

**Environment and Natural Resources Trust Fund
2016 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 130-D

Cover It Up! Using Plants to Control Buckthorn

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: \$ 307,703

Proposed Project Time Period for the Funding Requested: 3 years, July 2016 to June 2019

Summary:

We will develop management tools to limit buckthorn re-colonization following its removal, by identifying cost-effective methods of establishing dense cover of preferred plant species that will suppress buckthorn regeneration.

Name: Peter Reich

Sponsoring Organization: U of MN

Address: 1530 Cleveland Avenue North
St. Paul MN 55108

Telephone Number: (612) 624-4270

Email preich@umn.edu

Web Address _____

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

The visual illustrates how establishing a dense layer of competitors following buckthorn removal is likely to lead to better success at preventing its re-colonization

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



PROJECT TITLE: Cover it up! Using plants to control buckthorn

I. PROJECT STATEMENT

Buckthorn control is a common management goal, but is expensive and often only briefly effective. This lack of effectiveness is due to (1) buckthorn's capacity to re-invade from outside the treated area and to recolonize from residual seeds or roots that were not killed during removal treatment, and (2) because *removing* buckthorn often creates ideal conditions *for* buckthorn. Buckthorn is a disturbance-adapted species, and buckthorn management often disturbs the ecosystem creating more soil and light resources. **As a result, many current efforts to control buckthorn may have limited long-term benefit.**

Most research focuses on assessing the specific means of buckthorn removal, with little attempt to understand post-management treatments that might keep buckthorn from re-colonizing. We propose to develop practical strategies for the long-term control of buckthorn and to provide a freely available manual that describes how to stop buckthorn regeneration. We incorporate removal and post-removal treatments (including soil amendments, wood chips, or liming), followed by dense reseeding and/or planting of desired vegetation that will reduce buckthorn regeneration. **This is the key innovation of the proposed research: developing methods well matched to different site types, that will result in a dense cover of preferred species that will suppress buckthorn and other non-natives.**

This project will increase our capacity for effective, long-term management of buckthorn:

- (1) Experiments to develop effective buckthorn management. Compare "traditional removal" against "traditional removal plus novel post-removal" treatments (soil amendments, reseeding and/or planting of native species) that promote native vegetation that deters buckthorn.
- (2) Retrospective analyses of past buckthorn management efforts. Investigate the effectiveness of past buckthorn removal and control by state agencies and non-profit organizations.
- (3) Integrate and synthesize findings from Activities 1-2 into a manual of buckthorn management.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1. Use experiments to compare combinations of "traditional" buckthorn removal (weed-wrenching, basal bark herbicide application, cut-and-paint, and also burning) with novel post-removal treatments; most importantly, the dense planting or reseeding of native vegetation. **Budget \$258,703**

To develop effective management strategies, we will establish experiments at four locations with heavy buckthorn invasion. The experiments will include "traditional" removal techniques followed by manipulations of soil conditions (nitrogen, pH) via soil amendments, wood chips, or liming, and subsequent dense reseeding and/or planting of desired vegetation. *Prior work has shown that buckthorn performs poorly when the cover and diversity of native vegetation is high, and when buckthorn stems are repeatedly removed (e.g. by fire or cutting).* Our project will capitalize on those findings **by cultivating site-appropriate native species at densities high enough to shade out, and/or otherwise outcompete buckthorn** and keep it from growing up and taking over from below. The "site-appropriate" approach is operationally critical to success. For example, in a hardwood forest with heavy canopy cover, dense planting of sugar maple, which is very shade tolerant, coupled with buckthorn removal, may create enough shade to deter buckthorn from re-colonization. With time, other desired species, such as oaks, could be planted intermixed with maples in small gaps with higher light. Alternatively, on an oak woodland with dappled shade, fire-tolerant grasses, herbs, and shrubs would be encouraged by seeding, planting and/or prescribed fire. Few buckthorn removal efforts include a post-management component to reduce regeneration, resulting in expensive management with little long-term benefit. Our project will provide new tools to make such management more successful.



Environment and Natural Resources Trust Fund (ENRTF)
2016 Main Proposal
Project Title: Cover it up! Using plants to control buckthorn

Outcome	Completion date
1. Establish experimental plots at four sites with heavy buckthorn invasion	10/31/2016
2. Implement buckthorn removal, post-removal experimental treatments	8/31/2017
3. Assess success of native species and buckthorn (growth, survival, abundance)	10/31/2018
4. Conduct statistical analysis, interpret results, draft publication	6/30/2019

Activity 2: Review past buckthorn removal success by compiling management history and conducting interviews with managers for approximately 40 sites across the state. Follow-up with field site visits to assess the effectiveness of this management. **Budget: \$29,000**

Buckthorn management efforts occur independently from one location to the next, and thus managers often develop strategies based on ad hoc results. By comprehensively searching management records and interviewing managers, we will reconstruct the history of buckthorn removal activities in Minnesota and make observations of current conditions to assess the outcome of these efforts. The goal is to generate a central depository of buckthorn removal activities to guide the success of future management. We will work with agencies and non-profits such as the Minnesota DNR, Great River Greening, Friends of the Mississippi, and other organizations focused on land management to document invasive management history, and resulting outcomes, across the state.

Outcome	Completion date
1. Develop data base on past buckthorn management and outcomes	12/15/2017
2. Conduct statistical analyses, interpret results, draft publication	11/30/2018

Activity 3. Provide a manual that describes how to stop buckthorn regeneration. This will be a compilation of findings from activities 1-2 and other management targeted research in the region. **Budget: \$20,000**

We will develop guidelines for landowners and managers to successfully remove buckthorn and suppress its regeneration. These will be provided through a series of presentations, a written report, and also online.

Outcome	Completion date
1. Publish report, <i>Preventing buckthorn regeneration: a "how-to" guide</i>	3/31/2019
2. Outreach via presentations, workshops, written report, website	6/30/2019

III. PROJECT STRATEGY

A. Project Team/Partners. Peter Reich, project manager, U of M, Department of Forest Resources. Additional project partners: Shawn Schottler, St. Croix Watershed Research Station, invasive species expertise, site selection, and access to SCWRS management records; Ann Pierce, Luke Skinner, Laura Van Riper, Division of Ecological and Water Resources, MN DNR, biodiversity conservation and invasive species expertise, access to DNR management records; Alex Roth, Ecologist, Friends of the Mississippi River, invasive species expertise, site selection, and access to FMR management records.

B. Timeline Requirements. 3 years with 2 years of funding (because funding starts mid-field season).

C. Long-Term Strategy. Our goal is to provide guidelines for the permanent removal of buckthorn. Based on our results, land managers can develop cost effective buckthorn control strategies incorporating removal and suppression of regeneration. We will develop guidelines for long-term buckthorn control that make the initial investment in removal ecologically meaningful and economically viable.

2016 Detailed Project Budget

IV. TOTAL ENRTF REQUEST BUDGET for 3 years (intended to complete most of the work in

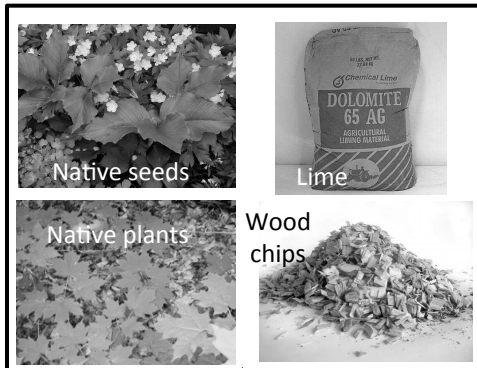
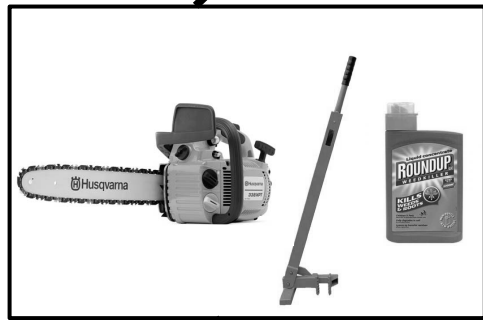
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel: 1 U of M Research Associate, 100%, coordination of day to day project activities, (\$53,000 salary + 33.8% fringe) for 2 years	\$ 143,246
Personnel: 1 Technician-50% time of \$47,490 annual + 26.3% fringe for 2 years	\$ 60,580
Personnel: 3 Interns- for 3 months/year for 2 years, \$15/hr for approximately 520 hours each per yr + 7.70% fringe	\$ 50,652
Personnel: 2 U of M undergrad students (academic year, 25%) 8 hrs/week, 640 hours @ \$11/hour for 2 academic years	\$ 14,080
Equipment/Tools/Supplies: Field supplies, tools, seeds, plants, site preparation chemicals	\$ 16,000
Travel: In-state travel to field sites and for interviews with land managers, includes lodging and mileage on personal vehicles	\$ 14,505
Additional Budget Items: Chemical analyses of soils, cost based on 40 soil samples per site for six sites at a total cost of \$13 per sample); printing of written report	\$ 8,640
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 307,703

V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other State \$ Being Applied to Project During Project Period:	\$ -	
In-kind Services During Project Period: Project manager (Reich) will contribute 1% time to project.	\$ 9,634	Secured
Unrecovered indirect costs @ 52% of modified total direct cost base of \$307,703	\$ 160,006	Secured
Remaining \$ from Current ENTF Appropriation (if applicable):		
Funding History:		
ENTF Project: Climate change and CO2 affect prairie/forest production, Project Manager Peter Reich, 2008-2011	\$ 330,000	Expired
ENTF Project: Healthy Forests to Resist Invasion, Project Manager Peter Reich, 2010-2013	\$ 359,000	Expired

Post-removal techniques for permanent buckthorn control

Traditional buckthorn management



Buckthorn management with post-removal treatments

Project Manager Qualifications & Organization Description

Project Manager: Professor Peter B. Reich

Regents Professor, Distinguished McKnight University Professor
F.B. Hubachek Professor of Tree Physiology and Forest Ecology
Department of Forest Resources, University of Minnesota, St. Paul, MN 55108
E-mail: preich@umn.edu; Phone: 612-624-4270; FAX 612-625-5212

Professional Appointments and Preparation

F.B. Hubachek, Sr., Professor, Dept of Forest Resources, U. Minnesota, 1991-
Assistant/Associate Professor, Dept of Forestry, U. Wisconsin-Madison, 1985-1991
Post-doc (1985) and Ph.D. (1983) Cornell University
M.S. (1977) University of Missouri
B.A. (1974) Goddard College

Honors, Professional Recognition and Service (Selected)

Invited speaker > 200 symposium, conferences, and seminars; e.g., Harvard; Duke;
Penn State; Princeton; Stanford; Cornell; Michigan State; Washington, U. Wisconsin.
Institute for Scientific Information (ISI) Science Citation Index, List of Top 10
Ecologists and Environmental Scientists in the World, 2002 – present
Advisor to numerous Federal science and policy agencies
Member of numerous editorial review boards and federal science agency panels

Areas of Expertise

Forestry; forest productivity, ecology and management; impacts of climate change on
forests; invasive species biology; biodiversity; wildfire, elevated CO₂; carbon cycling.
Systems studied: forests, woodlands, grasslands, agricultural crops.

Project Management Experience

Lead PI or co-PI on forest and grassland science projects (total funding, >\$30 million
2000- present, from federal [NSF, DOE, USDA, NASA], state, and private sources).

Peer-reviewed publications:

> 500 scientific articles and book chapters, including > 30 in high profile general
journals (Nature, Science, etc.) as well as >450 in specialized technical journals

Project Management Qualifications for this Project

Background in forest ecosystem ecology and management, including climate change studies.
Extensive experience successfully leading science projects and managing large
research teams.

Organization Description

The University of Minnesota is both the state land-grant university, with a strong tradition of
education and public service, and the state's primary research university