanna using silvopasture with farmers vs current agency approaches to oak savanna restoration.	June 2022
2. Framework to allow farmer/landowners to estimate of costs and benefits of establishing and managing a savanna silvopasture system for decision making.	June 2022.

**Activity 4. Conduct economic analyses to understand how much it would cost to restore oak savanna compared to traditional restoration approaches. Budget: \$142,050**

### III. PROJECT STRATEGY

#### A. Partners receiving ENRTF funding

Name/Title/Affiliation	Role
Great River Greening	Subcontractor; assist in Task 1 and Task 2
Sustainable Farming Association	Subcontractor; Assist in Task 2 and Task 3.

#### B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Anna Hess	Resource manager	DNR	Collaborator; assist pollinator study
Jodie Provost	Wildlife Specialist	DNR	Collaborator, assist wildlife study
Steve Karel	Director	Sherburne NWR	Collaborator
USDA-NRCS			Collaborator
Anoka Sandplain Restoration Group			Collaborator

**B. Timeline Requirements:** We anticipate that this study will require 3-years to complete, including: baseline data collection, demonstration site monitoring, and the development of a Minnesota-based information system and Silvopasture Learning Network.

**C. Long-Term Strategy and Future Funding Needs:** University of Minnesota Extension will include results in its outreach and education efforts to create increased impacts of the program. It is expected that a functional SLN will yield interest and resources to expand this work throughout the state.

## 2019 Proposal Budget Spreadsheet

**Project Title: Promoting and Restoring Oak Savanna using Silvopasture**

### IV. Total ENRTF REQUEST BUDGET (3 years )

BUDGET ITEM	AMOUNT
<b>Personnel:</b>	
Diomy Zamora, PI (10%) \$21,346 + Fringe (33.5%) \$7,151	\$ 28,497
Gary Wyatt, Extension Professor (5%) \$10,612 + Fringe (47%) \$4,988	\$ 15,600
Dean Current, Economist, Forest Resources (12%) \$33,798 + Fringe (33.5%) \$11,322	\$ 45,120
Joe Magner, Hydrologist, BBE (3%) \$11,133 + Fringe (33.5%) \$3,730	\$ 14,863
John Loegering, Wildlife Biologist, UMC Ag & Nat Res (2%) \$6,935 + Fringe (33.5%) \$2,323	\$ 9,258
Rebecca Montgomery, Ecologist, Forest Resources (2%) \$7,899 + Fringe (33.5%) \$2,646	\$ 10,545
Post Doc - TBN (100%) \$156,857 + Fringe (21.4%) \$33,568	\$ 190,425
1 Graduate Student - Academic (50%) \$57,576 + Fringe (15% & tuition) \$55,202	\$ 112,778
1 Graduate Student - Summer (50%) \$19,192 + Fringe (15%) \$2,878	\$ 22,070
1 Graduate Student (Years 2 & 3) - Academic (50%) \$38,856 + Fringe (15% & tuition) \$36,872	\$ 75,728
1 Graduate Student (Years 2 & 3) - Summer (50%) \$12,952 + Fringe (15%) 1,942	\$ 14,894
Program Coordinator to facilitate SLN (100%) \$147,630 + Fringe (27.2%) \$40,155	\$ 187,785
4 Undergrad Students for 5 months & Undergrad Student (500 hrs @ \$10/hr)	\$ 140,201
<b>Total Personnel</b>	\$ 867,764
<b>Professional/Technical/Service Contract:</b>	
Forester to Conduct Inventory, Logger to Cut Down & Remove Trees, Site Prep Contractor	\$ 17,000
Farmer Cooperator for Movement of Cattle in the Paddocks - 5 months x \$500	\$ 7,500
Pollinator Crew to Access Bee and Other Pollinators	\$ 18,000
Great River Greening (Sub-Award) to help in research and outreach	\$ 54,000
Sustainable Farming Association (Sub-award) to help in outreach	\$ 165,050
Programmer to Add Silvopasture Systems to Database	\$ 5,000
<b>Total Professional/Technical/Service Contract</b>	\$ 266,550
<b>Equipment/Tools/Supplies:</b>	
Dual-Wall Permeameter - 2 meters x \$3,500	\$ 7,000
Water Quality Materials and Supplies - pipe, containers, bottles , replacement probes, etc	\$ 2,100
Wildlife Assessment Field Supplies for Data Collection	\$ 1,500
Computer for Program Coordinator for SLN	\$ 1,500
Field & Office Supplies for use in Outreach Activities	\$ 4,500
<b>Total Equipment/Tools/Supplies</b>	\$ 16,600
<b>Travel:</b>	
To implement all components of the project (427 trips with approx 93,600 miles x \$0.545 + lodging (\$7,150) & M&IE (\$4,974)	\$ 63,136
Present Results - MN Assoc of Soil & Water Conservation Districts and MN Soc of American Foresters	\$ 3,000
<b>Total Travel</b>	\$ 66,136
<b>Additional Budget Items:</b>	
Soil Sample Analysis for Soil Health Parameters - 16 plots x 9 samples x \$95	\$ 27,360
Forum with Stakeholders to advance restoration (Food \$1,500, Facility Rental \$1,000) Printing (\$2,000)	\$ 4,500
Field Days - Bus Rental	\$ 3,000
Surveys - Printing and postage	\$ 10,000
Workshops - Facility Rental (\$1,000), Printing (\$2,000), Advertisement to recruit volunteers (\$6,000)	\$ 9,000
<b>Total Additional Budget Items</b>	\$ 53,860
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 1,270,910</b>

## Visual Map of the study location

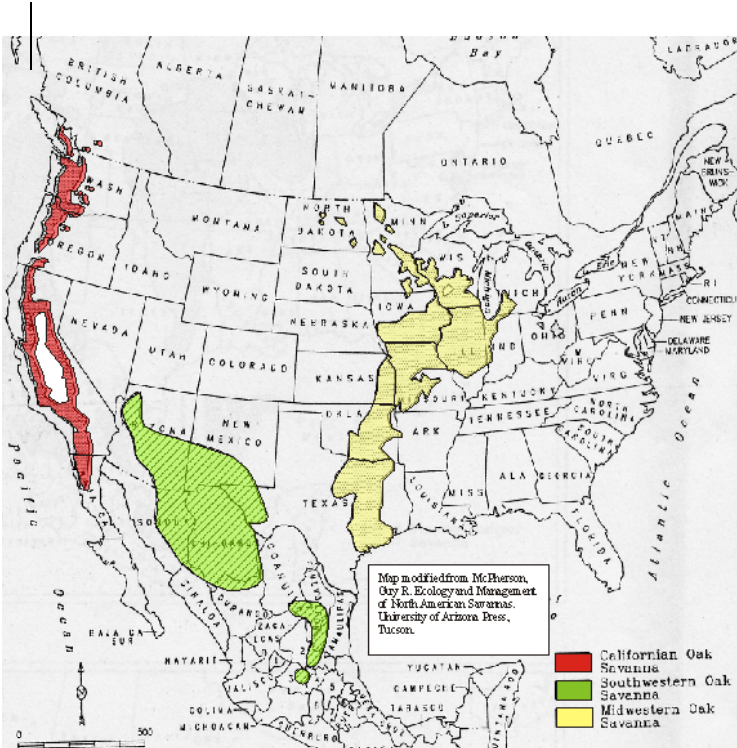
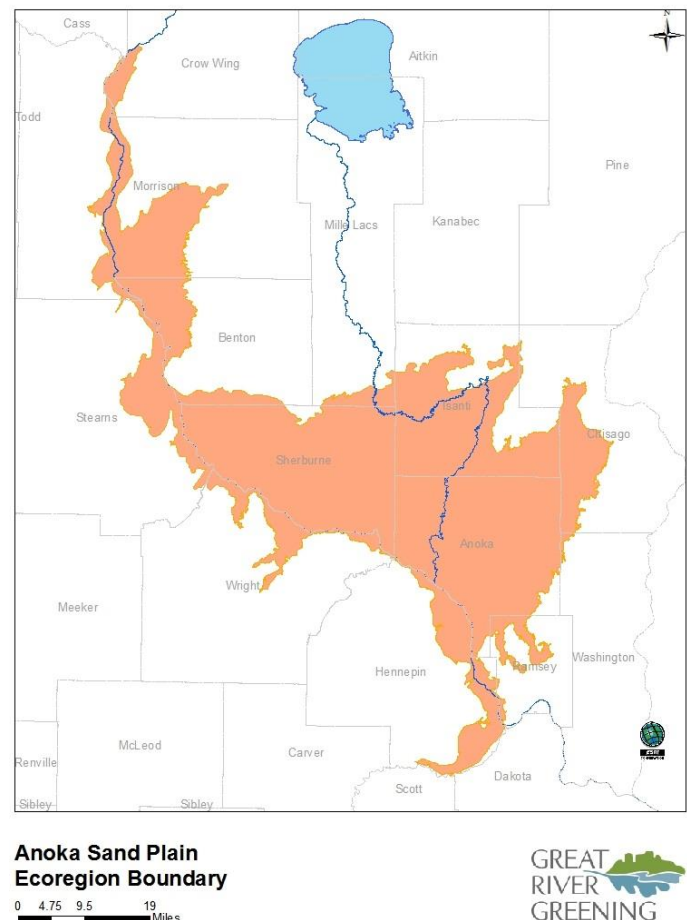


Fig 1. Geography of oak savanna ecosystem in the US. Historically, oak savanna ecosystem in MN covered 5.5 million acres but it has reduced to only 0.2% today.

Fig 2. Characterized by thousands of shallow wetlands, miles of rivers and streams, and acres of oak savanna, the Anoka Sandplain is a unique and vulnerable ecological region located in east-central MN. This region once rich in native species both animals and plants but such characteristics is declining. Oak savannas used to dominate this region.



**Promoting and Restoring Oak Savanna Using Silvopasture**  
**Project Manager Qualifications**  
**Dr. Diomy Zamora**

**Qualifications**

**Dr. Diomy Zamora** received his PhD in Forest Resources and Conservation at the School of Forest Resources and Conservation, University of Florida, Gainesville, Florida in 2005. Dr. Zamora is an Extension Educator of Forestry with an Academic Rank of Extension Professor with the University of Minnesota Extension focusing on agroforestry, biomass energy (bioenergy) and forest management. He is actively involved with implementing Extension's agroforestry, bioenergy and forest ecosystem health program for woodland owners, agricultural producers, and Natural Resource Professionals. Dr. Zamora promotes the establishment of different forms of agroforestry in Minnesota's landscapes for conservation and economic benefits. These agroforestry practices include silvopasture (managing trees + forage + livestock together as one practice), riparian forest buffers, alley cropping (planting rows of trees wide enough to create alley ways to allow production or planting of agronomic crops), windbreaks, and forest farming (farming non-timber forest products in the forests). Over 10 years with the University of Minnesota Extension, Dr. Zamora has lead a number of peer-reviewed extension publications and technical journal articles about the use of agroforestry for achieving environmental protection and conservation while enhancing economic productivity among farmers in Minnesota. Several of these articles resulted from the LCCMR –funded project of Enhancing Environmental and Economic Benefits of Woodland Grazing.

Dr. Zamora teaches a course on “Agroforestry – Role in Watershed Management” at the Department of Forest Resources, College of Food Agriculture and Natural Resource Sciences (CFANS), University of Minnesota. He also serves as a Principal Investigator and Co-PI for number of projects including: 1) Educating Woodland Owners in Minnesota (Forest Stewardship funded), 2) A Decision Support Tool to Restore Impaired Waters (Pollution Control Agency funded), and 3) Bioenergy Feedstock from Marginal Lands (SunGrant).

**Responsibilities:**

Dr. Zamora will act as Project Manager and oversee the implementation of all project components with collaborators. **Task 1 (ecological assessment)** will be led by project collaborators including: Dr. Rebecca Montgomery, lead for assessment of impacts on native species regeneration in partnership with Great River Greening; Dr. John Loegering, lead for wildlife assessment in partnership with DNR; Dr. Anna Hess, lead for pollinator assessment design and analyses; Dr. Joe Magner, lead for water and soil quality impacts, in partnership with Dr. Jess Gutknecht, Dr. Craig Schaefer and Great River Greening. **Task 2 (establishment of silvopasture learning network), Task 3 (outreach activities)** implementation will be led by Dr. Zamora in collaboration with Great River Greening and Sustainable Farming Association. **Task 4** economic assessment will be led by Dr. Dean Current. Dr. Zamora will provide leadership role in the outreach component of the project with assistance from Mr. Gary Wyatt, and assist in supervising graduate students. Dr. Montgomery will supervise the Post-Doctoral position. Dr. Zamora will assist supervising the Program Manager who will be working with the project.

**Organization Description:**

The University of Minnesota Extension is part of the University of Minnesota.