Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2013 Work Plan

Date of Status Update Report:

Date of Next Status Update Report:

Date of Work Plan Approval:

Project Completion Date: June 30, 2016 **Is this an amendment request? ____**

PROJECT TITLE: Biological Control of Garlic Mustard

Project Manager: Laura Van Riper

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Location: Statewide

Total ENRTF Project Budget: $140,000	
ENRTF Appropriation:	**$140,000**
Amount Spent:	**$0**
Balance:	**$140,000**

Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06e

Appropriation Language:
$140,000 the first year is from the trust fund to the commissioner of natural resources in cooperation with the University of Minnesota to continue the implementation of biological control for invasive garlic mustard plants. This appropriation is available until June 30, 2016, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Biological Control of Garlic Mustard

II. 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 ENRTF 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 ENRTF (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.

The desired outcomes of this project are 1) reduced negative impacts from garlic mustard on forest species; 2) long-term, self-sustaining control of garlic mustard; and 3) reduction in management time and cost for garlic mustard.

III. PROJECT STATUS UPDATES:

Project Status as of Dec. 31, 2013:

Project Status as of June 30, 2014:

Project Status as of Dec. 31, 2014:

Project Status as of June 30, 2015:

Project Status as of Dec. 31, 2015:

IV. PROJECT ACTIVITIES AND OUTCOMES:

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

Description: Research activities will include development of rearing protocols, release methods, 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.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 97,000
Amount Spent: $ 0
Balance: $97,000

Activity Completion Date:

Outcome	Completion Date	Budget
1. Develop rearing protocols and manual for *C. scrobicollis*	06/30/14	$15,000
2. Complete host specificity of *C. constrictus*	12/31/14	$50,000
3. If results warrant, write proposal to TAG for release of *C. constrictus*	06/30/15	$4,000
4. Develop rearing protocols and manual for *C. constrictus*	06/30/16	$20,000
5. If results warrant, write proposals to TAG for release of *C. roberti and C. alliariae*	06/30/16	$8,000

*Estimated amount per task, amounts may vary per task, but total budget will stay at $97,000.

Activity Status as of Dec. 31, 2013:

Activity Status as of June 30, 2014:

Activity Status as of Dec. 31, 2014:

Activity Status as of June 30, 2015:

Activity Status as of Dec. 31, 2015:

Final Report Summary:

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

Description: 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. Data is collected from the monitoring plots in June and October in each year.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 43,000
Amount Spent: $ 0
Balance: $43,000

Activity Completion Date:

Outcome	Completion Date	Budget
1. Collect October 2013 monitoring data and analyze results	12/31/13	$6,000
2. Collect June and October 2014 monitoring data and analyze results	12/31/14	$14,000

3. Collect June and October 2015 monitoring data and analyze results	12/31/15	$14,500
4. Collect June 2016 monitoring data.	06/30/16	$8,500

*Estimated amount per task, amounts may vary per task, but total budget will stay at $43,000.

Activity Status as of Dec. 31, 2013:

Activity Status as of June 30, 2014:

Activity Status as of Dec. 31, 2014:

Activity Status as of June 30, 2015:

Activity Status as of Dec. 31, 2015:

Final Report Summary:

V. DISSEMINATION:

Description: It is expected that the results of this project will be published in peer-reviewed scientific journals and also in special publications and newsletters. Results also will be presented at national, regional and state scientific meetings to peers in the field, as well as to resource managers and planners who will use the results of this project.

Status as of Dec. 31, 2013:

Status as of June 30, 2014:

Status as of Dec. 31, 2014:

Status as of June 30, 2015:

Status as of Dec. 31, 2015:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Budget Category	$ Amount	Explanation
Professional/Technical/Service Contracts:	$140,000	This project is in cooperation with the University of Minnesota. Work will be contracted out to the University of Minnesota as the University has the required BioSafety Level II facility which is necessary for host-specificity testing of insects not yet approved for release in the United States.
TOTAL ENRTF BUDGET:	**$140,000**	

Explanation of Use of Classified Staff: Not applicable.

Explanation of Capital Expenditures Greater Than $3,500: Not applicable.

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation: Not applicable.

Number of Full-time Equivalent (FTE) estimated to be funded through contracts with this ENRTF appropriation: 1

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
USDA Forest Service, cash support.	$73,059	$62,760	Funds for host specificity testing of *Ceutorhynchus* spp. This grant expires federal fiscal year 2013 (Sept. 2013).
USDA Forest Service, cash support.	$75,000	$0	Funds for host-specificity testing in the US and Europe. This grant expires after federal fiscal year 2014 (Sept. 2014).
State			
MN DNR, general fund, support	$10,000	$0	MN DNR project manager 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. MN DNR will provide fiscal oversight and direct and necessary costs related to this project.
TOTAL OTHER FUNDS:	**$158,059**	**$62,760**	

VII. PROJECT STRATEGY:

A. Project Partners: This project is in cooperation with the University of Minnesota. Dr. Roger Becker and Dr. Elizabeth J. Stamm Katovich from the University of Minnesota have expertise in garlic mustard biological control research and access to a Biosafety Level II facility for host-specificity testing. The $140,000 from the ENTRF will go to a contract with the University of Minnesota.

B. Project Impact and Long-term Strategy: Development and implementation of biological control is a long-term endeavor. Research on garlic mustard biocontrol has taken more than ten years to date. Consistent funding over multi-year periods is critical to support researchers to collect, grow, and adequately test and study the plants and insects involved. 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. Multiple biocontrol agents are found to give greater control of the target invasive plant. Release and distribution of the four weevil species (*C. scrobicollis, C. constrictus, C. roberti,* and *C. alliariae*) is the long-term strategy for control of the invasive plant garlic mustard.

C. Spending History:

Funding Source	M.L. 2007 or FY08	M.L. 2008 or FY09	M.L. 2009 or FY10	M.L. 2010 or FY11	M.L. 2011 or FY12-13
ENRTF	$135,000 Subd. 4(i)			$150,000 Subd. 6(a)	
USDA Forest Service		$115,000		$72,000	$62,760

VIII. ACQUISITION/RESTORATION LIST: Not applicable.

IX. MAP(S): Not applicable.

X. RESEARCH ADDENDUM: This project is part of a multi-phase effort and a peer review occurred through the LCCMR process as part of the first phase.

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted not later than Dec. 31, 2013, June 30, 2014, Dec. 31, 2014, June 30, 2015, and Dec. 31, 2015. A final report and associated products will be submitted between June 30 and August 15, 2016 as requested by the LCCMR.

Attachment A: Budget Detail for M.L. 2013 Environment and Natural Resources Trust Fund Projects

Project Title: *Biological Control of Garlic Mustard*
Legal Citation: *M.L. 2013, Chp. xx, Sec. xx, Subd. Xx*
Project Manager: *Laura Van Riper*
M.L. 2013 ENRTF Appropriation: $ *140,000*
Project Length and Completion Date: *3 years, June 30, 2016*
Date of Update: *Oct. 1, 2012*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Balance	Activity 2 Budget	Amount Spent	Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	***Developing rearing protocols and complete required host specificity testing for garlic mustard biological control agents in Minnesota***			***Introduce and evaluate garlic mustard biocontrol agents in Minnesota***				
Professional/Technical/Service Contracts								
University of Minnesota for garlic mustard research	$97,000		$97,000	$43,000		$43,000	$140,000	$140,000
COLUMN TOTAL	**$97,000**	**$0**	**$97,000**	**$43,000**	**$0**	**$43,000**	**$140,000**	**$140,000**

Biological Control of Garlic Mustard

Laura Van Riper, ID# 049-C2

Biocontrol:

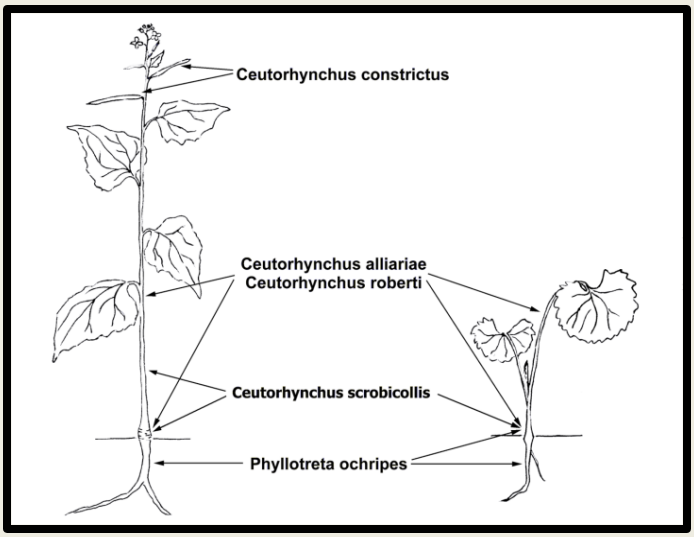
- Biological control insects can provide long-term control of invasive species
  - Successfully being used in MN for purple loosestrife, leafy spurge, and spotted knapweed

The problem:

- Garlic mustard invades forests and forms dense monocultures
- Declines in native plant species
- Decreases beneficial soil fungi on which other plants depend
- Prohibited Noxious Weed in MN
- Management is cost and labor intensive

- Development of biocontrol is a long-term commitment
- Insects undergo extensive testing to ensure that the insect chosen can only develop on the target weed

Biological Control of Garlic Mustard



Research timeline:

Year	Activity
1998	Research initiated
2003	ENRTF support begins
2005	Garlic mustard monitoring locations established in MN
2008	Release proposal submitted to USDA Technical Advisory Group (TAG) for *Ceutorhynchus scrobicollis*
2009	TAG recommends testing additional species of mustards (additional west coast mustards, horticultural species, rare species).
2011	Additional testing completed. Submit revised proposal to TAG in Sept. 2011.
2012	Response from TAG anticipated.
2012-2016	Continue garlic mustard monitoring. Release *C. scrobicollis* if approved. Continue host-specificity testing for additional potential biocontrol insects. Write release proposals for *C. constictus, C. alliarae,* and *C. roberti*

Proposal:

- Introduce *Ceutorhynchus scrobicollis* if it obtains USDA approval
- Complete host-specificity testing for *C. constrictus*
- Monitor garlic mustard in MN and the effectiveness of the biocontrol insects
- Develop rearing protocols and partners to facilitate distribution of biocontrol insects
- **Benefits:**
  - **Reduced impacts to forests**
  - **Long-term, self-sustaining control of garlic mustard**
  - **State saves time and money on control**