

**Environment and Natural Resources Trust Fund  
2012-2013 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 049-C2**

Biological Control of Garlic Mustard

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**Topic Area:** C2. Invasive Species - Terrestrial

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**Total Project Budget:** \$ 150,000

**Proposed Project Time Period for the Funding Requested:** 3 yrs. July 2013 - June 2016

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

**Summary:**

Garlic mustard is an invasive plant that severely threatens woodland habitats. This project will implement biological control of garlic mustard, to replace mechanical/chemical control methods which are labor and cost-intensive.

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**Sponsoring Organization:** MN DNR

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**Location**

**Region:** 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 _____%



# Environment and Natural Resources Trust Fund (ENRTF) 2012-2013 Main Proposal

## PROJECT TITLE: Biological Control of Garlic Mustard

### I. PROJECT STATEMENT

Garlic mustard is a non-native invasive plant species that is severely threatening native plant communities and degrading wildlife habitat in forest and riparian zones. The Minnesota Department of Natural Resources considers garlic mustard the highest priority species for the development of long-term management solutions, such as biological control. Garlic mustard is a prohibited noxious weed in Minnesota making management mandatory. Current management is cost and labor intensive. Biological control would provide long-term control. Successful biocontrol is now being achieved in Minnesota on two previous high priority species, purple loosestrife and leafy spurge, due in part to past LCCMR recommended funding.

The development and implementation of a biocontrol insect is a long-term commitment. Garlic mustard biological control efforts are currently ongoing and have been funded in part by the LCCMR (2003, 2005, 2007, 2010). This research is crucial in 1) determining if there are suitable insects that can be used to reduce impacts caused by garlic mustard and 2) implement introduction of insects to control garlic mustard and assess their establishment and success.

A petition to release the root-feeding weevil, *Ceutorhynchus scrobicollis*, for biological control of garlic mustard was submitted to the USDA-APHIS Technical Advisory Group (TAG) in September, 2011. If TAG recommends release and APHIS concurs, then releases of *C. scrobicollis* could start within the year. Host-specificity research for a second biological control agent, a seed-feeding weevil, *Ceutorhynchus constrictus*, is approaching completion. Multiple biological control insects can provide greater control than one species. The goal of this project is to release multiple biological control insects and monitor their effectiveness. The combination of the crown-mining weevil, *C. scrobicollis*, and the seed-feeding weevil, *C. constrictus* will provide the greatest potential for successful biological control of garlic mustard in Minnesota.

### II. DESCRIPTION OF PROJECT ACTIVITIES

**Activity 1:** Develop rearing protocols and complete required host specificity testing for garlic mustard biological control agents in Minnesota

**Budget:** \$105,000

Research activities will include development of rearing protocols and manuals for biological control insects. When biocontrol insects are approved, partners must be instructed how to raise the insects so they may release on their target sites.

Host-specificity testing of *C. constrictus* is near completion due to previous research in Europe. Research in this proposal will focus on completing the required host specificity testing of *C. constrictus* on Brassicaceae species native to North America, in order to submit a request for approval of *C. constrictus* for release.

Host-specificity testing of stem-feeding weevils *C. roberti* and *C. alliariae* is advanced due to previous research in Europe and Minnesota. If results warrant, researchers will assist in writing a proposal to TAG for release of these species.

Outcome	Completion Date
1. Develop rearing protocols and manual for <i>C. scrobicollis</i>	06/30/14
2. Complete host specificity of <i>C. constrictus</i>	12/31/14
3. If results warrant, write proposal to TAG for release of <i>C. constrictus</i>	06/30/15
4. Develop rearing protocols and manual for <i>C. constrictus</i>	06/30/16
5. If results warrant, write proposal to TAG for release of <i>C. roberti</i> and <i>C. alliariae</i>	06/30/16

**Activity 2:** Introduce and evaluate garlic mustard biological control agents in Minnesota

**Budget:** \$45,000

A national, standardized garlic mustard monitoring protocol is in place. Twelve permanent monitoring sites were established in Minnesota and data has been collected on garlic mustard and native plant populations at these sites since 2005. When biocontrol agents are approved they will be released at these monitoring sites, and at other release sites as prioritized based on availability of agents, suitability of the site, and past cooperator participation supporting this effort. Pre-release plant monitoring data will be essential to understand garlic mustard population dynamics and to determine if the biological control agents are effective once released.

Outcome	Completion Date
1. Collect October 2013 monitoring data and analyze results	12/31/13
2. Collect June and October 2014 monitoring data and analyze results	12/31/14
3. Collect June and October 2015 monitoring data and analyze results	12/31/15
4. Collect June 2016 monitoring data.	06/30/16

### III. PROJECT STRATEGY

#### A. Project Team/Partners

Dr. Roger Becker and Dr. Elizabeth J. Stamm Katovich, University of Minnesota have expertise in garlic mustard biological control research.

#### B. Timeline Requirements

This project is proposed for three years. Biological control development and implementation can take years to complete. This project builds on nine previous years of investment by the ENRTF to bring biological control to Minnesota. Consistent funding over multi-year periods is critical to support researchers to collect, grow, and adequately test and study the plants and insects involved.

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

Development and implementation of biological control for garlic mustard has taken more than ten years to date. The research on *C. scrobicollis* has brought us to the critical stage of gaining approval from USDA-APHIS to release and implement the first biological control of garlic mustard in North America. The research on *C. constrictus* is nearing completion and could provide greater and more consistent control of garlic mustard if our work results in its approval for release. Future needs include follow-up on the release and monitoring of *C. scrobicollis* to ensure success and to understand its impacts on Minnesota ecosystems, and to implement release and monitoring of *C. constrictus* should we gain approval for release.

**2012-2013 Detailed Project Budget**  
**Biological Control of Garlic Mustard**

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

<b>BUDGET ITEM</b>	<b>AMOUNT</b>
<b>Contracts:</b> Contract to carry out efforts to implement biological control of garlic mustard. A BioSafety Level II facility is necessary for host-specificity testing of insects not yet approved for release in the United States.	\$ 140,250
<b>Additional Budget items:</b> Direct support services: DNR used a rate of 6.5% to calculate costs for direct support services, which are DNR's direct and necessary business services required to support this proposal.	\$ 9,750
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	\$ 150,000

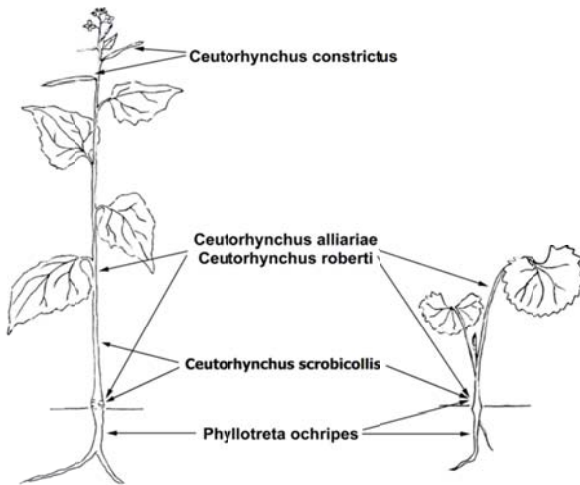
**V. OTHER FUNDS**

<b>SOURCE OF FUNDS</b>	<b>AMOUNT</b>	<b>Status</b>
<b>Other Non-State \$ Being Applied to Project During Project Period:</b> The USDA Forest Service has provided funding for garlic mustard biological control work in the past, including funds for host-specificity testing in the US and Europe. The current grant expires after federal fiscal year 2013.	\$ 75,000	Secured
<b>In-kind Services During Project Period:</b> MN DNR will assist in managing the contract, analyzing data, writing proposals for release, writing manuals for release and monitoring, identifying potential release sites, and collecting data in the field.	\$ 10,000	Secured
<b>Remaining \$ from Current ENRTF Appropriation (if applicable):</b> M.L. 2010, Chp. 362, Sec. 362, Subd. 6a. Biological Control of European Buckthorn and Garlic Mustard. This appropriation is available until June 30, 2013. Spending of funds has been slower than anticipated due to the delay in obtaining approval from TAG for release of the biocontrol agents.	\$135,148.19	Contracts are being developed to spend the remaining funds
<b>Funding History:</b> MN DNR spent \$25,000 in 1999 supporting garlic mustard biocontrol research. Between 2002 and 2008, the DNR received \$265,000 from USDA Forest Service to continue host-specificity testing of garlic mustard biological control agents. LCCMR funded \$90,000 (2005) and \$135,000 (2007).	\$ 515,000	Spent

**Biological Control of Garlic Mustard Graphic**



Garlic mustard infestation in Nerstrand, MN.



Potential biological control insects for garlic mustard and the parts of the plant that they feed on.



Garlic mustard plant damaged by *Ceutorhynchus scrobicollis*.

## LUKE C. SKINNER

### CURRENT EMPLOYMENT

Invasive Species Program Supervisor  
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### EDUCATION

Ph.D. Entomology (2004) University of Minnesota  
Bachelor of Science Degree (1987) University of Minnesota

### FUNDED PROPOSALS

2005-2012 Legislative-Citizen Commission on Minnesota Resources- Research on Biological Control of European Buckthorn and Garlic Mustard, \$800,000 (2005, 2007, 2010 appropriations)  
2002-2009 USDA-Forest Service- Biological Control of Garlic Mustard, \$265,000  
2003-2005 Legislative Commission on Minnesota Resources- Research on Biological Control of European Buckthorn, \$109,000  
2003-2005 U.S. EPA-GLNPO- Research on Biological Control of Buckthorn, \$50,000  
2002-2003 U.S. EPA-GLNPO- Research on Biological Control of Buckthorn, \$75,000  
1997-2003 Legislative Commission on Minnesota Resources- Research on Biological control of Eurasian Watermilfoil and Purple Loosestrife, \$315,000 (3 bienniums)  
1996-2001 USFWS FED-AID and NAWCA- Nationwide Rearing and Distribution of Insects for Biological Control of Purple Loosestrife, \$645,000

### SELECTED JOURNAL PUBLICATIONS AND TECHNICAL REPORTS

Van Riper, L.C., R.L. Becker and **L.C. Skinner**. 2010. Population biology of garlic mustard (*Alliaria petiolata*) in Minnesota hardwood forests. *Invasive Plant Science and Management*, 3: 48-59.  
Gerber, E., G. Cortat, H.L. Hinz, B. Blossey, E. Katovich and **L. Skinner**. 2009. Biology and host specificity of *Ceutorhynchus scrobicollis* (Curculionidae; Coleoptera), a root-crown mining weevil proposed as biological control agents against *Alliaria petiolata* in North America. *Biocontrol Science and Technology*. 19:2 pp. 117-138.  
**Skinner, L.C.**, D.W. Ragsdale, R.W. Hansen, M.A. Chandler, and G. Spoden. 2006. Phenology of first and peak emergence of *Aphthona lacertosa* and *A. nigriscutis*: Two leaf beetles introduced for biological control of leafy spurge, *Euphorbia esula* L. *Biological Control*, 37: 382-391.  
**Skinner, L.C.** and D.W. Ragsdale. 2005. Future needs in developing biological control for buckthorn. 2005. In L.C. Skinner (ed), *Proceedings: Symposium on the Biology, Ecology and Management of Garlic Mustard (Alliaria petiolata) and European Buckthorn (Rhamnus cathartica) 17-18 May 2005*, University of Minnesota, St. Paul, Minnesota, USA. Pp. 62-63.  
**Skinner, L.** and W.J. Rendall. 2001. New study assesses potential for biocontrol of buckthorn. *Ecological Restoration* 19:4 pp. 263-264.

**LCCMR Project Manager Responsibilities:** Write contracts with the researchers to carry out objectives, oversee researchers to ensure objectives are met, write LCCMR status reports and present results to LCCMR.

### ORGANIZATION DESCRIPTION

The Minnesota Department of Natural Resources' overall mission is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life. Minnesota DNR protects and manages the diverse natural resources of Minnesota. Because invasive species have the potential to adversely affect these natural resources, it is the DNR's policy to limit the introduction of invasive species, limit their rate of geographical spread, and reduce their impact on high value resources.