

Environment and Natural Resources Trust Fund 2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 097-D1

Project Title: Habitat and Bioenergy Impacts of Harvesting Minnesota Grasslands

Total Project Budget: \$ 1,661,478

Proposed Project Time Period for the Funding Requested: 3 years (July 2009 to July 2012)

Other Non-State Funds: \$ 0.00

Priority: D1. Renewable Energy Life Cycle Costs and Impacts

First Name: Greg **Last Name:** Cuomo

Sponsoring Organization: U of M

Address: Room 277 Coffey Hall, 1420 Eckles Ave
St Paul MN 55108

Telephone Number: 612-625-7098

Email: cuomogj@umn.edu

Fax: 612-625-1260

Web Address:

Region: Central	County Name: Stevens	City / Township: Stevens Cty and Surrounding Counties (see map)
---------------------------	--------------------------------	--

Summary: Use an existing bioenergy facility and available agricultural technologies to explore life-cycle implications (ecological-economic) and industrial applications for using untapped grassland biomass from managed grasslands (WPAs, WMAs and CRP).

Main Proposal: 0908-2-019-proposal-2009 LCCMR Proposal - Cuomo.doc

Project Budget: 0908-2-019-budget-2009 LCCMR Project Budget - Cuomo.xls

Qualifications: 0908-2-019-qualifications-2009 LCCMR Project Manager Qualification- Cuomo.d

Map: 0908-2-019-maps-2009 LCCMR map Cuomo.pdf

Letter of Resolution:

MAIN PROPOSAL

PROJECT TITLE:

Habitat and Bioenergy Impacts of Harvesting Minnesota Grasslands.

I. PROJECT STATEMENT

Grasslands (*M.S. 84.02*) are by a wide margin the most common plant communities found on marginal lands in West Central Minnesota. Grasslands are often managed on a rotational basis with relatively costly prescribed burns. Prescribed burns replicate the natural fire cycle that would have removed woody vegetation, thus maintaining prairies. It has been suggested that biomass harvesting could be used to both manage grasslands and provide biomass for energy production. A pilot study conducted by the University of Minnesota, West Central Research and Outreach Center indicates that biomass harvest from such grasslands is technically possible and potentially economical. Many questions remain, however, with respect to the overall suitability of biomass harvesting on managed grasslands.

This project analyzes the feasibility of managing grasslands for large-scale bioenergy harvest, in a manner consistent with habitat maintenance and other environmental imperatives. The project will investigate the sustainable use of grassland biomass by energy producers and demonstrate whether harvesting grasslands can successfully be used by public agencies and landowners in place of more expensive prescribed burns.

The project's *first objective* is to assess the environmental impacts of biomass harvest. Ecological and habitat changes at harvest sites will be analyzed, as will the emissions streams from the energy conversion process itself.

The *second objective* is to clarify the economics of bioenergy harvest from grasslands. The project analyzes production economics directly, and also develops a broader analysis of the overall life-cycle costs of harvesting grassland biomass. Intensive use will be made of the data gathered on harvesting, transport, and the energy conversion process.

The *third objective* is to disseminate information to land managers and private landowners with interest in biomass harvesting as a management strategy for their existing grasslands or for creating additional grassland acreage for biomass harvesting.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Ecology and Habitat analysis

Budget: \$ 803,671

Ecological work on the project will focus on the core question of how grassland biomass harvesting affects the plant community and corresponding value as animal habitat. The ecological component of the study will use three experiments to assess ecological impacts of harvesting vs. burning; an intensely monitored 3 year study area, a yearly set of harvest plots, and a set of invasive species harvest plots.

Deliverable	Completion Date
1. Identify Sites	10/01/09
2. Collect and analyze data	2/28/12
3. Develop recommendation	3/31/12

Result 2: Soil Analysis

Budget: \$ 243,500

Based on experiences in agricultural systems, biomass removal can cause significant changes in soil composition, structure, and nutrient levels. Soil properties at harvest sites will be assessed for three seasons to determine whether harvesting affects such factors as nutrient levels, organic matter (carbon), pH, and bulk density. Findings from soil analysis will be used to create soil management strategies that will appear in harvesting BMPs and guidelines.

Deliverable	Completion Date
1. Establish soil sampling plots	11/31/09
2. Collect soil samples and lab analysis	11/31/11
3. Develop recommendations	2/28/12

Result 3: Biomass Conversion Analysis **Budget: \$ 98,857**
The potential for diverse grasslands to be thermo-chemically converted to energy within emission and efficiency standards will be assessed at the University of Minnesota, Morris Gasification Facility. Physical properties, energy value (BTU's), air emissions, and ash content will be used to assess the viability of grassland biomass in energy production.

Deliverable	Completion Date
1. Biomass Gasified	12/31/11
2. Conversion Report	3/31/12

Result 4: Integrating Lifecycle Data **Budget: \$ 235,745**
The life cycle analysis will analyze the overall flow of resources (energy, carbon, nutrients) in the system. This data will be combined with the ecological, habitat, soil, and economic data to produce a lifecycle model for harvesting biomass from grasslands.

Deliverable	Completion Date
1. Collect and analyze data	2/28/12
2. Publish models	6/30/12

Result 5: Economic/logistic analysis **Budget: \$ 149,208**
The use of grassland biomass for energy will ultimately be driven by economics. The costs of harvesting, storing, and transporting grassland biomass will be assessed and balanced against the income from selling biomass and environmental impacts. Additionally, the costs of management alternatives, such as prescribed burns, will be compared with biomass harvesting.

Deliverable	Completion Date
1. Collect data	2/28/12
2. Publish business/economic models	6/30/12

Result 6: Outreach & Information Dissemination **Budget: \$ 130,497**
An initial set of best management practices (BMPs) and guidelines for harvest and management transportation strategies will be developed for land managers, property owners, and biomass facility managers will be created and publically presented in the final season of the project.

Deliverable	Completion Date
1. Guidelines for harvesting	3/31/12
2. BMPs for land managers and property owners	3/31/12
3. Information dissemination via print media, web access, and field days.	6/30/12

III. PROJECT STRATEGY AND TIMELINE

A. Project Partners. This project brings together a team of natural resource and economic professionals from throughout the University of Minnesota system in conjunction with the Morris USDA-ARS Soils Lab to examine biomass harvesting. In addition, the Minnesota DNR and the Morris Regional US Fish and Wildlife Service district office have agreed to let their lands be used and are eager to provide feedback on BMPs.

B. Project Impact. Data from this project will empower land managers to make informed decisions about land under their supervision. It will also provide industry with crucial information regarding the availability and use of grasses from marginal lands. The impacts will be statewide.

C. Time. This project is designed to achieve an understanding of harvesting impacts in three years.

D. Long-Term Strategy. The sites harvested in this study will be used for long-term research if additional funding to cover future work is acquired. The long term goals for this work are to develop a more complete understanding of the effects of biomass harvesting on grasslands and develop sustainable harvesting practices which will allow long-term economical harvesting for the bioenergy market.

Project Budget- Habitat and Bioenergy Impacts of Harvesting Minnesota Grasslands.

IV. TOTAL PROJECT REQUEST BUDGET (Based on 3 year study)

BUDGET ITEM (See list of Eligible & Non-Eligible Costs, p. 17)	AMOUNT	% FTE
Personnel: Dr. Greg Cuomo, Project Manager, overall project administration, verification of all reports and data, personnel management.	\$ 30,246	5%
Dr. Dan Svedarsky, Analyze plant communities to predict wildlife impacts.	\$ 42,553	10%
Dr. Arne Kildegaard, Life-cycle research and modeling of energy and impacts	\$ 27,657	10%
Troy Goodnough, Data collection for life-cycle analysis.	\$ 42,454	25%
Project Coordinator, organizing research activities, compile reports and maintain budgets.	\$ 33,751	15%
Emissions Scientist, analyze biomass feedstock pre and post gasification.	\$ 16,133	10%
Economic Analyst, Review bioenergy related costs for the project.	\$ 29,203	10%
Biomass Scientist, Outreach and Extension to disseminate BMPs	\$ 37,547	15%
Plant Scientist, Direct plant community data collection and analysis.	\$ 25,031	10%
2- Scientist/Technicians to assist with data collection and management	\$ 271,034	100%
3- Graduate Students, each investigate a different applied aspect of the study	\$ 331,814	50%
10-Undergrad interns per year to conduct field, library, and lab work	\$ 178,955	25%
Contracts: USDA-ARS-North Central Soil Conservation Research Lab (soils studies)	\$ 243,500	
UMM Biomass Facility Usage Costs (Standard Fee charged to cover costs associated with research at biomass facility)	\$ 55,000	
Payment for biomass harvester assisting with collection and transport	\$ 60,000	
Equipment/Tools: Economics/data analysis software for 2 researchers	\$ 5,000	
Field Research Equipment: GPS unit, field data entry tablet PC, field research supplies, signage, field utility vehicle	\$ 27,500	
Specialized Harvesting Equipment: Lease of a tractor capable of harvesting on wet ground, purchase of a round baler with load cells.	\$ 109,500	
Other: Meeting Expenses (Meetings will be used to get feedback from scientists, resource managers, and landowners on BMPs)	\$ 3,000	
Printing/Publication Expenses: Cover the cost of print brochures, BMPs, guidelines, web outreach, BMP Outreach Video	\$ 53,000	
Transportation expenses: includes transportation to research sites, stakeholder outreach workshops, scientific conferences, and policy meetings.	\$ 38,600	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	\$ 1,661,478	

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Remaining \$ From Previous Trust Fund Appropriation (if applicable):	\$ -	
Other Non-State \$ Being Leveraged During Project Period:	\$ -	
Other State \$ Being Spent During Project Period:	\$ -	
In-kind Services During Project Period:	\$ -	
Past Spending: Funds used by UMM for pilot study	\$ 12,491	

Project Manager Qualification

Dr. Greg Cuomo is an Associate Dean for Extension in the College of Food, Agricultural and Natural Resource Sciences. He currently leads University of Minnesota Extension programs related to food, agriculture and natural resource sciences, and works to further interdisciplinary programs targeted to the public's critical issues.

Greg's academic background is in Pasture Management/Ecology. Greg received his B.S. degree from Texas A&M and his M.S. from Texas Tech University in Range Science. He worked as a research technician in Texas and Nebraska before completing a Ph.D. in Agronomy/Forages from the University of Nebraska-Lincoln. Prior to coming to the University of Minnesota, Greg was responsible for a diverse research and outreach project at the Louisiana State University, Southeast Research Station near Franklinton, that focused on forage management and quality and included oversight for the Louisiana and Mississippi Forage Testing Laboratory.

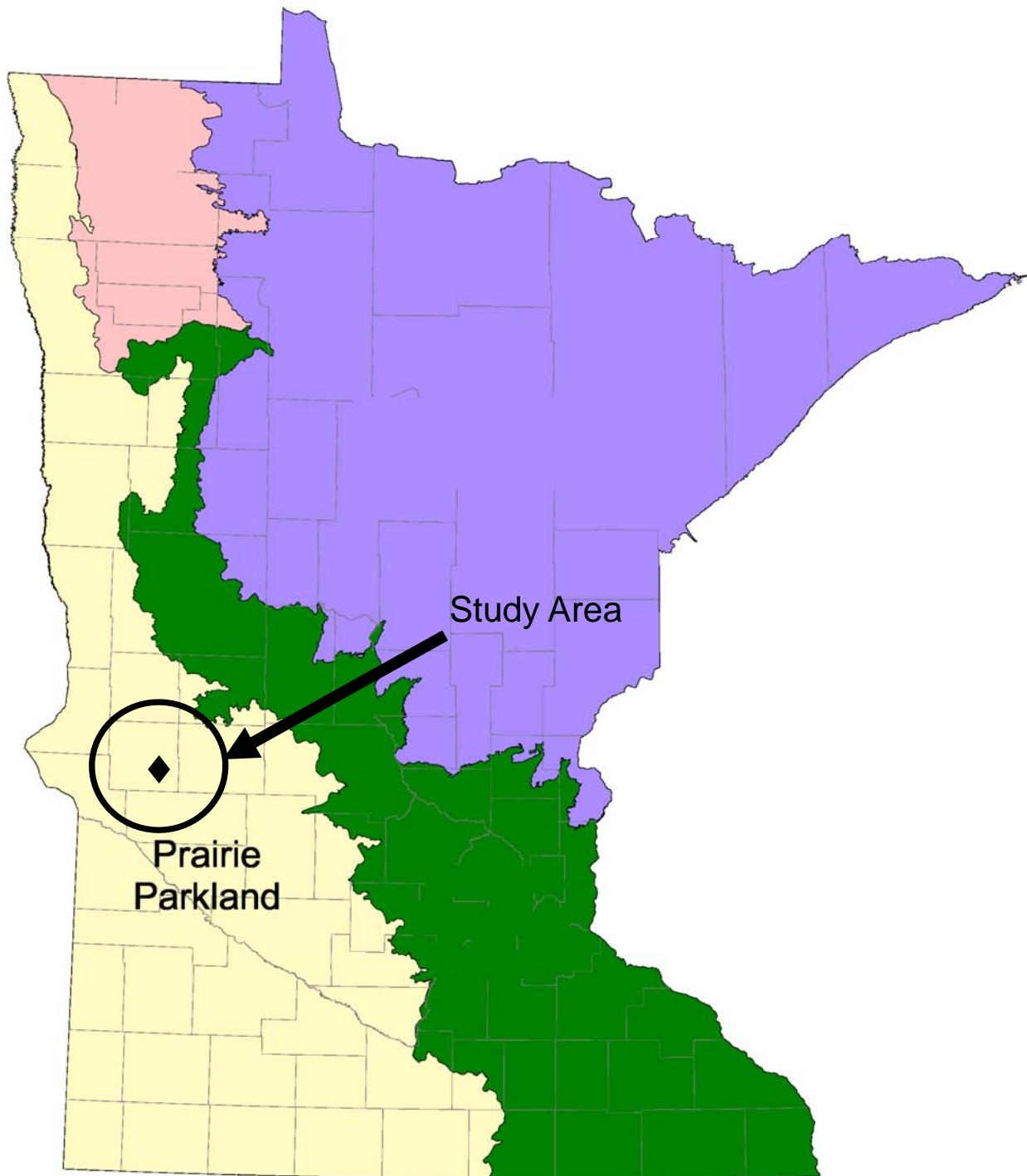
At the University of Minnesota, Greg's research and outreach program emphasized a systems approach to ecologically and economically sound pasture and grazing management systems. A focus of his studies was the relationship of harvesting and burning on the health of native grass stands. Among his studies of grasslands, he has previously participated as an investigator in LCMR (1999) funded work, which examined best management practices to promote wildlife in prairies.

Beginning in 2000, Greg was the Head at the West Central Research and Outreach Center in Morris, Minnesota and had an administrative role in the Sand Plain Research Farm near Becker. At the West Central Research and Outreach Center Greg was responsible for the development of a Renewable Energy Research and Demonstration Center that included a first of its kind biomass gasification facility on the University of Minnesota, Morris (UMM) campus. The facility is designed to capitalize on abundant local sources of biomass for renewable energy, such as, agricultural residues, grassland biomass, and industrial/forestry wood residues. Greg and others planned the gasification and other energy platforms to be both operation systems and applied research facilities. By conducting hands-on research using these brick and mortar facilities with the latest near-term technologies, Greg intends to generate the information needed to advance sustainable renewable energy projects in Minnesota. The project in this proposal is an example of the type of research that he feels will have immediate applications to industry, habitat managers, and landowners.

Organization Description

The University of Minnesota is a world class educational and research institution with campuses and research centers throughout the state. The combination of exceptional faculty and staff knowledge with the latest in research facilities and equipment gives the University of Minnesota the ability to consistently conduct ground-breaking research.

Minnesota Ecological Provinces



Study Area and Area of Impact. The study sites are planned to be within a 20 mile radius of Morris, Mn (diamond). The results from this study will be applicable to most of Prairie Parkland province (light colored area on map) of Western Minnesota. Impacts will extend to facilities throughout the state which use biomass from the Prairie Parkland.

Base map courtesy of the Minnesota Department of Natural Resources.