

**Environment and Natural Resources Trust Fund  
2012-2013 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 024-B**

Enhancing Environmental and Economic Benefits of Woodland Grazing

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**Topic Area:** B. Forestry/Agriculture/Minerals

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**Total Project Budget:** \$ 380,000

**Proposed Project Time Period for the Funding Requested:** 4 yrs, July 2013 - June 2017

**Other Non-State Funds:** \$ 0

**Summary:**

We will demonstrate/assess that managing woodlands used for grazing can provide environmental and economic benefits: improved water quality, reduced soil erosion, enhanced species diversity, and improved forage and livestock performance.

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**Name:** Diomy Zamora

**Sponsoring Organization:** U of MN

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**Location**

**Region:** NW, Central

**County Name:** Beltrami, Benton, Carver, Cass, Crow Wing, Itasca, Kandiyohi, Koochiching, Lake of the Woods, McLeod, Meeker, Morrison, Renville, Scott, Sherburne, Sibley, Stearns, Todd, Wadena, Wright

**City / Township:**

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<input type="checkbox"/> Funding Priorities	<input type="checkbox"/> Multiple Benefits	<input type="checkbox"/> Outcomes	<input type="checkbox"/> Knowledge Base
<input type="checkbox"/> Extent of Impact	<input type="checkbox"/> Innovation	<input type="checkbox"/> Scientific/Tech Basis	<input type="checkbox"/> Urgency
<input type="checkbox"/> Capacity Readiness	<input type="checkbox"/> Leverage	<input type="checkbox"/> Employment	<input type="checkbox"/> TOTAL <input type="checkbox"/> %

**PROJECT TITLE:** Enhancing Environmental and Economic Benefits of Woodland Grazing

**I. PROJECT STATEMENT**

Over 527,000 acres of unmanaged woodlands are being used for livestock grazing throughout Minnesota. Of that area, 40% (210,800 acres) is located in central and north-central regions representing more than 11,600 farms (USDA-ERS, 2012). Managing these grazed woodlands based on the use of best management practices will provide environmental and economic opportunities. Silvopasture, the practice of intentionally combining and managing trees, forage (grasses), and livestock (i.e., cattle) as one integrated practice, can enhance woodland grazing for environmental protection/conservation and production benefits. Managing the trees, forage and livestock together as a whole can improve functionality and health of the watershed, resulting in an improved water quality in streams, rivers and lakes due to reduced soil erosion and minimization of nitrate leaching. Nitrogen applied in excess of what the plant uses results in inefficient use by the forage and contributes to nitrogen leaching below the effective rooting zone and therefore moves into the surface, subsurface drainage and groundwater. The complex root systems under silvopasture can mitigate the effects of nitrate leaching into the groundwater as they occupy different soil depths resulting in improved efficiency of nitrogen uptake, reducing nitrogen losses from soil compared with monoculture agronomic crop and tree plantations (Allen et al., 2004; Bambo et al., 2009). Silvopasture also enhances species (plant and animals) diversity. Economically, it maximizes forage production in wooded pastures while building long-term capital in high quality timber. Silvopasture helps avoid economic losses from reduced timber value and low quality of forage that could translate to decreased animal productivity due to inadequate nutrition. Shade from trees may translate to greater forage production, nutritive value, digestibility of pasture grasses grown under trees relative to open sites and mitigation of stress to animals, hence more livestock weight gain. Because it utilizes best management practices, silvopasture would create a healthier working agricultural landscape.

Silvopasture exhibits potential to enhance environmental and economic benefits within Minnesota’s hardwood transition zone where livestock production is practiced. Compared to other part of the US where silvopasture (e.g., Pine-based system) is a common practice, barriers exist in adopting silvopasture in MN because of lack of knowledge of how trees, forage, and cattle can be managed as one integrated system for environmental and economic benefits.

The goal of the study is to assess, monitor and demonstrate the effectiveness of silvopasture as a tool for enhancing woodland grazing particularly for improving water quality, reducing soil erosion, and enhancing and preserving species diversity (plant and animals) while improving economic productivity of livestock producers in central and north-central Minnesota. At least 5% of the 11,600 farmers in these regions will adopt silvopasture at the end of the project resulting in reduced soil erosion rate, improved water quality, enhanced plant and animal diversity and a healthier forest and agricultural landscape.

Four farmer cooperators are willing to participate and have volunteered the use of their land to demonstrate, monitor and assess the potential of silvopasture. We will establish and evaluate three systems serving as treatments in each cooperator’s farm: 1) unmanaged (traditional) woodland grazing, 2) conventional pasture, 3) silvopasture (managed woodland grazing with trees, livestock and forage together). Effects on water quality, erosion rate, and species diversity (focusing on game animals and native plants) for each of these systems will be monitored and assessed. Forage quality and nutritional value, and cattle weight gain will also be assessed. We will host field days in partnership with the Crow Wing River Forage Council to educate livestock producers.

**II. DESCRIPTION OF PROJECT ACTIVITIES**

Activity 1: Conduct a pre-survey of pasture and woodland owners to identify barriers in adopting silvopasture; use survey results to direct extension efforts and to assess potential adoption rate of silvopasture once the project has ended.

*Budget: \$5,000*

Outcome	Completion Date
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1. Barriers to adopting silvopasture identified, assessed and analyzed.	November 2013
2. Pre-survey report submitted including framework for addressing adoption constraints developed.	December 2013

Activity 2: Establish and monitor demonstration/research sites with 3 treatments/systems on 4 farmer cooperators' farms for water quality, erosion rate reduction, species diversity and assessment of economic parameters  
**Budget: \$361,500.**

Outcome	Completion Date
1. Demonstration/research plots established; baseline data collected	June 2014
2. Forage planted in year 1; Cattle allowed to graze in year 2 onwards	June 2014
3. Water quality, erosion rate and species diversity assessed	Annually
4. Economic parameters assessed (forage yield, nutritive value, livestock performance, tree volume)	Annually

Activity 3: Conduct outreach activities i.e., workshops & field days on cooperators' farms targeting at least 150 livestock producers, woodland owners and natural resource managers in central & north central Minnesota annually  
**Budget: \$13,500**

Outcome	Completion Date
1. One field day & one workshop conducted every year (a total of 6 events)	Annually
2. Extension materials (i.e., fact sheet and bulletin series) developed	December 2016
3. Post survey conducted to assess changes in practices and behavior of livestock producers, woodland owners and natural resource managers	January 2017
4. Final Project Report written	June 2017

### III. PROJECT STRATEGY

#### A. *Project Team/Partners:*

The University of Minnesota will receive all of the funding and contribute time and effort to the project. Staff involved are: Diomy Zamora (Associate Extension Professor & Project Leader), Allen Bridges (Assistant Professor), Eleanor Burkett (Associate Extension Professor), Charlie Blinn (Professor), Dean Current (Program Director) will perform economic analysis at a cost of \$20,000, and Gary Wyatt (Extension Professor). All University staff will work together implementing the project. The University of Missouri, through Dr. Dusty Walter will serve as our collaborator with salary no-cost involved, but the project will cover his travel-related expenses (2 trips) to MN to help the project team set-up the project. USDA-NRCS (Jeff Duchene – Grazing Specialist), SWCD, the National Agroforestry Center, and the Minnesota State Cattleman's Association will cooperate and participate at no cost to the project. The Crow Wing River Basin Forage Council – a project collaborator - will facilitate the outreach activities of the project and connections of the project to livestock producers at a cost of \$6,000.

#### B. *Timeline Requirements*

A four-year project length is needed to be able to collect background information, establish and monitor demonstration and research sites, develop Minnesota-based research information for promoting silvopasture to pasture producers and woodland owners, conduct outreach activities, and prepare project summary reports.

#### C. *Long-Term Strategy and Future Funding Needs*

This project will be the first silvopasture agroforestry demonstration and research trial in Minnesota. Information collected will be used to further expand this research in other parts of MN with greater applicability. We will continue to seek funding from other funding agencies to carry this effort beyond the life of the project.

**2012-2013 Detailed Budget**

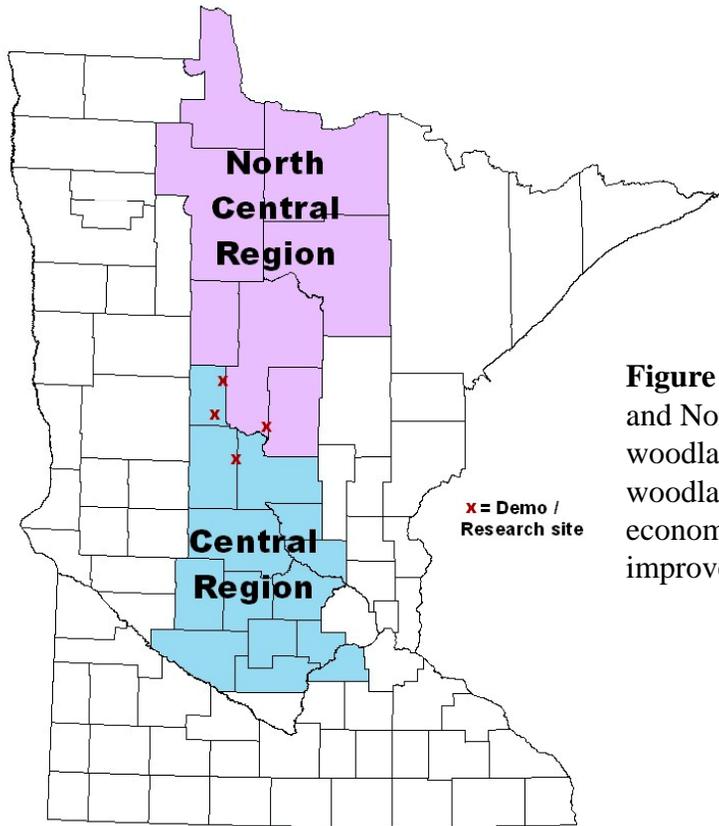
**IV. TOTAL ENTRF REQUEST BUDGET: 4 Years**

<b>BUDGET ITEM</b>	<b>AMOUNT</b>
<b>Personnel:</b>	
1 UMN Graduate Research Assistant Student (50% time) to work on the project Salary (\$81417) + Fringe (Tuition and Health Insurance)	\$ 150,814
1 Undergraduate Student Technician @ \$12/hour x 500 hours/year + Fringe (FICA) \$377/year	\$ 25,573
UMN-CINRAM Economist (Dean Current) to conduct economic analysis (6% Salary and Fringe)	\$ 20,000
<b>Contracts:</b>	
Forester to conduct tree inventory and determine project basal area @\$1,000/site x 4 sites)	\$ 4,000
Labor to install fence, pipes and tanks @ \$3000/site x 4 sites)	\$ 12,000
Crow Wing River Forage Council to facilitate project outreach	\$ 6,000
<b>Equipment/Tools/Supplies:</b>	
Electric fence (\$2000/site x 4 sites) + Water Pipes (\$1,500/site 4 sites) + Water Tanks (5 tanks/ site x 4 sites x \$200/tank)	\$ 18,000
Soil eorsion rate monitoring devices + water quality monitoring devices (lysimeter, piezometer and labor to install) + native grass seeds for the study and fertilizers	\$ 14,060
4 Field Monitoring Weather Statios @\$500 a piece, + Gap Light Analyzer, rectal thermome	\$ 3,800
Ceptometer and hemispherical camera for light measurement	\$ 3,000
<b>Travel for Personnel</b>	
Travel for project personnel for 4 yrs (Zamora - 14 trips/yr, Bridges - 7 trips/yr, Burkett - 21 trips/yr, Wyatt - 3 tripss/yr, Grad Student & Student Tech -56 trips for yr 1 and 14 trips/yr for yr 2-4) @ 300 miles/travel x 0.55 mile/travel) + Logding & perdiem for 10 days @ \$126/day	\$ 46,013
<b>Additional Budget Items</b>	
Forage Analysis 3 samples/trt x 3 trt/site x 4 sites x 3 collection/year x 4 year x \$30/sample	\$ 9,720
Forage Mineral Analysis:3 sample/ trt x 3 trt/site x 4 sites x 1 collection/year x 3 year x \$30/sample	\$ 3,240
Soil Analysis (3 samples/trt x 3 trt/site x 4 sites x 1 collection/year x 3 years x \$15/samples)	\$ 2,160
Water Quality analysis: 3 samples/trt x 3 trt x 3 collection/year/trt x 4 sites x 3 year x \$30/sample	\$ 9,720
Outreach Activities (3 fielddays including bus rentals + 3 indoor workshops + promotion cost & printed publications)	\$ 13,500
Land rental (payment to farmer cooperators for use of their land causing inconvenience to them. \$50/ac rent = \$500/yr/farmer x 4 yrs	\$ 8,000
Farmer Cooperators Fee (Farmers time in preparing and hosting field days; use of their machineries; assistance in managing the project) @ \$500/farmer/yr x 4 farmers x 4 yrs	\$ 8,000
Survey Costs (printing & mailing for pre and post surveys (Activity 1)	\$ 5,000
Logging Cost (A supplemental cost to be paid to Logger, as the Logger may not be willing to cut trees due to low volume of trees) @ 2,000/farm x 4 farms	\$ 8,000
Maintenance of Chute and Scale @200/trip x 8 trips/year	\$ 6,400
Travel cost by Dr. Dusty Water - Univ of MO Silvopasture Expert to asist project team set up plots and serve as speaker during one field day @\$1,500/trip x 2 trips.	\$ 3,000
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	\$ 380,000

**V. OTHER FUNDS**

<b>SOURCES OF FUNDS</b>	<b>AMOUNT</b>	<b>STATUS</b>
<b>Other Non-State \$ Being Applied to Project During Project Period</b>	\$ -	None
<b>Other State \$ Being Applied to Project During Project Period</b>	\$ -	None
<b>In-Kind Service During Project Period</b>		
<i>UMN Extension In-Kind Contribution through Staff Salary and Fringe (Zamora @ 15% time - \$42,319 + Burket @ 15% time - \$41,560 + Bridges @ 1% time - \$5,375)</i>	\$ 89,254	
<b>Remaining \$ from Current ENRTF Appropriation (if applicable)</b>		None
<b>Funding History</b>	\$ -	
<b>TOTAL OTHER FUNDS</b>	\$ 89,254	

# PROJECT GRAPHICS



**Figure 1.** Location of the silvopasture demonstration /research trials in Central and North-Central, MN. There are at least 210,800 acres (40%) of unmanaged woodland grazing in Central and North-Central, MN. Managing these grazed woodlands through best management practices would provide environmental and economic benefits such as improved water quality, reduced soil erosion, and improved species diversity.



**Figure 2.** Unmanaged Woodland Grazing.



**Figure 3.** Managed Woodland Grazing through the application of silvopasture principles.

## **Enhancing Environmental and Economic Benefits of Woodland Grazing Project Manager Qualifications**

**Dr. Diomy Zamora**

### **Qualifications**

**Dr. Diomy Zamora** is an Associate Extension Professor and Extension Forester with the University of Minnesota Extension focusing on agroforestry and biomass energy (bioenergy). Dr. Zamora is actively involved with implementing Extension's agroforestry and bioenergy program for woodland owners, agricultural producers, and Natural Resource Professionals. He received his PhD in Forest Resources and Conservation at the School of Forest Resources and Conservation, University of Florida, Gainesville, Florida in 2005 specializing in Agroforestry. Dr. Zamora promotes the establishment of different forms of agroforestry in Minnesota's landscapes for environmental 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). Dr. Zamora is also implementing a number of bioenergy-related projects including the use of agroforestry practices to produce feedstock for energy. Having been with the University of Minnesota Extension for over six years now, Dr. Zamora has developed, authored and published 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.

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) Production and Economics of Perennial-based Woody Herbaceous Biomass Crops under Alley Cropping Systems.

### **Responsibilities**

As Project Manager, Dr. Zamora will implement the research component of the project in collaboration with project team members including Ms. Eleanor Burkett who will provide co-leadership role in assessing the environmental benefits of managed woodland grazing on water quality and species diversity, Dr. Allen Bridges who will take leadership role in assessing impacts of the managed woodland grazing on cattle performance, and Dr. Dean Current who will perform the economic analysis of managed woodland grazing. In addition to providing leadership role in the outreach component of the project with assistance from Mr. Gary Wyatt, Dr. Zamora, along with project team members, will supervise and mentor the graduate student who will be working with the project.

### **Organization Description**

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