

**Environment and Natural Resources Trust Fund
2010 Request for Proposals (RFP)**

LCCMR ID: 093-C

Project Title:

Climate Change Adaptation Planning for Border Lakes Forests

LCCMR 2010 Funding Priority:

C. Habitat Restoration, Enhancement, and Acquisition

Total Project Budget: \$ \$175,000

Proposed Project Time Period for the Funding Requested: 3 years, 2010 - 2013

Other Non-State Funds: \$ \$0

Summary:

Assess the potential for Border Lakes forests to adapt to a warmer climate through expansion of temperate tree species and persistence of boreal tree species in cold temperature refuges

Name: Lee Frelich

Sponsoring Organization: U of MN

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St.Paul MN 55108

Telephone Number: (612) 624-3671

Email: frel001@umn.edu

Fax: (612) 625-5212

Web Address: _____

Location:

Region: NE

County Name: Cook, Lake, St. Louis

City / Township:

_____ Knowledge Base	_____ Broad App.	_____ Innovation
_____ Leverage	_____ Outcomes	
_____ Partnerships	_____ Urgency	_____ TOTAL

MAIN PROPOSAL

PROJECT TITLE: Climate change adaptation planning for Border Lakes forests

I. PROJECT STATEMENT

Boreal forests of spruce, fir, paper birch, aspen and jack pine on the Border Lakes Ecoregion of northern Minnesota are near the southern edge of their geographic range. Therefore, large changes are expected to occur with a warmer climate; the existing tree species will be under stress from heat, drought, fires, storms and insect pests. To predict and plan for these changes, we need to know whether the forest is poised to respond in a resilient fashion as the boreal tree species decline in abundance:

1. Will temperate forest species now at the northern edge of their range in the Border Lakes, such as red maple, sugar maple, American basswood, bur oak, pin oak, red oak, and white pine expand to take the place of declining boreal species such as spruce and fir?
2. Are sufficient seed source populations already present for these temperate species to fill in the niche vacated by boreal tree species, and are those temperate populations already expanding?
3. Will invasive plant species (e.g. buckthorn) be able to jump in and take advantage of the warming climate and changing forest situation, possibly displacing native species?
4. Will boreal species like spruce, fir and jack pine be able to persist under a future warmer climate in areas with locally cooler climates such as bogs and north-facing hillsides?

With this project we will obtain the information necessary to answer these questions and provide the scientific basis for climate change adaptation plans for a variety of scenarios (from low to high magnitudes of change) that may occur over the next century. These goals will be accomplished by surveying the forest to assess the abundance of colonies of temperate species at the northern edge of their range, the potential for these colonies to expand, and whether invasive species are present that may interfere with forest adaptation to climate change. We will also measure temperature in areas with varied physiographic settings (e.g. bogs, and north and south facing hillsides), for 2 years to assess whether cool microclimates exist that may allow persistence of boreal tree species on some parts of the landscape. This information will be used for to prepare adaptation and management options for commercial and BWCAW wilderness forests. Finally, via presentations and workshops in the Border Lakes Ecoregion, we will begin the process of educating forest managers on adaptation options for climate change. The audience will include staff of the Superior National Forest, Minnesota DNR, County and Tribal forestry divisions.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Survey abundance of temperate species (e.g. maple and oak) and invasive species within Border Lakes boreal forests. Budget: \$76,149

A graduate student and undergraduate student assistant will survey large tracts of forest to assess the number and geographical distribution of outlying colonies of temperate tree species and invasive plant species, as well as evidence regarding current or future potential expansion of their populations within the southern margin of the boreal forest. This data will allow us to assess whether temperate tree species are poised to expand as the climate warms, and whether invasive species may interfere with forest adaptation to climate change.

Deliverables

- | | |
|---|----------------------|
| 1. Distribution of temperate tree species within the Border Lakes | December 2012 |
| 2. Distribution of invasive plant species within the Border Lakes | December 2012 |
| 3. Two scientific papers to be submitted to peer-reviewed journals | June 2013 |

Result 2: Microclimate variation across the Border Lakes landscape and cold-temperature refuges for boreal tree species. **Budget: \$79,851**

The graduate student and assistants will place 100 HOBOs (small devices originally developed for NASA space programs, that record temperature on an hourly basis and store the data for up to a year for later download to a computer) in the field to measure the effect of topographical features, such as south and north facing slopes, bogs and lakeshores on local climate. This data will be collected for two years. Analyses of this data will allow us to predict whether refuges with cool temperatures will allow persistence of boreal species for a variety of future climate change scenarios.

Deliverables

- | | |
|--|---------------------|
| 1. Microclimate variation across the Border Lakes landscape | October 2012 |
| 2. Scientific paper submitted to peer-reviewed journal | June 2013 |

Result 3: Outreach and education on forest adaptation options for forest managers and stakeholders. **Budget: \$19,000**

A variety of presentations and workshops for managers of wilderness and commercial forests (Forest Service, State, County and Tribal) and BWCAW users will be offered through the University of Minnesota Center for Continuing Education at Cloquet Forestry Center, and at other venues such as Vermilion Community College in Ely.

Deliverables

- | | |
|--|----------------------|
| 1. Synthesis of adaptation options | July 2012 |
| 2. Prepare presentations and workshops | December 2012 |
| 3. Scientific paper on boreal forest adaptation to climate change | June 2013 |

III. PROJECT STRATEGY

A. Project Team/Partners. Lee Frelich is the project manager, and will participate as advisor to the graduate student, supervisor of the undergraduate workers, and also will participate directly in the field work and data analyses. Peter Reich will collaborate and provide expertise on forest ecology, tree population dynamics and landscape ecology, as well as co-advise a graduate student and help with data analyses. A graduate student to be determined will take on this project as part of his/her Ph.D. research. An undergraduate student will be hired as a field assistant during the summers of 2011 and 2012 and as a lab assistant at the University of MN during the academic years 2010-2011 and 2011-2012.

B. Timeline Requirements. The proposed project would last 36 months, from July 1, 2010- June 30 2013. Field data on the forest and microclimate will be collected by a graduate student and undergraduate assistants during the summers of 2011 and 2012. Site selection and pilot work for the 2011-2012 field work will be done from July-October 2010. Data analyses will occur as data comes in throughout the project, and will be synthesized during summer and fall of 2012. Outreach and education will take place during the latter half of 2012 and first half of 2013.

C. Long-Term Strategy

This project will capitalize on results from a previous workshop on Climate Change Adaptation and Biodiversity Conservation in Minnesota (Organized by Frelich and Galatowitsch, June 2008) by using the Border Lakes forests as the first area to undergo detailed analyses for climate change adaptation using principles gathered from the scientists at the 2008 meeting. Also, the results with public education and policy will be carried forward after the termination of this project by Greater Quetico-Superior Climate Change Adaptation Plan Alliance, a coalition of environmental groups that has held preliminary organizational meetings and is pursuing their own funding.

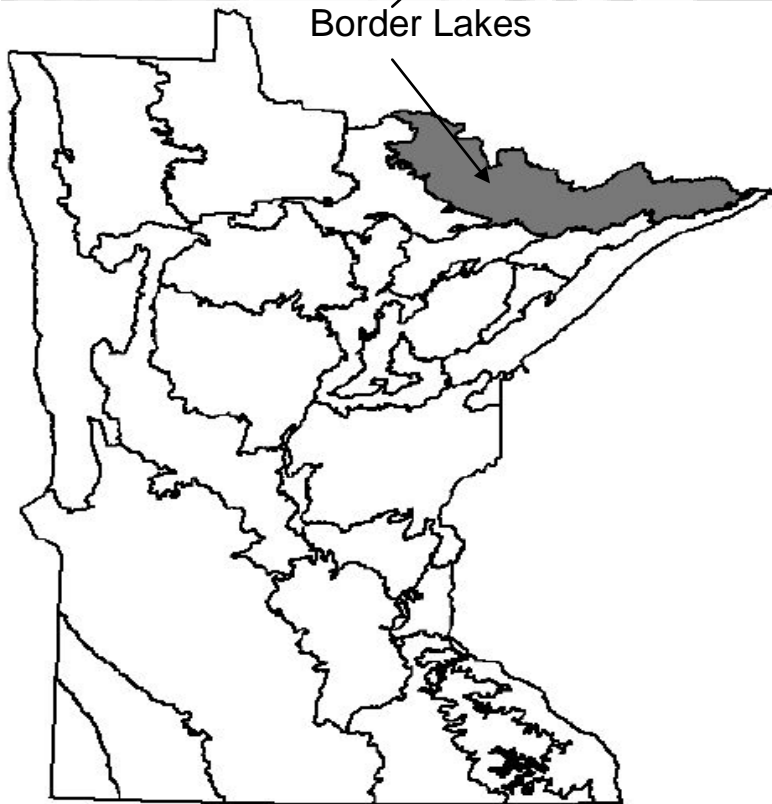
Project Budget

IV. TOTAL PROJECT REQUEST BUDGET 3 years

BUDGET ITEM <i>(See list of Eligible & Non-Eligible Costs, p. 13)</i>	AMOUNT
Personnel: Frelich, project manager, advise graduate students, supervise undergraduate students, analyze data, write papers and co-write papers with graduate student, present workshops on climate adaptation (0.3 FTE for 2.5 years, \$40407 salary, \$13051 benefits, on soft money).	\$ 53,458
Personnel: Graduate student, collect and analyze field data, write papers (0.5 FTE for 2.5 years, \$46463 salary, \$35726 benefits).	\$ 82,189
Personnel: Undergraduate assistant, help collect field data during summer, assist with analysis in the lab during academic year (0.4 FTE for 2.5 years, \$20,000 salary, \$653 benefits).	\$ 20,653
Equipment/Tools/Supplies: 100 Hobo units to record temperatures on an hourly basis at remote field sites, approximately \$42 each, and a GPS unit for navigation in remote areas.	\$ 4,700
Travel: Summer field work for graduate student and undergraduate assistant, including lodging (camp grounds and university field station facilities will be used as much as possible to reduce costs), car rental and mileage for 4 months (2 months for each of 2 summers). Also included is mileage for visits while field work is in progress by project manager Frelich, mileage for travel by Frelich and Reich to present workshops. All travel will be in state.	\$ 12,000
Additional Budget Items: Materials for workshops and public education, including duplication and dissemination of results.	\$ 2,000
TOTAL PROJECT BUDGET REQUEST TO LCCMR	\$ 175,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ Being Applied to Project During Project Period:	NA	
Other State \$ Being Applied to Project During Project Period:	NA	
In-kind Services During Project Period:	NA	
Remaining \$ from Current Trust Fund Appropriation (if applicable):	NA	
Funding History: This project is a logical continuation of the following pending LCCMR project (Peter Reich manager): Projecting Environmental Trajectories for Energy-Water-Habitat Planning, recommended for funding for 2009	\$180,000	Pending



Map. The Border Lakes Subsection (Lower map, shaded, map credit: MN DNR) lies at the southern margin of the North American boreal forest dominated by spruce, fir and jack pine (Upper map, dark gray, map credit: Global Forest Watch Canada). The Border Lakes is also close to the northern range limit for temperate forest species sugar maple, red maple, American basswood, red oak, bur oak, and white pine, which may replace the boreal species with a warmer climate.

Vitae

Dennis J. Fuchs, District Administrator
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Waite Park, MN 56387
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Work Experience:

STEARNS COUNTY SOIL AND WATER CONSERVATION DISTRICT
(website: <http://www.stearnscountyswcd.net/>)
Waite Park, MN. District Administrator, 1996-present.

Stearns County Soil and Water Conservation District, Organization Description:

The Stearns County Soil and Water Conservation District's (SWCD) mission is to provide local leadership in the conservation of soil, water, and related natural resources through programs and partnerships with individuals, businesses, organizations, and government

MINNESOTA DEPARTMENT OF AGRICULTURE St. Paul, MN. Soil Scientist, 1994-1996.
Assisted local and state units of government in evaluating agricultural nutrient management practices on water quality Designed and coordinated a variety of "Best Management Practices" implementation programs with organizations such as the Minnesota Extension Service, Soil and Water Conservation District, and Clean Water Partnership staff. Worked on LCMR funded demonstration projects, such as, field-scale paired-watershed comparison between Variable Rate Technology (VRT) and conventional technology

UNIVERSITY OF MINNESOTA--SOUTHWEST EXPERIMENT STATION Lamberton, MN.
Scientist, 1988-1994.

Assisted in the supervision of all plot work, full-time technicians and part-time summer employees. Conducted research in specialized areas of soil science and agronomy, including site specific research and soil erosion management. Statistically analyzed, summarized and reported research findings

Education

UNIVERSITY OF MINNESOTA, St. Paul, MN. 1986-1988

Master of Agriculture, Soil Science; Hydrology Minor

Master project; extensive study of earthworm distribution in MN and effect on soil properties

UNIVERSITY OF MINNESOTA, St. Paul, MN. 1983-1986

B.S. degree, Agronomy; Applied Agricultural Economics Minor

Organizations/Committees

- Certified Crop Adviser
- Licensed Professional Soil Scientist
- Soil and Water Conservation Society member
- American Society of Agronomy & Soil Science member
- MN Agriculture Rural Leadership alumni member
- Pheasants Forever member
- National Wild Turkey Federation member