



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2011 Work Plan

Date of Status Update:

Date of Next Status Update: 5/1/2012

Date of Work Plan Approval: 6/23/2011

Project Completion Date: 6/30/2014

Is this an amendment request? _____

Project Title: Emerald Ash Borer Biocontrol Research and Implementation

Project Manager: Monika Chandler

Affiliation: Minnesota Department of Agriculture

Address: 625 Robert St N

City: St Paul **State:** MN **Zipcode:** 55155

Telephone Number: (651) 201-6537

Email Address: Monika.Chandler@state.mn.us

Web Address:

Location:

Counties Impacted: Statewide

Ecological Section Impacted: Lake Agassiz Aspen Parklands (223N), Minnesota and Northeast Iowa Morainal (222M), North Central Glaciated Plains (251B), Northern Minnesota and Ontario Peatlands (212M), Northern Minnesota Drift and Lake Plains (212N), Northern Superior Uplands (212L), Paleozoic Plateau (222L), Red River Valley (251A), Southern Superior Uplands (212J), Western Superior Uplands (212K)

Total ENRTF Project Budget:	ENRTF Appropriation \$:	500,000
	Amount Spent \$:	<u>0</u>
	Balance \$:	500,000

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 06b

Appropriation Language:

\$250,000 the first year and \$250,000 the second year are from the trust fund to the commissioner of agriculture to assess a biocontrol method for suppressing emerald ash borers by testing bioagent winter survival potential, developing release and monitoring methods, and piloting implementation of emerald ash borer biocontrol. This appropriation is available until June 30, 2014, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Emerald Ash Borer Biocontrol Research and Implementation

II. PROJECT SUMMARY: Biological control is currently the only promising long-term management strategy for emerald ash borer (EAB), a beetle that is native to Asia. It was first detected in North America near Detroit in 2002 and has killed millions of ash trees. In May 2009, Minnesota's first EAB was detected in St. Paul and has since been found in Minneapolis and in a natural ash stand on the Mississippi River in southeastern Minnesota. The loss of Minnesota's nearly 1 billion ash trees, more ash on forestland than any other state, would be catastrophic. Ash-dominated sites are essential to many native plants and wildlife.

Biological control is the only potential tool to save ash that can be implemented at a forest scale. Biological control reunites the target pest with the insects or diseases that control the pest in its native range. In this case, parasitoids that control EAB in Asia would be released to control EAB in Minnesota.

The project goal is to establish biological control agent populations that suppress EAB and minimize EAB damage. Our objectives are to assess biological control agent winter survival potential, and assess establishment and spread of biological control agents after release in order to successfully implement EAB biocontrol in Minnesota.

III. PROJECT STATUS UPDATES:

Project Status as of May 31, 2012:

Project Status as of November 30, 2012:

Project Status as of May 31, 2013:

Project Status as of November 29, 2013:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Assess biological control agent winter survival potential

Description: Cold hardiness of *S. agrili* and *T. planipennisi* will be assessed using established laboratory methods to measure the insect supercooling point, lower lethal temperature, and lower lethal times and field studies to measure actual agent survival. Temperatures experienced by the bioagents will be measured with thermocouples beneath the bark on various parts of the tree. This research will be completed by a graduate student, Anthony Hanson, and one undergraduate student advised by Dr. Robert Venette with the Forest Service and the University of Minnesota. This study complements Dr. Venette's research on EAB larval cold weather survival potential.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 150,600
Amount Spent: \$ 0
Balance: \$ 150,600

Activity Completion Date: 06/30/2014

Outcome	Completion Date	Budget
1. Measure bioagent cold hardiness for two species	06/30/2014	\$108,100
2. Develop predictive model and map of expected bioagent survivorship	06/30/2014	\$42,500

Activity Status as of May 31, 2012:

Activity Status as of November 30, 2012:

Activity Status as of May 31, 2013:

Activity Status as of November 29, 2013:

Final Report Summary:

ACTIVITY 2: Examining parasitoid establishment and dispersal

Note: Activity 2 was revised from the submitted proposal based upon peer review comments to the research addendum.

Description: The goal is to determine movement and potential establishment of parasitoids of EAB from the release site. Biological control agent traps will be placed at incremental distances of up to 1km from the sites where biological control agents have been or are being released (e.g., 0, 100, 200, 500, 1000m in four cardinal directions, or at points along an arc). These traps will serve to monitor EAB parasitoids emerging from the release site over time. This research will be conducted by a graduate student and one undergraduate student advised by Dr. Brian Aukema at the University of Minnesota. This study complements Dr. Aukema's existing work on landscape ecology, movement patterns, and spatiotemporal modeling of insects undergoing range expansion events.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 162,000
Amount Spent: \$ 0
Balance: \$ 162,000

Activity Completion Date: 06/30/2014

Outcome	Completion Date	Budget
1. Identify monitoring points within/around release sites	10/01/2013	\$ 63,800
2. Determine dispersal gradient of parasitoids	06/30/2014	\$ 98,200

Activity Status as of May 31, 2012:

Activity Status as of November 30, 2012:

Activity Status as of May 31, 2013:

Activity Status as of November 29, 2013:

Final Report Summary:

ACTIVITY 3: Coordinate Minnesota's biological control implementation

Description: Strategic implementation of EAB biocontrol will require coordination, communication, and facilitation with other agencies, private landowners, and the general public. Potential release sites will be assessed and information related to field releases will be tracked. A new position will be created within the Plant Protection Division at MDA to coordinate implementation.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 187,400
Amount Spent: \$ 0
Balance: \$ 187,400

Activity Completion Date: 06/30/2014

Outcome	Completion Date	Budget
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1. Webpage developed for outreach	12/30/2011	\$ 500
2. Phase one implementation strategy for Minnesota developed	06/30/2012	\$ 50,000
3. Potential release sites delimited and assessed	04/30/2014	\$ 77,800
4. Field data collected and entered into database	06/30/2014	\$ 59,100

Activity Status as of May 31, 2012:

Activity Status as of November 30, 2012:

Activity Status as of May 31, 2013:

Activity Status as of November 29, 2013:

Final Report Summary:

V. DISSEMINATION:

Description: We will communicate about EAB biological control research and implementation with the public, land managers, and researchers. The web will be used for communication with all <http://www.mda.state.mn.us/en/plants/pestmanagement/eab/eabbiocontrol.aspx> and will be updated annually. Communication with the public will be via news media (print, television, and radio) and social media such as Facebook and Twitter. We will communicate updates with land managers at the multi-agency EAB Forum (meets 4 times/year) and in trade publications such as “The Scoop” published by the Minnesota Nursery Landscape Association. Research findings will be presented at University of Minnesota seminars, the 2012 Minnesota-Wisconsin invasive species conference, and a national Entomological Society of America meeting (LCCMR funding will not be used for meetings). After project completion, research papers will be submitted for publication.

Status as of May 31, 2012:

Status as of November 30, 2012:

Status as of May 31, 2013:

Status as of November 29, 2013:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Budget Category	\$ Amount	Explanation
Personnel:	\$ 442,700	<p>U of M: One 2 year part-time faculty (1 mo/yr) mean salary \$8,200/mo plus fringe benefits @ 7% for examining parasitoid establishment and dispersal (Activity 2). The total is \$17,500 and is for Dr. Aukema's summer salary because he has a 9 month appointment that does not include the summer field season.</p> <p>U of M: Two 3 year full-time graduate students mean salary \$28,500/yr plus fringe benefits @ 25% for bioagent cold-hardiness (Activity 1) and examining parasitoid establishment and dispersal (Activity 2). The total is \$214,000.</p> <p>U of M: Two 3 year part-time school year and full-time summer field season undergraduate students mean wages \$15/hr plus fringe benefits @ 7.6%, 2 students for Activity 1 and 2 for Activity 2 (40 wks @ 20 hr/wk & 12 wks in summer @ 40hrs/wk). The total is \$41,200.</p> <p>MDA: One 2.7 year full-time Research Scientist 1 mean salary \$42,500/yr plus fringe benefits @ 49% for EAB biocontrol implementation (Activity 3). This is a new, unclassified position within the Plant Protection Division.</p>
Capital Equipment:	\$ 14,000	<p>U of M: 2 ultralow precision temperature freezers @ \$7,000 each for Activity 1. The precision freezers can be set to and hold constant lower temperatures than standard freezers are necessary to test the cold-hardiness of the biological control agents. Varying levels of time at specific temperatures will be tested. Running two freezers simultaneously is necessary to perform the tests within the project timeframe. After this project is completed, the freezers will continue to be used for invasive species related activities.</p>
Equipment/Tools/Supplies:	\$ 13,800	<p>Equipment for MDA: One rangefinder @ 300 for Activity 3.</p> <p>Tools and Supplies for U of M (12,000) and MDA (1,500): Activity 1 supplies include thermocouple wire (\$250/yr), thermocouple connectors (\$130/yr), PTFE tubing (\$140/yr), 8 channel data logger (\$330/yr), rearing containers (\$750/yr), petri dishes (\$150/yr). Activity 2 supplies include insect rearing tubes (\$500/yr), field supplies such as insect collection traps and containers (\$750/yr). All activity supplies include tools related to bark peeling such as draw knives and chisels (\$500/yr), and miscellaneous (\$1,000/yr) such as DBH tapes (for measuring tree size), spray paint, and tree tags.</p>
Travel Expenses in MN:	\$ 29,500	<p>Travel expenses for U of M for Activities 1 (\$3,000) and 2 (\$10,900) are \$13,900. Travel expenses for MDA are \$15,600.</p> <p>Vehicles: Vehicle rental for Activities 2 and 3 during the summer field season. (Activity 2: One 3 mo. vehicle rental (\$700/mo for 6 mo. for 2 yr - includes milage) and fuel (\$200/mo for 6 mo/yr for 2 yr) and Activity 3: One 3 mo. vehicle rental (\$700/mo for 3 mo. for 3 yr - includes milage)</p>

		and fuel (\$200/mo for 3 mo/yr for 3 yr)). MDA's vehicle pool will be used for travel vehicles during the non-field season. Meals and lodging for all 3 activities (Activity 1: Approx. 6 days of travel/yr each for 3 yr for 1 undergrad student, 1 grad student, and the PI; Activity 2: Approx. travel/yr for 3 yr for 1 undergrad student (3 days), 1 grad student (6 days), and the PI (3 days); Activity 3: Approx. travel/yr for 3 yr for 1 EAB biocontrol coordinator (10 days) and the PI (6 days))
TOTAL ENRTF BUDGET:	\$500,000	

Explanation of Use of Classified Staff: N/A

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation:

One 2 year part-time faculty (1 mo/yr) = 346 hrs
 Two 3 year full-time graduate students = 2080*2*3 = 12,480 hrs
 Two 3 year part-time undergraduate students = 1280*2*3 = 7,680 hrs
 One 2.7 year full-time Research Scientist 1 = 2080*2.7 = 5,616
 Total hours: 26,122
 Total FTEs = 26,122/2080 = 12.56

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
	\$	\$	
State (in-kind)			
Field equipment, lab equipment and lab space, computing/software, GIS and data management (\$40,000 for U of M, \$15,000 for MDA), graduate student advising and research management (\$100,000 at U of M), project coordination and overseeing EAB biocontrol implementation (\$15,000 at MDA)	\$ 170,000	\$	
TOTAL OTHER FUNDS:	\$ 170,000	\$	

VII. PROJECT STRATEGY:

A. Project Partners: Receiving funds: EAB biological control research and implementation will be a joint U of M and MDA endeavor. U of M will lead research and receive funds for the research projects: Assessing bioagent cold-hardiness and method development for bioagent monitoring. MDA will lead implementation and receive funds for coordinating Minnesota's EAB biocontrol program. MDA will provide labor to support research and implementation. Both institutions will provide in-kind equipment, facilities, intellectual input, and GIS/technical support. **Not receiving funds:** We will collaborate with Dr. Luke Skinner (DNR), USDA EAB biocontrol researchers, other federal and state agencies, counties, municipalities, and private landowners. The US Forest Service will not receive funds but will provide facilities.

B. Project Impact and Long-term Strategy: All three biological control agent species were released and recovered in Michigan. We are confident that these species will establish in southern Minnesota which has a similar climate to the areas of biological control agent release and recovery. However, northern Minnesota is colder than Michigan so we are not sure that EAB and its biological control

agents will survive northern winters. Understanding their winter survival potential would inform biological control agent release decisions.

EAB biocontrol is still too new for conclusions regarding efficacy. Although EAB can spread and kill ash trees at high rates, the movement potential of parasitoids once released is less well known, especially in new environments like Minnesota. Understanding rates of establishment and spread will permit judicious use of biological control agents as new sites with EAB are detected.

Implementing EAB biological control is very time and labor intensive. Site selection, data collection, coordination with project partners, and outreach are involved. Biological control agents are in short supply due to the limitations of production and demand thereby increasing the need for strategic releases. Based upon the experience in Michigan and other states, we learned that EAB can spread and destroy ash trees very quickly. An efficient and forceful implementation strategy for Minnesota should be developed and enacted immediately. Management recommendations resulting from research should be incorporated into the strategy as they become available.

C. Spending History:

Funding Source	M.L. 2005 or FY 2006-07	M.L. 2007 or FY 2008	M.L. 2008 or FY 2009	M.L. 2009 or FY 2010	M.L. 2010 or FY 2011
Forest Service (supplies and salary for Activity 1)					8,000
University of Minnesota (salary to initiate Activity 2)					2,500
Minnesota Department of Agriculture (salary to initiate bioagent releases, Activity 3)					3,000

These funds were spent prior to LCCMR fund availability.

VIII. ACQUISITION/RESTORATION LIST: NA

IX. MAP(S): NA

X. RESEARCH ADDENDUM: (attached)

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted not later than May 31, 2012, November 30, 2012, May 31, 2013 and November 29, 2013. A final report and associated products will be submitted between June 30 and August 1, 2014 as requested by the LCCMR.

Attachment A: Budget Detail for M.L. 2011 (FY 2012-13) Environment and Natural Resources Trust Fund Projects											
Project Title: Emerald Ash Borer Biocontrol Research and Implementation											
Legal Citation:											
Project Manager: Monika Chandler, Minnesota Department of Agriculture, 651-201-6537, Monika.Chandler@state.mn.us											
M.L. 2011 (FY 2012-13) ENRTF Appropriation: \$ 500,000											
Project Length and Completion Date: 3 years, 06/30/2014											
Date of Update: Initial work plan submitted 05/12/2011											
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Balance	Activity 2 Budget	Amount Spent	Balance	Activity 3 Budget	Amount Spent	Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Assess biological control agent winter</i>			<i>Examining parasitoid establishment and dispersal</i>			<i>Coordinate Minnesota's biological control implementation</i>				
Personnel (Wages and Benefits)											
Personnel at U of M for Activities 1 (\$127,600) and 2 (\$145,100) total is \$272,700. Personnel at MDA is \$170,000.	127,600	0	127,600	145,100	0	145,100	170,000	0	170,000	442,700	442,700
U of M: One 2 year part-time faculty (1 mo./yr) mean salary \$8,200/mo plus fringe benefits @ 7% for examining parasitoid establishment and dispersal (Activity 2). The total is \$17,500 and is for Dr. Aukema's summer salary because he has a 9 month appointment that does not include the summer field season.											
U of M: Two 3 year full-time graduate students mean salary \$28,500/yr plus fringe benefits @ 25% for bioagent cold-hardiness (Activity 1) and examining parasitoid establishment and dispersal (Activity 2). The total is \$214,000.											
U of M: Two 3 year part-time school year and full-time summer field season undergraduate students mean wages \$15/hr plus fringe benefits @ 7.6%. 2 students for Activity 1 and 2 for Activity 2 (40 wks @ 20 hr/wk & 12 wks in summer @ 40hrs/wk). The total is \$41,200.											
MDA: One 2.7 year full-time Research Scientist 1 mean salary \$42,500/yr plus fringe benefits @ 49% for EAB biocontrol implementation (Activity 3). This is a new, unclassified position within the Plant Protection Division.											
Equipment/Tools/Supplies											
Capital equipment over \$3,500											
Capital equipment: 2 ultralow precision temperature freezers @ \$7,000 each for Activity 1. The precision freezers can be set to and hold constant lower temperatures than standard freezers are necessary to test the cold-hardiness of the biological control agents. Varying levels of time at specific temperatures will be tested. Running two freezers simultaneously is necessary to perform the tests within the project timeframe. After this project is completed, the freezers will continue to be used for invasive species related activities.	14,000	0	14,000							14,000	14,000
Equipment: One rangefinder @ 300 for Activity 3							300	0	300	300	300
Activity 1 supplies include thermocouple wire (\$250/yr), thermocouple connectors (\$130/yr), PTFE tubing (\$140/yr), 8 channel data logger (\$330/yr), rearing containers (\$750/yr), petri dishes (\$150/yr). Activity 2 supplies include insect rearing tubes (\$500/yr), field supplies such as insect collection traps and containers (\$750/yr). All activity supplies include tools related to bark peeling such as draw knives and chisels (\$500/yr), and miscellaneous (\$1,000/yr) such as DBH tapes (for measuring tree size), spray paint, and tree tags.	6,000	0	6,000	6,000	0	6,000	1,500	0	1,500	13,500	13,500
Travel expenses in Minnesota											
Vehicles: Vehicle rental for Activities 2 and 3 during the summer field season. (Activity 2: One 3 mo. vehicle rental (\$700/mo for 6 mo. for 2 yr - includes mileage) and fuel (\$200/mo for 6 mo/yr for 2 yr) and Activity 3: One 3 mo. vehicle rental (\$700/mo for 3 mo. for 3 yr - includes mileage) and fuel (\$200/mo for 3 mo/yr for 3 yr)). MDA's vehicle pool will be used for travel vehicles during the non-field season.				5,400	0	5,400	8,100	0	8,100	13,500	13,500
Meals and lodging for all 3 activities (Activity 1: Approx. 6 days of travel/yr each for 3 yr for 1 undergrad student, 1 grad student, and the PI; Activity 2: Approx. travel/yr for 3 yr for 1 undergrad student (3 days), 1 grad student (6 days), and the PI (3 days); Activity 3: Approx. travel/yr for 3 yr for 1 EAB biocontrol coordinator (10 days) and the PI (6 days))	3,000	0	3,000	5,500	0	5,500	7,500	0	7,500	16,000	16,000
COLUMN TOTAL	\$150,600			\$162,000			\$187,400			\$500,000	\$500,000