

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

Project Title:

ENRTF ID: 084-D

Preventing a New Disease of Pines in Minnesota

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: \$ 371,840

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

Summary:

An emerging tree disease is present in Wisconsin and threatens pines and other conifers in Minnesota. This work establishes early detection and prepares an effective defense to reduce its impact.

Name: Robert Blanchette

Sponsoring Organization: U of MN

Address: 1991 Upper Buford Cir, 495 Borlaug Hall
St. Paul MN 55108

Telephone Number: (612) 625-0202

Email robertb@umn.edu

Web Address _____

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Threat from a new disease of red and white pine to Minnesota

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



PROJECT TITLE: Preventing a new disease of pines in Minnesota

I. PROJECT STATEMENT: The goal of this project is to identify this emerging invasive tree disease as early as possible as it moves into Minnesota, prepare an effective defense to fight the disease and reduce its impact to our native conifers growing in forests and urban landscapes.

Background information: A new invasive tree disease called *Heterobasidion* root rot is a serious threat to Minnesota's red and white pines as well as other conifers. It is considered the most economically important disease of pines throughout the Northern temperate regions. In the United States it causes over 1 billion dollars in losses annually. It also has tremendous ecological impacts on forest health and productivity. Minnesota has been free of this very destructive tree disease but recently it has become well established in Wisconsin and has spread quickly. The Wisconsin Department of Natural Resources reports in 2013 that it has been confirmed in 23 counties and three of these counties are adjacent to Minnesota. This pathogen attacks the roots of trees and moves from tree to adjacent tree underground causing circles of dead trees. Once in an area, the fungus grows through the roots and expands causing greater and greater mortality. The fungus produces fruiting bodies with spores at the base of dead trees and these disseminate overland to start new infections. The disease is caused by a complex of *Heterobasidion* species but the species currently in Wisconsin is *H. irregulare*.

Early Detection and Control Treatments: Both red pine and white pine are very susceptible to this pathogen. Since the disease is found right across the St Croix River in pine stands of Wisconsin, a program to prevent this disease from spreading throughout Minnesota is essential. The disease situation in Wisconsin escalated quickly because there was no rapid method to detect the disease and control was delayed. It takes several years for evidence of the fungus to be seen on dead and dying trees. To successfully manage this disease in Minnesota and reduce its economic and ecological impact, early detection is essential. Our goals are to develop a fast and reliable molecular detection method that can be used to quickly identify the fungus directly from wood samples, survey for the disease and establish management guidelines for effective control to limit its spread and impact. The best time to act is now before this invasive disease has become wide spread. This project will establish effective guidelines to manage this disease which can be implemented immediately as disease infection centers are found. It will also investigate potential biological control methods that can be used for long term prevention.

II. PROJECT ACTIVITIES AND OUTCOMES

1. Develop new diagnostic tools for rapid detection. Identifying this disease is very difficult. Using molecular primers (DNA sequences) that are made specifically for this fungus we will develop a diagnostic kit that can be used to rapidly identify the pathogen directly from wood samples obtained from the field.

2. Survey and identify infected trees. With many infection centers located in Wisconsin, the disease is possibly already present in Minnesota. Disease surveys in all Minnesota counties adjacent to the Wisconsin border will be done to identify locations that have the disease. Since visible evidence of the pathogen, such as fruiting bodies, may take years to show up, the new diagnostic procedures will provide the technology to find the disease in its earliest stage of colonization.

3. Establish guidelines for controlling the disease. For a disease control program to be successful, we need the help of foresters, arborists, master gardeners and the general public to be on the lookout for this disease. Educational programs will train people about this disease, develop sampling protocol and set up the University of Minnesota Plant Disease clinic to run samples. A network of first responders for this disease will also be initiated. There are several integrated control procedures that can be used to combat this disease once it is found in Minnesota. In addition, we will investigate potential biological control methods using native fungi that out competes the pathogen. Recommended guidelines for controlling the disease in woodlands as well as in urban landscapes will be developed. These management plans will include silvicultural, chemical control and novel methods of biological control. An integrated approach for control will be implemented with cooperators in the Minnesota DNR, Wisconsin DNR, Minnesota Dept. of Agriculture and the U.S. Forest Service.



Activity 1: Develop new diagnostic tools for rapid detection

Budget: \$88180

A rapid molecular diagnostic kit will be developed and perfected for use to identify the fungus causing this disease in wood samples. This method would directly assay for the presence of the pathogen in field collected samples.

Outcome	Completion Date
1. Molecular diagnostic kit developed for use by the Plant Disease Clinic to identify the fungus	1/2016
2. Perfect the diagnostic kit detection resolution with additional DNA primers	6/2016

Activity 2: Survey and identify infected trees.

Budget: \$178300

Surveys throughout the state will be done to identify sites with the disease. Since the disease does not show signs of the fungus for many years, samples of suspect trees will be taken and analyzed using the developed diagnostic procedures in the Plant Disease Clinic so early detection is possible.

Outcome	Completion Date
1. Complete first surveys for the disease in all Minnesota counties adjacent to Wisconsin	1/2017
2. Complete 2 nd year surveys throughout pine growing areas of Minnesota	1/2018

Activity 3. Establish a monitoring network for diagnostics outreach program for controlling the disease

Budget: \$105360

Educational programs will be developed to alert people in Minnesota about this new invasive disease and how to take samples. Samples will be sent to the Plant Disease Clinic and processed for pathogen identification. Integrative control management strategies developed and implemented.

Outcome	Completion Date
1. Control guidelines developed for woodlands and urban landscapes and training	6/2016
2. Complete disease detection on samples submitted	2/2018

III. PROJECT STRATEGY

A. Project Team/Partners

Professor Robert Blanchette will be the project leader and coordinate activities. He will take part in the development of the diagnostic kits and oversee the surveys. Dr. Arenz will take part in outreach and training programs and lead the laboratory diagnostics in the Plant Disease Clinic. Professor D'Amato will be involved with the development of management plans for Minnesota's woodlands, will help coordinate surveys and contribute to training programs. Non funded partners that will help with surveys and sample collection include the MN Dept. of Agriculture, Minnesota DNR, Wisconsin DNR and U.S. Forest Service.

B. Project Impact and Long-Term Strategy

The main goal of this project is to identify this new invasive tree disease as early as possible as it moves into Minnesota, prepare an effective defense to fight the disease and reduce its impact to our native conifers growing in forests and urban landscapes. Once the diagnostic procedures are developed, the Plant Disease Clinic can continue to evaluate samples for the people of Minnesota past the end of this proposal by a per sample fee system. Other State agencies can use control management guidelines developed from this work long into the future.

C. Timeline Requirements

The time line is 3 years. This will provide time to complete a thorough disease survey and for efficient and effective protocols for early detection to be developed.

2015 Detailed Project Budget

Project Title: Stopping Circles of Death in Minnesota: Reducing the impact from a new disease of

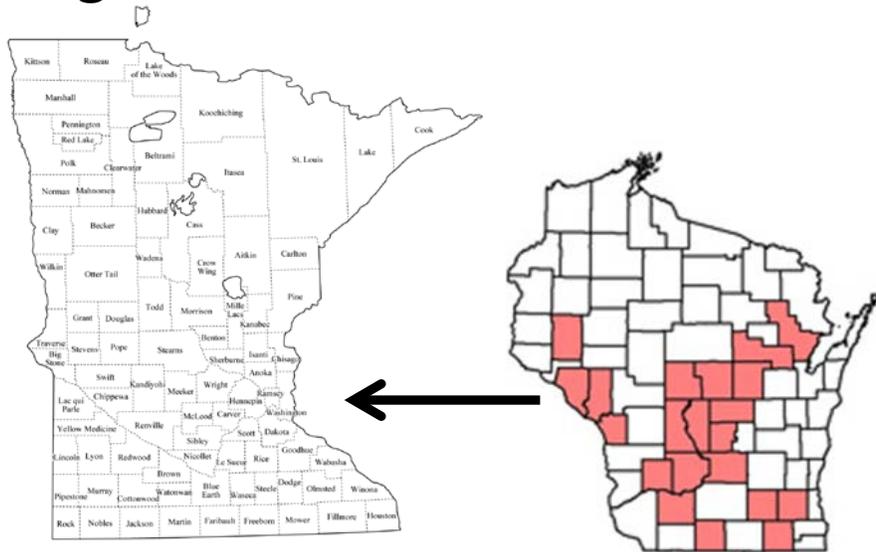
IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel:	
Graduate Student 50% time (56% salary, 44% benefits, for 3 years) Graduate student to work on the molecular diagnostics, developing control guidelines and potential of using biological control.	\$ 132,000
3 Undergraduate students (100% salary,\$6000 per student for 3 years). Students will be involved with the field surveys, research on biological control and outreach programs for control of the disease.	\$ 18,000
Lab Technician 100% (71% salary, 29% benefits): \$54,180 for salary and benefits per year for3 years. This person will take part in diagnostic development, field surveys, sample analyses in the laboratory and training / outreach programs.	\$ 162,540
Equipment/Tools/Supplies: Real time PCR diagnostic system (\$32000.)- a molecular diagnostic system that is able to detect specific DNA primers. This is needed for the rapid detection of the fungus in wood. Also requested are funds for field supplies, laboratory microbiology materials, molecular sequencing and materials for the diagnostic kits (5100 / yr, 3 years) and	\$ 47,300
Travel: In State travel for surveys and sampling for disease centers (4,000/yr, 3 yrs)	\$ 12,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 371,840

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not*

SOURCE OF FUNDS	AMOUNT
Other Non-State \$ To Be Applied To Project During Project Period:	N/A
Other State \$ To Be Applied To Project During Project Period:	N/A
In-kind Services To Be Applied To Project During Project Period: Blanchette (PI) salary and fringe for one month per year for 3 years (\$41,900). University of Minnesota indirect costs at 52% (183,997). University of Minnesota researchers Brett Arenz and Tony D'Amato will also contribute to this project.	\$ 225,897
Funding History: University of Minnesota Rapid Agricultural Response Fund- allocated for 2013 to begin preliminary aspects of this project.	\$ 72,000
Remaining \$ From Current ENRTF Appropriation: These funds were allocated one year ago for a different project 2013-019-B, Finding Disease Resistant Elm Trees in Minnesota.	\$ 132,000

Preventing A New Disease of Pines in Minnesota



The Problem: Heterobasidion is an invasive root rot fungus now in Wisconsin (red counties on map) causing serious losses. It is at the border to Minnesota or may already be here. Early detection and control is essential.



Minnesota's red and white pine resources are threatened by this new disease

04/21/2014

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Project Managers Qualifications and Responsibilities / Organization Description

Dr. Brett Arenz (Co-PI) has a PhD in plant pathology and is a Teaching Assistant Professor as well as the Director of the Plant Disease Clinic in the Department of Plant Pathology. He has taught numerous classes in general biology, microbiology, plant pathology and fungal biology. In addition, he and the Plant Disease Clinic have extensive experience in isolating fungal organisms and pathogens from plant tissues using both traditional culturing methods and molecular techniques. The Plant Disease Clinic routinely receives and diagnoses hundreds of plant samples per year that are affected by important tree diseases. His responsibilities will include establishing the diagnostic laboratory and methods to analyze samples collected during surveys. He will lead the development of an improved kit and help establish an effective outreach program through the University of Minnesota Plant Disease Clinic.

Dr. Robert Blanchette (Co-PI) is a professor in the Department of Plant Pathology. He has been involved with research and teaching of forest and landscape trees at the University for 30 years. He currently teaches undergraduate and graduate classes at the University of Minnesota on forest and shade tree diseases. Research is in the area of forest pathology and wood microbiology with investigations underway on the biology and ecology of tree pathogens, tree defense mechanisms and managing tree diseases using integrated control procedures. He has received many honors for his research accomplishments including Fellow of the American Association for the Advancement of Science, Fellow of the American Phytopathological Society, Fellow of the International Academy of Wood Science, and Hans Merensky Fellow for Wood Science. He will serve as Project Manager and coordinate the overall project, facilitate the surveys and sampling, direct the graduate student and laboratory technician. He will also take an active part in the outreach activities proposed for this project.

Dr. Tony D'Amato (Co-PI) is an Associate Professor of Silviculture and Applied Forest Ecology in the Department of Forest Resources, University of Minnesota. He conducts teaching, research, and participates in outreach/Extension programs. His research primarily focuses on traditional and experimental silvicultural strategies for meeting diverse forest management objectives ranging from the sustainable production of woody biomass for biofuels to increasing the resilience and resistance of forest ecosystems to future climate and disturbance impacts. His primary outreach audiences are natural resource managers. Anthony has been the principal investigator and project manager on several large-scale projects aimed at evaluating the effectiveness of different management strategies at conferring resistance and resilience to future environmental changes. He has published numerous peer-reviewed and non-technical articles which address the impacts of climate, forest harvesting practices, and natural disturbances on forest growth and development and has been involved with several outreach programs. He will act as liaison with the MN and WI Departments of Natural Resources, co-direct and advise the graduate student, take part in organizing surveys and develop management guidelines.

Organization Description – University of Minnesota

The Department of Plant Pathology is located in the College of Food, Agricultural and Natural Resource Sciences at the University of Minnesota St. Paul Campus. Modern research laboratories are available for this project as well as the University of Minnesota's Plant Disease Clinic.