Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)

Project Title: **ENRTF ID:** **069-C**

Reed Canary Grass Threat to the Tension Zone

Category: C. Environmental Education

Total Project Budget: $ 538,968

Proposed Project Time Period for the Funding Requested: 3 years, July 2015 - June 2018

Summary:

The research will determine sources, uses, and spread in the Tension Zone of native/invasive reed canarygrass by Native- and Euro-Americans to solve critical management issues, using environmental education-driven science.

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Sponsoring Organization: U of MN

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Web Address

Location

Region: NE

County Name: Aitkin, Anoka, Beltrami, Carlton, Cass, Chisago, Hubbard, Isanti, Itasca, Kanabec, Lake of the Woods, Mille Lacs

City / Township:

Alternate Text for Visual:

State of Minnesota map of Tribal Territories, dates ceded, current Tribal Nation locations, and possible historical spread routes of native (light gray arrows) and invasive (darker gray arrows) reed canarygrass. Counties highlighted in gray are in the tension zone, an area at risk for future invasion by reed canarygrass. The bold line indicates the southernmost extent of glacial lake Agassiz. The “N” symbols are historical, pre-1940 herbarium specimens of reed canary grass native to North America. The “U” symbols represent historical, pre-1940 herbarium specimens of unknown origin.

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

PROJECT TITLE: Reed canarygrass threat to the Tension Zone

I. PROJECT STATEMENT

The Tension Zone (Map, highlighted region) is a region identified by invasive species managers most at risk for future reed canarygrass invasion; many American Indian Nations are also located therein. Determination of native reed canarygrass in MN, risk of spread and management in the Tension Zone is critical for Minnesota. Collaboration between UMN researchers and MN tribal communities is essential to conduct this research while offering research experience for Native students. While reed canarygrass has been viewed as an exotic introduction that became invasive, genetic research techniques have revealed that plants collected before 1940 in the UM herbarium are native (N; see Map). It is unknown if other herbarium specimens are native or invasive (U – unknown; Map). Reed canarygrass seed producers in Roseau harvested hay in unplowed, potentially native stands during the Dust Bowl (1930s) and sold it throughout the Midwest (Map; arrows from Roseau) which may have caused its spread. Likewise, American Indians used this grass to weave household items and thatch wigwam roofs (samples in MN History Center; on Map - arrows from Tension Zone). Thus, both groups may have inadvertently spread this grass (the native forms) throughout MN due to their distinct usages but we do not know its native distribution in MN and the Tension Zone, whether it is also invasive and if control is warranted to prevent future spread.

Overall Goals of the Project: (1) Determine native vs. invasive reed canarygrass locations in MN and Tension Zone (genetic studies); identify if field studies of risk and management issues are warranted. (2) Build strong, collaborative educational-research mentoring relationships with UMN researchers and reservation personnel.

Specific, direct outcomes: 1. Determine native grass locations across MN and in Tension Zone (ID, mapping, plant sampling), monitor the invasion front of reed canarygrass in the Tension Zone, characterize spread due to humans, and determine appropriate control measures if native plants are also invasive (Tension Zone; Tribal Nations); 2. Assess the risk of invasion in the Tension Zone and the effectiveness of control methods of native and non-native reed canarygrass; 3. Understanding the influence of American Indian and European uses on native grass distribution; 4. Create enduring mentoring relationships among teachers, scientists, and American Indian students for improved research outcomes, leading to increased graduation rates and college attendance.

How the project will achieve those goals: Research goals - genetic analyses from collections of potentially native populations across MN (including herbarium, museum specimens); determine native ranges, field experiments to determine control options. Educational goals - a series of integrative, collaborative research classes will be conducted with a focus on holistic understanding (weaving together art, science, history, culture).

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Field and lab research to determine native status and effective control strategies for reed canarygrass in the Tension Zone. **Budget: $385,768**

Plant identification, population mapping (using GPS/Kite Aerial Photography technology), genetic analyses to determine native status of reed canarygrass populations across MN and invasive potential in Tension Zone. Students and mentors conduct field experiments to determine the risk of invasion and effectiveness of control strategies (herbicide, harvesting of leaves for weaving) for native and non-native reed canarygrass plants in the Tension Zone. UMN researchers conduct genetic analyses of all existing and collected plant samples (herbarium samples, current populations growing where herbarium samples were collected, those from Tribal Nations in Tension Zone, museum artifacts), analyze data and communicate results with stakeholders.

Outcome	Completion Date
#1. Plant identification and sampling across MN and Tension Zone by UM researchers, students.	June 2017

#2: Genetic analyses, data analysis and interpretation.	Jan. 2018
#3: Field research and risk assessment (invasion front changes in the Tension Zones during Years 1-3). Communicate results to the public in science fair projects, manuscripts, and presentations	June 2018
#4: Study, sample herbarium samples and museum weaving objects with reed canarygrass (traditional, cultural uses of art objects) for genetic/molecular research (UM researchers, museum experts, Tribal College students).	Jan 2018

Activity 2: Research findings used for management recommendations. **Budget: $153,200**
Yearly Tension Zone Research conferences with students, researchers, managers, stakeholders, (3 years). Education events in various Minnesota communities, including tribal communities. Give recommendations for improved management.

Outcome	Completion Date
#1: Public and resource managers receive necessary information about reed canarygrass for improved management.	Feb 2018
#2 Students gain experience presenting their work to the public and to scientific community	Feb 2018

III. PROJECT STRATEGY

A. Project Team/Partners

•Neil O. Anderson*, Dept. Horticultural Science; coordinate all project activities.
•Diana Dalbotten*, St Anthony Falls Laboratory; coordinate student research.
•Emi Ito*, Dept. Earth Sciences; coordinate with tribal reservation management
•Michael Nelson*, Dept. Horticultural Science; conduct field/molecular research, mentor educational activities.
•Holly Pellerin*, Staff, coordinate workshops.
•Reginald Defoe, Dir., Fond du Lac Resource Mgt. Div.; facilitate Reservation, 1854 ceded territories' research.
•Roger Becker*, Dept. of Agronomy & Plant Genetics; provide control strategies, control & risk assessments.
•Mark Bellcourt, CEHD Student Services, Office for Diversity & Inclusion; interface with American Indian Tribes.

B. Project Impact and Long-Term Strategy

Determination of native vs. invasive reed canarygrass and risk of spread in the Tension Zone will impact the MN environment for control strategies, support better and more efficient use of management resources, enhance invasive species control and integrate student learning. The project's long-term strategy is to continue place-based education involving American Indian students in the study of the environment with the goal of increasing the resource management workforce. We will engage N. Minnesota communities (Tension Zone) in conferences where students showcase their education-research products.

C. Timeline Requirements

1. Research to identify/collect native reed canarygrass across MN, in Tension Zone, in herbaria and museums and conduct genetic analyses will require 3 years for completion.
2. Assessment of potential spread of native reed canarygrass in Tension Zone requires field studies (common gardens) to determine risk and effectiveness of control (chemical, harvest for weaving) takes multiple years. Working with American Indian communities requires a long-term commitment (3-year series of interactive education-research), which allows all stakeholders to become acquainted, develop and strengthen respectful working relationships to accomplish research goals.
3. Student participants need extended support in order to achieve academic success. Short-term interventions might stimulate engagement but are unsuccessful at supporting content knowledge acquisition and student transitions. Participatory education-science with students in the Tension Zone area will increase the effectiveness of this research.

2015 Detailed Project Budget

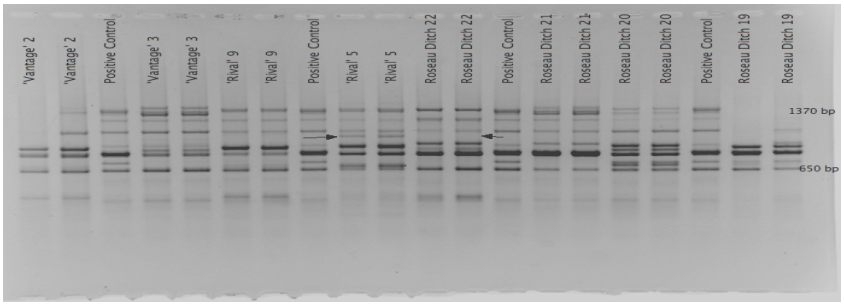
Project Title: Reed canarygrass threat to the Tension Zone

IV. TOTAL ENRTF REQUEST BUDGET *3* **years**

BUDGET ITEM	AMOUNT	
Personnel:	$	241,848
Emi Ito, Professor, coordinate w Native American communities - 5.26% FTE (summer salary) +19.83% benefits for three years. $5,098 x 3 = $15,294 salary, $1,011 x 3 = $3,033 fringe	18327	
Diana Dalbotten, St. Anthony Falls Laboratory, Coordinate w Native American communities - 3.94% FTE + 33.6% benefits for three years. $2,869 x 3 = $8,607 salary, $964 x 3 = $2,892 fringe	11499	
Mike Nelson, data analyses, research/educational activities - 100% FTE + 20.75% benefits for 3 years	152145	
Holly Pellerin, workshop coordinator - 25% FTE + 36.8% benefits for three years; $9,983 x 3 = $29,949 salary, $3,674 x 3 = $11,021 fringe	40970	
1-UMN undergraduate, molecular research - 25% FTE summer salary, 7.04% benefits for 3 years. $5,888 x 3 = $17,664 salary, $414 x 3 =$1,243 fringe	18907	
Equipment/Tools/Supplies	$	56,959
Lab supplies, molecular analyses of ~1000 reed canarygrass plants,scoring gels	30000	
Lab equipment (1-compound-transmission microscope, plant collection tools, 3-GPS, 3-kite aerial photography kits, 1-gel apparatus for electrophoresis, 1-transilluminator, lab supplies)	26959	
Travel:	$	154,661
Travel: Mileage (~10,000 miles), van/bus rental, lodging, and meals for travel to and between plant collection trips statewide, data gathering, 6 summer workshops each year at 2 Tribal Colleges, research trips to the Twin Cities (UMN researchers, Tribal College Teachers, K-12 students and undergraduates); 3 years	154661	
Additional Budget Items:	$	85,500
Manuscript publication costs (3)	$ 3,000	
Fond du Lac High School and Red Lake Tribal College summer workshops for teachers; $22,500/year for 3 years	67500	
Fond du Lac High School and Red Lake Tribal College Undergraduate Student Summer workshops, $1000/student, 5 students/year for 3 years	15000	
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$	538,968

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	$ -	
Other State $ To Be Applied To Project During Project Period:	$ -	
In-kind Services To Be Applied To Project During Project Period: Unpaid effort including salary & fringe for three years for Neil Anderson @ 5% ($19,743); Roger Becker @ 5% ($22,476); Mark Bellcourt @ 1% ($2,532); Diana Dalbotten @ 2% ($5,835); and Emi Ito @ 2% ($7,719). Also included is the unrecovered indirect costs @ 52.0% of $538,968 or $280,263. Total In-Kind = $338,568.	$ 338,568	*Secured*
Funding History:	$ -	
Remaining $ From Current ENRTF Appropriation:	$ -	

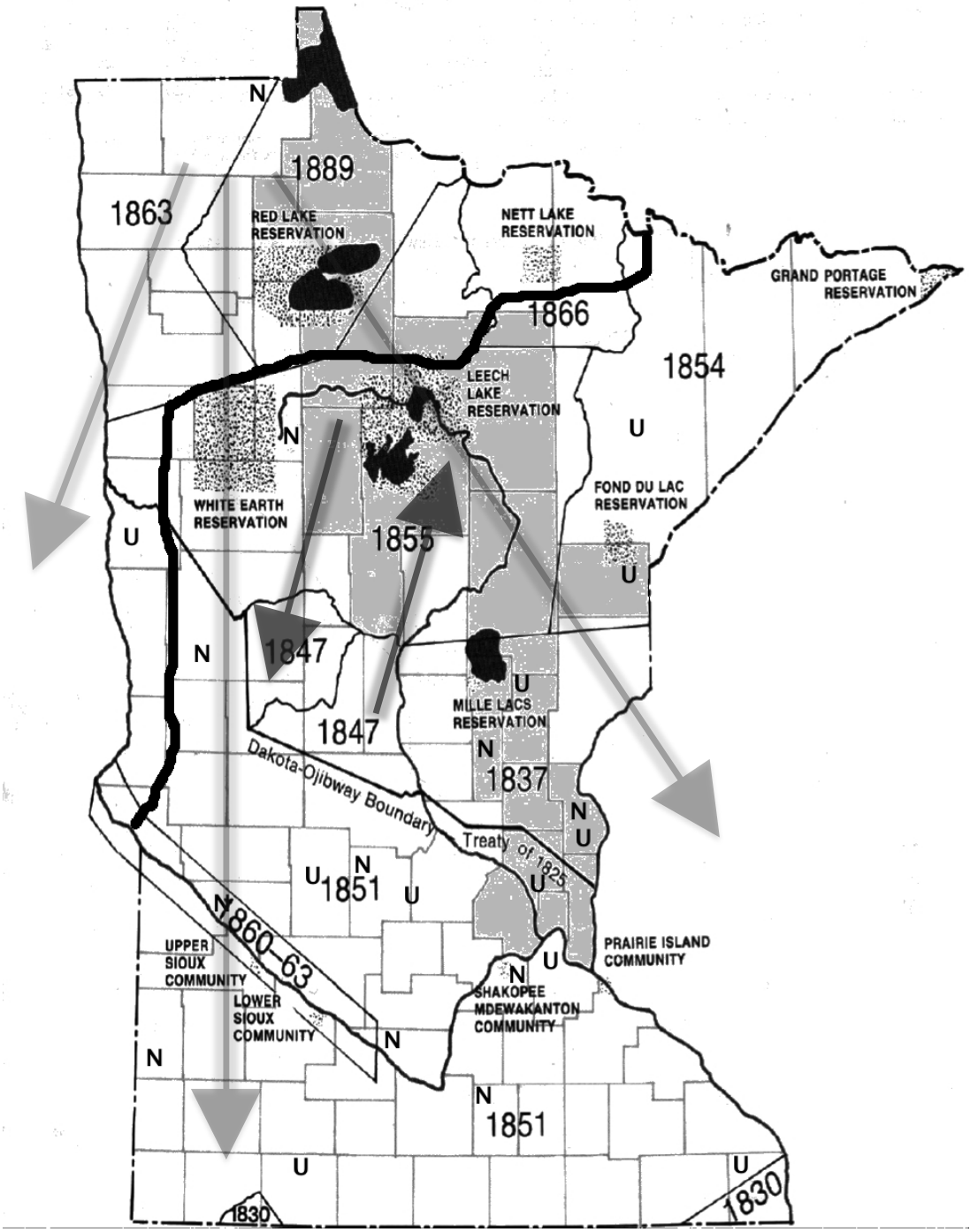


Genetic techniques used to determine the origin of reed canarygrass populations.

Tribal students collecting samples in the field

Tribal students working with lake core samples in the lab

Basket woven from reed canarygrass



#6: Project Manager Qualifications & Organization Description

PROJECT TITLE: Reed canarygrass threat to the Tension Zone

Summary of Project Manager Qualifications and Responsibilities pertaining specifically to project proposal.

•**Neil Anderson**, Professor, is a geneticist having directed grants on invasive reed canarygrass. His laboratory has in its collection ~2,000 DNA samples from Europe and MN (from 6 MN rivers) – to be included in this study.

•**Emi Ito**, Professor, is an expert in geochemistry applied to the study of lakes and lake sediments and has used her expertise to benefit indigenous groups and regions facing water shortage to reconstruct past water availability. She has co-directed a nationally-funded (NSF) grant of MN native wild rice (also a grass) education/research with American Indian Nations in MN (Fond du Lac). She directs LacCore, National Lacustrine Core Facility which hosted Fond du Lac students participating in the wild rice project, introducing them to research. She has well-developed Tribal connections and relationships which will benefit the workshops.

•**Diana Dalbotten**, St. Anthony Falls Laboratory, is an expert in creating research opportunities for diverse students of all ages and has co-directed a nationally-funded (NSF) grant of MN native wild rice education/research with American Indian Nations in MN (Fond du Lac, Red Lake). She has well-developed Tribal connections and relationships which will benefit the workshops.

•**Michael Nelson,** Postdoc, will work with the genetics, plant identification, and mentoring students in the Workshops. Mike's PhD dissertation focused on population genetics, risk assessment, drought tolerance, and spread of invasive European reed canarygrass throughout MN. He developed the Kite Aerial Photography to study reed canarygrass growth and spread.

•**Holly Pellerin**, Staff, will mentor educational activities. Pellerin, an American Indian elder, has been conducting youth workshops at Fond du Lac for over 30 years to help keep students in school and successfully graduate from high school and to attend college. Pellerin and Dalbotten have collaborated on science workshops for Fond du Lac youths for almost 15 years. She oversees the teachers who work with Fond du Lac youths and how these workshops should be conducted.

•**Reginald Defoe**, Dir., Fond du Lac Resource Mgt. Div.; Defoe directs the Resource Management Division and will facilitate plant collection on Reservation and 1854 ceded territories. He is an expert on tribal sovereignty, applicable laws, and traditional knowledge.

•**Roger Becker** is an internationally known researcher and UM Extension Weed Scientist. He has expertise in management of invasive species, risk assessment, physiology and biology of invasive plants, and in the biological control of plant pests. He will be a valuable team member to determine if native grasses are invasive and whether existing potential management strategies will effectively control invasions in Tribal Nations and beyond. If ineffective, he will assist in the development of novel management techniques.

•**Mark Bellcourt** is a native American Indian (White Earth Tribal Nation who has enhances the interface between MN Tribal Nations and the UM with respect to Indigenous knowledge.

Organization Description.

The University of Minnesota is the Land Grant College which serves the resident of Minnesota and the greater region through teaching, research and extension. All involved departments serve the public and agencies connected with invasive species control.