



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2017 LCCMR Work Plan

Date of Submission: September 13, 2016
Date of Next Status Update Report: November 30, 2017
Date of Work Plan Approval: 06/07/2017
Project Completion Date: June 30, 2020
Does this submission include an amendment request? No

PROJECT TITLE: Emerald Ash Borer Biocontrol – Phase III

Project Manager: Jonathan Osthus
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Location: Statewide

Total ENRTF Project Budget:	ENRTF Appropriation:	\$729,000
	Amount Spent:	\$0
	Balance:	\$729,000

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06b

Appropriation Language:

\$729,000 the first year is from the trust fund to the commissioner of agriculture in cooperation with the Board of Regents of the University of Minnesota to implement biocontrol of emerald ash borer using a newly approved parasitic wasp, assess the impact of the statewide program, and engage citizen volunteers. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: EAB Biocontrol Phase 3: Assessment & Citizen Engagement

II. PROJECT STATEMENT:

Emerald ash borer (EAB) continues to be one of the most destructive non-native pests in North America with over 1 billion ash trees at risk in Minnesota. Although Minnesota has had some success with slower than national average spread of EAB, the number of counties infested more than doubled from 2015-2016. Several effective methods to combat EAB exist, but biological control remains the most promising long-term management strategy at the landscape level. Along with biocontrol, citizen volunteers can detect new EAB infestations and gather data about other wood-boring beetles in Minnesota by conducting EAB biosurveillance using the native smoky winged beetle bandit wasp. Our project focuses on expanded implementation and assessment of the statewide impact biological control is having on EAB populations.

Accomplishments from Phases 1 & 2 (2011-2014) & (2014-2017)

- Total release of 359,548 wasps! at 30 EAB infested sites.
- 37 distinct wasp recoveries from parasitized EAB larvae and eggs have been recorded across the state.
- Determined cold tolerance for EAB and parasitic wasps.
- Determined flight capacity of parasitic wasp, *Tetrastichus planipennis*.
- 50 citizen volunteers checked and monitored 84 sites. The smoky winged beetle bandit wasp was confirmed at 31 sites in 11 counties.

The Next Step: As EAB spreads to more northern and forested areas of the state, biocontrol will be the most practical management option available. The newly approved parasitic wasp, *Spathius galinae*, is from the Russian Far East and may be better suited to northern climates. (Unfortunately, one of the early approved species, *Spathius agrili*, has been found to be incapable of establishing in Minnesota). This new species offers Minnesota yet another tool for natural reduction of EAB populations.

Objectives for Phase 3:

Expand EAB biocontrol: The biocontrol effort will be expanded to address new EAB finds, release EAB biological control agents and continue existing site monitoring.

Assess EAB biocontrol establishment and impact: Measure numbers of stingless wasp recoveries. Annual data will allow us to examine how densities of biological control agents are changing through time (i.e., impacting population growth and mortality rates of EAB).

Determine cold tolerance – *Spathius galinae* (*new parasitic wasp): Measure the cold hardiness of this new stingless wasp with techniques that our team successfully applied to two other biological control agents for EAB. This information refined MDA's strategy to implement biocontrol for EAB.

Citizen engagement and Biosurveillance of EAB: Engage and educate the public about EAB and involve citizens in the detection and data collection process. Additionally, biosurveillance will monitor for similar high risk wood-boring beetles that are not documented in Minnesota such as the European oak borer that threatens our oaks. That borer was recently detected with biosurveillance in Ontario, Canada.

Our project will build on other LCCMR projects: Emerald Ash Borer Biocontrol Research and Implementation (2011-2014), Biosurveillance and Biocontrol of Emerald Ash Borer – Phase 2 (2014-2017).

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of November 30, 2017:

Project Status as of May 31, 2018:

Project Status as of November 30, 2018:

Project Status as of May 31, 2019:

Project Status as of November 30, 2019:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1:

Description: Expand biological control implementation

EAB biological control has been implemented with the goal of using natural enemies to reduce EAB populations and damage to ash trees. Initial biological control agent releases in Minnesota began in 2010 with the release of two larval parasitoid species (wasps that attack EAB larvae underneath the bark) and the addition of an egg parasitoid species (wasps that attack EAB eggs) beginning in 2011. These three species were tested to ensure that they will not negatively impact other species or the environment. USDA rears these stingless wasps at a facility in Brighton, MI and provides them to states with EAB infestations.

The larval parasitoid species are *Spathius agrili* and *Tetrastichus planipennis*. Both species were released 2010 – 2012 in Minnesota. USDA decided in 2013 that they would continue releases of *S. agrili* south of the 40th parallel trying to better synchronize EAB and *S. agrili* lifecycles. Minnesota has not received *S. agrili* for release since 2012 and there are no plans to release this species again north of the 40th parallel. *T. planipennis* continues to be released and has showed the greatest success thus far with an annual increase of recoveries in southeast Minnesota. The egg parasitoid, *Oobius agrili*, continues to be released each season and has now been recovered from sites in Hennepin and Winona Counties.

A new larval parasitoid species, *Spathius galinae*, was discovered in the Russian Far East and has undergone testing and has been approved for release by the USDA. Due to the origin of *S. galinae*, it is hypothesized that its life cycle will be more synchronized with northern latitudes and thus more suited for success in places such as Minnesota. Results from Activity 3 in this project will help inform implementation of this newly approved biological control agent, especially for locations like Duluth, MN.

MDA coordinates statewide implementation of the EAB biological control program and collaborates with local governments and state and federal agencies. ENRTF funding has enabled EAB biological control activities to date. Data are collected for all insect releases and recoveries. All release sites are monitored for ash health and EAB activity. Results are entered into MDA and USDA databases annually. Based upon results of our first two projects, we will continue weekly parasitoid releases throughout each field season. A MDA Research Scientist 1 will expand biological control releases to new EAB finds and continue monitoring older sites.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 195,900
Amount Spent: \$ 0
Balance: \$ 195,900

Outcome	Completion Date
1. New release sites established and existing ones monitored (MDA)	10/31/2019
2. Data entered into MDA database and into national database (MDA)	06/10/2020

Activity 1 Status as of November 30, 2017:

Activity 1 Status as of May 31, 2018:

Activity 1 Status as of November 30, 2018:

Activity 1 Status as of May 31, 2019:

Activity 1 Status as of November 30, 2019:

Final Report Summary:

ACTIVITY 2:

Description: Assessing biological control establishment and impact

Two release sites will be selected for in-depth assessment of parasitism rates by EAB biological control agents. These stingless wasps are very small, so documenting recoveries and detections of reproducing populations in subsequent years are non-trivial. MDA will implement several different recovery techniques including yellow pan trapping and bark and branch sampling to collect data on the impact of the stingless wasps on EAB populations. Two sites will be selected in geographically separate areas of the state. The U of M will analyze biological control agent recovery data and calculate the percent parasitism by species per site. We hope to see that parasitism rates increase through time as species become established and spread. Any impacts by native wasps that begin to respond numerically to EAB populations will also be noted. Efficacy curves for parasitoid recovery methods will be developed to better understand strengths and limitations of detection tools. This work will be completed by one technician, one graduate student and one undergraduate student advised by Dr. Brian Aukema at the University of Minnesota.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 285,540
Amount Spent: \$ 0
Balance: \$ 285,540

Outcome	Completion Date
1. Two former release sites assessed for impact of parasitism by EAB bioagents (MDA)	06/30/2020
2. Data analyzed, percent parasitism by species per site calculated (U of M)	06/30/2020
3. Develop efficacy curve for utilized bioagent recovery techniques (U of M)	06/30/2020
Research recommendations will be implemented and published after completion	

Activity 2 Status as of November 30, 2017:

Activity 2 Status as of May 31, 2018:

Activity 2 Status as of November 30, 2018:

Activity 2 Status as of May 31, 2019:

Activity 2 Status as of November 30, 2019:

Final Report Summary:

ACTIVITY 3:

Description: Assess new bioagent cold hardiness – *Spathius galinae*

Cold hardiness of the new EAB biological control agent, *Spathius galinae*, will be assessed using established laboratory methods to measure the insect supercooling point, lower lethal temperature, and lower lethal times. Climate analysis maps will be developed for the state of Minnesota projecting where *S. galinae* may not be able to establish based on cold hardiness testing results. This work will be completed by one graduate student and one undergraduate student advised by Dr. Robert Venette with the U.S. Forest Service and University of

Minnesota. This project complements previous ENRTF funded work assessing cold hardiness of EAB and EAB biological control agents.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 132,000
Amount Spent: \$ 0
Balance: \$ 132,000

Outcome	Completion Date
1. Measure bioagent cold hardiness of <i>Spathius galinae</i> (U of M)	05/15/2019
2. Develop climate analysis maps for Minnesota to determine the establishment potential for <i>Spathius galinae</i> .	06/10/2020
Research recommendations will be implemented and published after completion	

Activity 3 Status as of November 30, 2017:

Activity 3 Status as of May 31, 2018:

Activity 3 Status as of November 30, 2018:

Activity 3 Status as of May 31, 2019:

Activity 3 Status as of November 30, 2019

Final Report Summary:

ACTIVITY 4:

Description: Citizen Engagement and Biosurveillance of EAB

University of Minnesota Extension will continue to engage volunteers as well as other community groups to monitor EAB with the smoky winged beetle bandit wasp and other early detection techniques. By examining the prey beetles of the smoky winged beetle bandit, *Cerceris fumipennis*, we learn which species of wood-boring beetles, including EAB, are in an area. Early detection techniques, such as looking for fresh woodpecker damage in ash trees, provide volunteers with another tool for identifying EAB infestations in their neighborhoods and communities. A Community Program Specialist will build upon the network of volunteers developed in the previous ENRTF funded project to expand statewide participation, outreach, and educational efforts.

Summary Budget Information for Activity 4:

ENRTF Budget: \$ 115,560
Amount Spent: \$ 0
Balance: \$ 115,560

Outcome	Completion Date
1. Train and coordinate volunteers to monitor colonies	09/30/2019
2. Educate and train volunteer groups on EAB early detection methods	06/30/2020
3. Beetles identified and data entered into a Forest Service database	06/10/2020

Activity 4 Status as of November 30, 2017:

Activity 4 Status as of May 31, 2018:

Activity 4 Status as of November 30, 2018:

Activity 4 Status as of May 31, 2019:

Activity 4 Status as of November 30, 2019:

Final Report Summary:

V. DISSEMINATION:

Description: We will communicate about biocontrol of EAB and our citizen science effort of biosurveillance with the public, land managers and researchers. Webpages will be used for communication <http://www.mda.state.mn.us/plants/pestmanagement/eab/eabbiocontrol.aspx> of activities and outcomes and will be updated bi-annually. Communication with the public will be via news media (television, print and radio) and social media with Facebook and Twitter. Updates will be communicated with land managers at the multi-agency and open to the public EAB Forum meetings (meets 4 times/year) and in trade publications such as “The Scoop” published by the Minnesota Nursery Landscape Association. Updates and findings will be presented at the 2018 Upper Midwest Invasive Species Conference and other meetings (LCCMR funding will not be used for meetings).

Status as of November 30, 2017:

Status as of May 31, 2018:

Status as of November 30, 2018:

Status as of May 31, 2019:

Status as of November 30, 2019:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview:

***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$271,790	MDA One 3 yr FTE Research Scientist 1 salary \$44,500/yr & 48% fringe for Activities 1 & 2 MDA One 3 yr PTE-FTE undergrad student wages \$14.73/hr & 7.65% fringe for Activities 1 & 2
Equipment/Tools/Supplies:	\$3,000	MDA supplies include pan traps, propylene glycol, gloves, insect vials, sieves, etc. for Activities 1 & 2
Travel Expenses in MN:	\$20,500	MDA mileage for Activities 1 & 2 at 54 cents/mile MDA meals and lodging for Activities 1 & 2 (approx.. 20 days of travel/yr for a Student worker and EAB Biocontrol Coordinator and 10 days of travel/yr for 3 yrs for the PI)
Other:	\$150	MDA shipping bioagent coolers and specimens for official identification for Activity 1
Contract with U of M	\$433,560	

Personnel:	\$388,800	U of M One FTE Technician, 1 yr, salary \$46,000 inclusive of 27.4% benefits for Activity 2 U of M One graduate student, 2 yr 4 mo. MS position, \$100,000 inclusive of stipend, tuition and 17.6% fringe for Activity 2 U of M One graduate student, 2 yr 4 mo. MS position, \$100,000 inclusive of stipend, tuition and 17.6% fringe for Activity 3 U of M One partial faculty summer salary support, \$18,000 inclusive of 33.6% benefits for each Activities 2 & 3 U of M One undergraduate student approx. 16 weeks per yr for 3 yrs, wages \$12.50 x 40 hrs x 16 wks with no charge for benefits as undergrads for Activities 2 & 3 U of M One 3 yr PTE-FTE Community Program Specialist wages \$20/hr & 7.65% fringe, 40 wks @ 20hrs/wk & 12 wks @ 40hrs/wk for Activity 4
U of M Professional/Technical/Service Contracts:	\$ 6,500	U of M One 3 yr PTE Insect Taxonomist stipend \$6,500 (100% stipend, 0% fringe) for Activity 4
Equipment/Tools/Supplies:	\$10,900	U of M supplies include nets, personal protective equipment, vials, insect collection kits, curating supplies & rearing supplies for Activities 2, 3 & 4
Printing:	\$6,360	U of M printing manuals, id guides, recruitment flyers and promotions products for Activity 4
Travel Expenses in MN:	\$20,000	U of M mileage for Activities 2, 3 & 4 at 54 cents/mile U of M meals and lodging for Activities 2, 3 & 4 (approx. 20 days of travel/yr for Community Program Specialist and Grad students)
Other:	\$1,000	U of M shipping beetles from volunteers and to taxonomist for Activity 4
TOTAL ENRTF BUDGET:		\$729,000

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

One 3 yr full-time Research Scientist 1 = $2080 \times 3 = 6,240$ hrs
 One 3 yr part-time undergrad student = $1000 \times 3 = 3,000$ hrs
 One 1 yr Technician = $2080 \times 1 = 2,080$ hrs
 Two 3 yr full-time graduate students = $2080 \times 2 \times 3 = 12,480$ hrs
 Two 0.5 mo. faculty (summer) = $80 \times 2 \times 3 = 480$ hrs
 One 3 yr part-time undergrad student = $40 \times 16 \times 3 = 1,920$ hrs
 One 3 yr part-time Community Program Specialist = $1280 \times 3 = 3,840$ hrs
 One 3 yr part-time Insect Taxonomist = $80 \times 3 = 240$ hrs
 Total hours = 30,280
 Total FTEs = $30,280 / 2080 = 14.56$

**Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF
Appropriation: N/A**

B. Other Funds: N/A

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
	\$N/A	\$N/A	
State (in-kind)			
MDA Oversight of project, 5% FTE MDA Scientist	\$15,000	\$0	
TOTAL OTHER FUNDS:	\$15,000	\$0	

VII. PROJECT STRATEGY:

A. Project Partners:

Partners receiving ENRTF funding

- Dr. Brian Aukema, Associate Professor with U of M, Activity 2 – Assessing biological control establishment and impact and Activity 4 - Citizen Engagement and Biosurveillance of EAB; with biosurveillance capture identifications in conjunction with Jeffrey Hahn, Entomologist with U of M Extension. Dr. Robert Venette, Research Biologist and Adjunct Associate Professor, USDA Forest Service and U of M, Activity 3 – Assess new bioagent cold hardiness of *Spathius galinae*. U of M contract total = \$433,560. Jonathan Osthus, Research Scientist, Minnesota Department of Agriculture, Activities 1 & 2– Expand biological control implementation, assessing biological control establishment and impact. MDA total = \$295,440

Partners NOT receiving ENRTF funding

- For EAB biosurveillance, we will draw on volunteers from Forest Pest First Detectors, Minnesota Master Naturalist and 4H programs. For all activities, we will collaborate with USDA APHIS and Forest Service EAB biocontrol researchers, DNR, MNDOT, other federal and state agencies, counties, municipalities and private landowners.

B. Project Impact and Long-term Strategy:

Minnesota EAB biological control is entering the third phase of implementation with establishment of biological control agents documented in the southeast and Twin Cities. The project will guide implementation of this third phase to determine impacts and develop a road map of a successful long-term EAB biocontrol program. As predicted since the start of this project, EAB has increased in density and distribution in the state and will continue to do so. Early detection efforts remain critical to implementing EAB management in a timely manner to ensure best possible outcomes. We plan to use biosurveillance and citizen engagement to help monitor for new EAB infestations and inform potential new biocontrol release locations. We will continue to release biological control agents on the leading edges of EAB populations in order to establish parasitoids that will move and spread with EAB. Assessing the impact of EAB biological control agents on EAB populations at two sites post release will provide in-depth analysis of the dynamics at work in two distinct locations. This work will lead to a better understanding of which methods of recovery provide the best data and most efficient use of resources. Cold hardiness testing of the newly approved, *Spathius galinae* will inform best timing strategies for release as well as generate climate analysis maps. This will lead to improved understanding of where in the state, if any, is too cold for *S. galinae* to establish.

Although it may take decades to determine the efficacy of EAB biological control nationwide, it is vitally important to implement best available management tools now to help reduce and potentially limit the devastating impacts of EAB in the future as other tools also improve. By developing a cohesive biological control

implementation strategy we leave Minnesota in the best possible situation to manage our states extensive ash resource.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
LCCMR Emerald Ash Borer Biocontrol Research and Implementation project	July 1, 2011 - June 30, 2014	\$500,000
LCCMR Improving Emerald Ash Borer Detection Efficacy for Control	July 1, 2013 – June 30, 2016	\$600,000
LCCMR Biosurveillance and Biocontrol of EAB – Phase 2 project	July 1, 2014 – June 30, 2017	\$447,000

VIII. REPORTING REQUIREMENTS:

- The project is for 3 years, will begin on 07/01/17, and end on 06/30/20.
- Periodic project status update reports will be submitted November 30th and May 31st of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2020.

IX. VISUAL COMPONENT or MAP(S): See final page

X. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS: N/A

EAB Biocontrol Phase 3: Assessment & Citizen Engagement

Cold Tolerance

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**Citizen
Engagement**

Subd. 06b

***New this year!**

Spathius galinae



EAB Quarantined County



Implementation

Year	2010	2011	2012	2013	2014	2015	All Years (30 Sites)
# Releases	3,326	30,717	45,321	51,176	46,496	182,512	359,548!



IMPACT?



Adult parasitoid wasp recovery



Monitoring for parasitized EAB eggs & larvae



**Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget**



Project Title: Emerald Ash Borer Biocontrol – Phase III

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06b

Project Manager: Jonathan Osthus

Organization: Minnesota Department of Agriculture

M.L. 2017 ENRTF Appropriation: \$ 729,000

Project Length and Completion Date: 3 years, June 30, 2020

Date of Report: September 13, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	Activity 4 Budget	Activity 4 Spent	Activity 4 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Expand biological control implementation			Assessing biological control establishment and impact			Assess new bioagent cold hardiness - Spathius galinae			Citizen Engagement & Biosurveillance of EAB				
Personnel (Wages and Benefits)	\$178,900	\$0	\$178,900	\$92,890	\$0	\$92,890							\$271,790	\$271,790
MDA: Research Scientist 1: \$197,580 (52% salary, 48% fringe); 100% FTE for 3 years for Act. 1 & 2														
MDA: Student Worker Para-Professional Senior: \$74,210 (92.35% salary, 7.65% fringe); 48% FTE for 3 years for Act. 1 & 2														
Equipment/Tools/Supplies	\$1,000	\$0	\$1,000	\$2,000	\$0	\$2,000							\$3,000	\$3,000
MDA: supplies include pan traps (\$750), propylene glycol (\$1,250), cut resistant gloves (\$100), insect vials (\$300), petri dishes (\$200), sieves (\$150), etc. \$3,000 (\$1,000 Act. 1 and \$2,000 Act. 2)														
Travel expenses in Minnesota	\$16,000	\$0	\$16,000	\$4,500	\$0	\$4,500							\$20,500	\$20,500
MDA: Travel to and between data gathering and biocontrol release sites in SE, Metro and Northern MN. Mileage: \$12,000; Lodging: \$5,000; Meals: \$3,500 (Act. 1 & 2)														
Other				\$150	\$0	\$150							\$150	\$150
MDA: Shipping bioagent coolers and specimens for official identification \$150														
Contract with U of M total is \$433,560														
U of M Personnel (Wages and Benefits)				\$180,000	\$0	\$180,000	\$126,000	\$0	\$126,000	\$82,800	\$0	\$82,800	\$388,800	\$388,800
U of M: Technician: \$46,000 (72.6% salary, 27.4% fringe); 100% FTE for 1 year for Act. 2														
U of M: Graduate Student: \$100,000 (82.4% salary (stipend & tuition), 17.6% fringe); 100% FTE for 3 years for Act. 2														
U of M: Graduate Student: \$100,000 (82.4% salary (stipend & tuition), 17.6% fringe); 100% FTE for 3 years for Act. 3														
U of M: Partial Faculty summer salary: \$18,000 (67.4% salary, 33.6% fringe); 4% FTE for 3 years for Act. 2														
U of M: Partial Faculty summer salary: \$18,000 (67.4% salary, 33.6% fringe); 4% FTE for 3 years for Act. 3														
U of M: undergraduate student: \$24,000 (100% salary, 0% fringe); 30.8% FTE for 3 years for Act. 2 & 3														
U of M: Community Program Specialist: \$82,800 (92.35% salary, 7.65% fringe); 61.5% FTE for 3 years for Act. 4														
U of M Subcontract										\$6,500	\$0	\$6,500	\$6,500	\$6,500

Insect Taxonomist (Buprestidae expert Wayne Steffens): \$6,500 (100% stipend, 0% fringe); 4% FTE for 3 years for Act. 4														
Equipment/Tools/Supplies				\$1,000	\$0	\$1,000	\$1,000	\$0	\$1,000	\$8,900	\$0	\$8,900	\$10,900	\$10,900
U of M: supplies include nets (Act. 4 \$2,500), vials (Act. 3 \$200, Act. 4 \$500), curating supplies (Act. 4 \$2,000), safety vests and other PPE (Act. 2 \$750, Act. 4 \$3,500) and rearing supplies (Act. 3 \$750) \$10,900 (\$1,000 Act.2, \$1,000 Act. 3 and \$8,900 Act. 4)														
Printing										\$6,360	\$0	\$6,360	\$6,360	\$6,360
U of M: manuals (\$2,000), ID guides (\$2,000), recruitment flyers (\$1,000) and promotions products (\$1,360)														
Travel expenses in Minnesota				\$5,000	\$0	\$5,000	\$5,000	\$0	\$5,000	\$10,000	\$0	\$10,000	\$20,000	\$20,000
U of M: Travel to and between data gathering, biosurveillance and biocontrol release sites in SE, Metro and Northern MN. Mileage: \$15,000; Lodging: \$1,500; Meals: \$3,500														
Other										\$1,000	\$0	\$1,000	\$1,000	\$1,000
U of M: Shipping beetles collected by volunteers(statewide) and to taxonomist (Duluth) \$1,000														
COLUMN TOTAL	\$195,900	\$0	\$195,900	\$285,540	\$0	\$285,540	\$132,000	\$0	\$132,000	\$115,560	\$0	\$115,560	\$729,000	\$729,000