

**Environment and Natural Resources Trust Fund  
2011-2012 Request for Proposals (RFP)**

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**LCCMR ID: 123-E**

**Project Title:** Switchgrass: A Biofuel Crop or Invasive Species?

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**Category:** E. Aquatic and Terrestrial Invasive Species

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**Total Project Budget:** \$ \$122,178

**Proposed Project Time Period for the Funding Requested:** 2.5 yrs, July 2011 - Dec 2013

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

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**Summary:**

Determine invasion risk of selectively bred native grasses for biofuel production. Develop strategies to minimize invasion potential and impacts on biodiversity. Evaluate trade-offs between biofuel production and invasion risk.

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**Sponsoring Organization:** Central Lakes College

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Staples MN 56479

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**Location**

**Region:** Statewide

**Ecological Section:** Statewide

**County Name:** Statewide

**City / Township:**

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_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity	_____ Readiness	_____ Leverage	_____ Employment
_____ TOTAL			_____ %

# 2011-2012 MAIN PROPOSAL

## PROJECT TITLE: Switchgrass: A Biofuel Crop or Invasive Species?

### I. PROJECT STATEMENT

1) Native switchgrass has been selected and bred to establish dense, productive biofuel stands with little nutrient or water requirements. This major advance in biofuel sustainability also poses a significant risk to native biodiversity; selectively bred switchgrass shares many characteristics that typify our most invasive species. Little is known about the invasion risk posed by selective breeding of native grasses.

Invasion risk assessment is urgently needed because these crops are being established widely across the state. This research complements current work on *Miscanthus* because selectively bred native grasses could pose a greater invasion risk since they spread by seed and are being established on larger areas in the state. We will integrate three focus areas for risk management:

- **Improved Varieties of Native Grass**— Little is known about the potential for improved native grass varieties to invade prairie and impact local biodiversity. We will evaluate invasion risk by comparing competitiveness of improved grass varieties versus a study control, local genotypes of native grass.
- **Buffer Management**— We will develop recommendations for managing buffers to limit the spread of potentially invasive grass biofuel crops. We will test several strategies for managing biofuel escapees in buffers; recommendations will balance effective control with management cost.
- **Biofuel Sustainability**— Invasion risk and impacts on native biodiversity is often overlooked as a critical consideration for biofuel crop sustainability. We will integrate information from concurrent studies on biofuel production, carbon sequestration, and profitability to determine the trade-offs associated with more productive but potentially more invasive biofuel crops.

2) This research will be used to develop a community-based and sustainable biofuel industry for the Central Sand Plains. Our team will include agronomists and ecologists from the University with a central goal of developing productive biofuel systems that do not threaten the state's native biodiversity. At the core of this project is the Energy and Agricultural Center of Central Lake College in Staples, Minnesota. The Energy Center is well connected to regional producers, agriculture, and bioenergy facilities.

### II. DESCRIPTION OF PROJECT ACTIVITIES

#### Activity 1: Invasive Risk of Selectively Bred Native Grasses

**Budget:** \$85,525

We will test invasion into prairie by improved grass varieties versus local genotypes (study control) grasses. Three varieties and three local populations of switchgrass and big bluestem will be introduced into newly established prairie plots in four locations. We will determine the relationship between seed arrival and dominance by improved grass varieties.

Outcome	Completion Date
Predictions of invasion risk for selectively bred native grass varieties	December 1, 2013
Communicate relevance to Minnesota biofuels through peer-reviewed journals, websites and field days.	December 1, 2011, 2012, 2013

**Activity 2: Buffer Management****Budget:** \$36,653

We will determine buffer size based on dispersal distance and relationship between arriving seed number and probability of invasion. We will test management strategies to contain biofuel crops in the buffer: mowing and grass selective herbicide. We will investigate the role of buffer composition (ie. tree windrow versus grasses) on biofuel crop containment.

<b>Outcome</b>	<b>Completion Date</b>
Recommendations for buffer size, composition, and management to contain potential invasion by biofuel crops.	December 1, 2013
Communicate relevance to Minnesota biofuels through peer-reviewed journals, websites and field days.	December 1, 2011, 2012, 2013

**III. PROJECT STRATEGY****A. Project Team/Partners**

Jim Eckberg, Research Fellow, (Soil, Water and Climate) – University of MN.

*Lead scientist, technical writing, develop protocols, and supervisory services.*

Robert Schafer, Director-Central Lakes College Ag & Energy Center, Staples MN

*Provide land and equipment, labor, financial accounting with MNSCU system, publicity.*

Michelle Johnson, Technician – Central Lakes College Ag & Energy Center

*Establish experimental plots and treatments, data collection*

Shelby Flint, Graduate Trainee in Risk Analysis, (Conservation Biology) – University of MN.

*Consulting and assistance with research protocols, data collection, and publications*

Dr. Ruth Shaw, Professor, (Ecology, Evolution and Behavior) – University of MN.

*Consulting on invasiveness of grass varieties*

Dr. Neil Anderson, Associate Professor, (Horticulture Science) – University of MN.

*Consulting on improved grass variety invasiveness*

**B. Timeline Requirements**

Spring 2011— Establish experimental treatments.

Summer 2011-December 2013— Maintain experimental treatments, collect data, conduct field demonstrations, and provide annual reports.

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

This research is a part of a larger effort to develop a community-based and sustainable biofuel industry for the Central Sand Plains. The funding requested here is essential to address invasion risk associated with selective breeding of native grasses and develop management recommendations for biofuel crops. Funding beyond the scope of this proposal will be important to understanding the long-term dynamics of perennial biofuel invasiveness in native prairie.

## 2011-2012 Detailed Project Budget

### IV. TOTAL TRUST FUND REQUEST BUDGET

Three years

<b>BUDGET ITEM</b>		
<b>Personnel:</b>		<b>Grant</b>
Robert Schafer, Project Manager Annual Salary \$56,523 plus fringe \$24,916 = \$81,439 x .05 FT = \$4,072 x 3 years		\$ 12,216
Michelle Johnson, Research Technician Annual Salary \$27,266 plus fringe \$19,463 x .10FT = \$4,673 x 3 years		14,019
<b>Contractual / Professional Services:</b>		
Jim Eckberg, Research Fellow / Ecologist - will oversee the project consultation, research protocols and publications and professional writing	\$ 45,000	
Shelby Flint, develop research protocols, data collection, and publication	\$ 12,000	
Dr. Ruth Shaw, Consulting	9,000	
Dr. Neil Anderson, Consulting	9,000	
<b>Equipment/Tools/Supplies:</b>		
Seed, Herbicide	\$ 5,000	
Planting, spraying equipment	4,000	
<b>Travel:</b>		
Ag Center Travel for Project Manager, Research Technician and Equipment Operator between off site plots for project purposes. Anticipated number of sites 12 x 24 mile average RT x (Once per week x 24 weeks) = 6,912 miles annually x .50/mile	\$ 10,368	
<b>Additional Budget Items:</b>		
2 Field Days annually (3yr total of 6 Field Days) will include tours, educational seminars for farmers, educators, industry and Gov't Agencies estimated cost per event including guest speakers, facilities and set-up = \$200/event	\$ 1,200	
Materials and publication of newsletters (1 issues per year)	375	
<b>TOTAL ENVIRONMENT &amp; NATURAL RESOURCES TRUST FUND \$ REQUEST</b>	<b>\$</b>	<b>122,178</b>

### V. OTHER FUNDS

<b>SOURCE OF FUNDS</b>	<b>AMOUNT</b>	<b>Status</b>
<b>Other Non-State \$ Being Applied to Project During Project Period:</b>	-	
USDA New Era Rural Technician Competitive Grant Program (RTP)	43,000	Pending
<b>Other State \$ Being Applied to Project During Project Period:</b>	-	
Do you have any other funds that you are applying for from the state?		
<b>In-kind Services During Project Period:</b>	-	
Central MN Irrigators, Inc.	3,000	Secured
NRCS - Environmental Assessments of plantings on Water Quality, Soil Erosion and Wildlife Habitat	2,000	Secured
Central Lakes College Ag Center land, facilities and incidental equipment	6,000	Secured
<b>Funding History:</b>		



Native Switchgrass has been selected and bred to establish dense, productive stands with little nutrient or water requirements. Switchgrass now shares many characteristics that typify our most invasive species. Little is known about the invasion risk of improved and selectively bred varieties of native switchgrass biofuel crops

### **Project Manager Qualifications**

Jim Eckberg is a research fellow at the University of Minnesota. Jim received a Masters in Ecology while working with Dr. Svata Louda at the University of Nebraska-Lincoln. The Louda lab has shown that biocontrol insects released to control noxious plants can themselves become invasive pests. Jim's research addressed the role of native insects as an alternative means to control noxious weeds, specifically thistle. His research demonstrated that native insects can prevent some thistles from becoming invasive, an ecosystem service that has gone unnoticed in the absence of any thistle problems. Jim has designed and implemented multi-site invasion studies, constructed models to predict invasive spread, and has published scientific papers on plant population dynamics and invasions.

As the project manager, Jim will be responsible for coordinating research to address the emerging issue of invasive biofuel crops. Jim will collaborate with Dr. Ruth Shaw, Dr. Neil Anderson and Shelby Flint; their combined experience in selective breeding, invasiveness and genetics will help guide the development of studies to illuminate the potential for engineered invasiveness in biofuel crops. Jim's experience with on-the-ground invasion tests and use of field data to construct invasion models will be instrumental to understanding potential impacts of invasive biofuel crops on native biodiversity. As a Udall Scholar in environmental policy, Jim is highly interested in using this research to inform ecologically sensitive bioenergy policies.

### **Organization Description**

The Ag and Energy Center is a 500 acre research and demonstration station located in the central sand plains. The sand plains are a potential epicenter for perennial biofuel crops given the wide availability of marginal, sandy land. The mission of the Ag and Energy Center is to lead the development of a community-based and sustainable biofuel industry. The Ag and Energy Center is well connected to regional producers, agriculture, bioenergy facilities and the University of Minnesota.

The Center has an established array of biomass demonstration plots containing hybrid poplar, survivor false indigo, hazelnut, Miscanthus, switchgrass, big bluestem, mixed prairie, prairie cordgrass, wheatgrass and many more. Approximately twenty five acres of wasteland are planted to annual and perennial biofuel crops to test their drought tolerance, growth characteristics, nutrient requirements, economic value and environmental benefits.