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

Date of Status Update Report: October 2, 2012

Date of Next Status Update Report: May 15, 2014

Date of Work Plan Approval:

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

PROJECT TITLE: Improving Emerald Ash Borer Detection Efficacy for Control

Project Manager: Mark Abrahamson

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Location: Region: Statewide, Metro, Southeast

Counties: Statewide, Hennepin, Houston, Ramsey, Winona

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$600,000**
	Amount Spent:	**$0**
	Balance:	**$600,000**

Legal Citation: M.L. 2013, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

DRAFT

I. PROJECT TITLE: Improving Emerald Ash Borer Detection Efficacy for Control

II. PROJECT STATEMENT:

Emerald ash borer (EAB) was first discovered in Minnesota in 2009 in St Paul. It is now known to occur in four Minnesota Counties (Ramsey, Hennepin, Houston and Winona) as of September, 2012. Minnesota has more ash than any other area of the U.S. and ash is an important component of our rural and urban forests. Much work has been done to stem the spread of EAB throughout Minnesota including education, quarantine, detection surveys and biological control efforts. The likely consequence of taking no action against EAB is its rapid spread through most of the state and the resulting death of > 99% of the ash trees in those areas.

Detection is a key obstacle to controlling EAB. Minnesota has worked with the United State Department of Agriculture (USDA) to conduct detection surveys for EAB since 2003 using a variety of techniques – most recently large, purple traps. However, EAB detection tools have not been calibrated to provide an estimate of what population density of EAB they are able to detect. This is a critical information gap as EAB population density is a critical parameter in determining how and where to implement control measures.

This project will evaluate a range of detection tools and measure their ability to detect EAB at different population densities. We will also evaluate aspects of EAB biology that are critical in estimating dispersal and consequently, spread. We will use different detection techniques in and around EAB-infested areas in order to compare their ability to detect EAB. We will work with local governments to implement this work.

Through this project we will gain a better understanding as to the feasibility of using EAB detection surveys to inform EAB management for local governments or others.

III. PROJECT STATUS UPDATES:

Project Status as of May 15, 2014**:**
Project Status as of November 15, 2014**:**
Project Status as of May 15, 2015**:**
Project Status as of November 15, 2015**:**

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Implement detection surveys for EAB to evaluate efficacy of different detection techniques under different abundances of EAB

Description:
We will conduct detection surveys for EAB in and around infested areas. The purpose of working in these areas will be to measure the efficacy of different detection techniques. The techniques will include visual evaluation (low labor input), purple traps and / or EAB cadaver traps (moderate labor input) and removal and sampling tree branches (high labor input). We will also visually evaluate tree canopy and stem condition in these areas so as to relate the results of the detection work to tree health. We will gather data from trees felled by cooperators for EAB sanitation when possible to estimate EAB population density in these areas. This is a labor intensive task, but important to understanding the efficacy of the detection techniques (i.e., at what population density are they detecting EAB?).
This work will be coordinated by MDA who will hire one temporary employee for this task. The employee is anticipated to spend 80% of their time on this project. In addition, MDA staff funded by other EAB projects will collect information that will contribute to this project as well. Sampling design and analysis will be coordinated by Drs. Aukema and Venette. One graduate student and one undergraduate student advised by Dr. Aukema will

also work on sampling design and analysis as well as data collection. All sampling work will be coordinated by MDA with local government cooperators who will also assist by felling branches for sampling.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 450,750
Amount Spent: $ 0
Balance: $ 450,750

Activity Completion Date:

Outcome	Completion Date	Budget
1. Year 1 visual assessment of canopy condition in detection areas - associated data management and analysis	September 2013	$ 42,392
2. Year 1 Branch and tree sampling in detection areas, visual assessment of stem condition - associated data management and analysis	April 2014	$ 90,075
3. Year 2 Trap survey for EAB in detection areas, visual assessment of canopy condition, associated data management and analysis	September 2014	$ 59,508
4. Year 2 Branch and tree sampling in detection areas, visual assessment of stem condition - associated data management and analysis	April 2015	$ 90,575
5. Year 3 Trap survey for EAB in detection areas, visual assessment of canopy condition - associated data management and analysis	September 2015	$ 59,508
6. Year 3 Branch and tree sampling in detection areas, visual assessment of stem condition - associated data management and analysis	April 2015	$ 90,575
7. Develop, print and distribute informational materials related to project	June 2016	$ 18,117

Activity Status as of May 15, 2014**:**
Activity Status as of November 15, 2014**:**
Activity Status as of May 15, 2015:
Activity Status as of November 15, 2015:
Final Report Summary:

ACTIVITY 2: Implement field and laboratory experiments to examine factors affecting dispersal distances and winter survival of EAB.

Description:
We will measure the effect of winter cold on dispersal by measuring the fat content of beetles held under different temperature regimes. It is possible that beetles held at lower temperatures will have lower lipid reserves and therefore shorter dispersal ability. This is an important consideration when predicting spread rates of EAB in different areas of the state. We will also model the relationship between air temperature and the temperature within trees where EAB overwinter. This is a critical gap in our understanding of the impact of winter on EAB. This work will be conducted by Dr. Venette, one graduate student and one undergraduate assistant. Initial work on the overwintering biology of EAB is being completed by Dr. Venette as a result of the ENRTF project "Ecological and Hydrological Impacts of Emerald Ash Borer" which was initiated in July 2010. That work investigated the effect of host (green ash vs black ash) on the supercooling point and lower lethal temperature of EAB. The proposed project would take the next step to investigate the impact of non-lethal cold temperatures on the ability of EAB to disperse. This is an important component in understanding how Minnesota winters will affect the rate of spread and ultimately the impact of EAB.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 149250
Amount Spent: $ 0
Balance: $ 149250

Activity Completion Date:

Outcome	Completion Date	Budget
1. Measure effect of cold on EAB lipid content and create model.	June, 2016	$ 73,375
2. Measure relationship between air and within-tree temperatures and create model.	June, 2016	$ 75,875

Activity Status as of May 15, 2014**:**
Activity Status as of November 15, 2014**:**
Activity Status as of May 15, 2015:
Activity Status as of November 15, 2015:
Final Report Summary:

V. DISSEMINATION:

Description:
The primary audience for this work will be municipalities and other entities responsible for managing EAB at the local level. There are many opportunities to address this audience through meetings held throughout the year, both at MDA through the EAB Forum (bimonthly meeting) and also through conferences and meetings held around the state throughout the year. MDA is often invited to provide information about EAB at these meetings and conferences which is likely to continue in the future.
We anticipate that this work will result in the development of guidelines or documents meant to convey the findings of this work and what it means for local level management of EAB. In addition, we expect that this work will result in articles in scientific journals as well as presentations at national scientific meetings. However, ENRTF funds will not be used for travel to national meetings. Significant findings through this work may be communicated through the news media as well as social media.

Status as of May 15, 2014**:**
Status as of November 15, 2014**:**
Status as of May 15, 2015**:**
Status as of November 15, 2015**:**
Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Minnesota Department of Agriculture

Budget Category	$ Amount	Explanation
Personnel:	$ 145,000	One 3 year 80% time Coordinator at the Research Scientist 1 level with mean salary $30,000/year + fringe. MDA anticipates either employing this position at 32 hours per week or funding the remaining 20% through other projects.
Professional/Technical/Service Contracts:	$ 75,000	Contract with local units of government cooperators to conduct branch removal for Activity 1 - $25,000/year total among all cooperators for 3 years. Branches will be removed for evaluating the effectiveness of different detection techniques.

		There are many instances when cooperators will supply labor and equipment as in-kind donations. For instance, we will base estimates on EAB population size from samples taken from trees felled by cooperators. Cooperators will not be reimbursed for this activity as the tree felling can be considered part of their normal activities. However, with the threat of EAB, it is not efficient for cooperators to use resources for pruning of ash trees. Since we will be asking them to do something for us they wouldn't otherwise do and city budgets for dealing with EAB are already tight, we will need to be able to cover their time and equipment costs.
Equipment/Tools/Supplies:	$ 7,500	Supplies for conducting survey and sampling (traps, lures, etc.) - $2,500/year for 3 years
Printing:	$1,000	Outreach materials such as fact sheets/brochures (approximately 5,000 copies for $1,000)
Travel Expenses in MN:	$ 11,500	Vehicle and Fuel = $9,000 • Mileage for vehicle rental and fuel at $3,000/year for 3 years • We have 3 options for travel – use MDA minipool, use a personal vehicle, use a rental vehicle – the best option will depend on daily mileage and area traveled – we will choose among these 3 options to be most cost effective Meals and lodging = $2,500 • Coordinator: approx. 15 days of travel/year for 3 years • Project Manager: approx. 5 days of travel/year for 3 years
TOTAL ENRTF BUDGET:	**$ 240,000**	

University of Minnesota

Budget Category	$ Amount	Explanation
Personnel:	$ 348,000	One person (Dr. Aukema) for 3 years of faculty summer salary = $64,000 • 1.6 month/year + benefits Two 3 year FTE graduate students = $240,000 • mean salary of $21,300 + fringe + tuition @ $13,300 = $40,000/year/student Two undergraduate students = $44,000 • $12/hour for 14 weeks at 40 hours/week + 8% benefits for 2 students for 3 years
Equipment/Tools/Supplies:	$ 2,500	Temperature sensors for recording within tree winter temperatures ~25 @ $100 each
Travel Expenses in MN:	$ 7,500	Vehicle rental and fuel = $1,500 • Mileage for vehicle rental and fuel at $500 /year for 3 years – as described above in the MDA budget, the most cost efficient means of

		travel will be utilized Meals and Lodging = $6,000 • Approximately 15 days of travel/year for 3 years for 4 employees - 2 undergrad students, 2 grad students, and approximately 5 days of travel/year for 3 years for 2 of the co-principal investigators
Other:	$ 2,000	Publications including approximately 2 journal articles ($500-$1,000 each), scientific meeting posters (2 @ $200 each)
TOTAL ENRTF BUDGET:	**$ 360,000**	

Explanation of Use of Classified Staff:
N/A

Explanation of Capital Expenditures Greater Than $3,500:
N/A

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation:
MDA Coordinator: 3 years @ 32 hours / week = 4,992 total hours
UM Faculty Advisor: 3 years @ 1.6 months / year = 832 total hours
Graduate Students: 2 students for 3 years @ 2080 hours year = 12,480 total hours
Undergraduate Students: 2 students for 3 years @ 14 weeks per year = 3,360 total hours
Total Hours = 21,664
Total FTE's = 21,6664 hours / 2080 hours per year = 10.42

Number of Full-time Equivalent (FTE) estimated to be funded through contracts with this ENRTF appropriation:
Branch sampling and related work is estimated to require ~500 hours from cooperators over 3 years = 1,500 hours
Total FTE's = 1,500 hours / 2080 hours per year = 0.72

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
USDA Forest Service – MDA has funds to support work related to EAB management from July 1, 2012 through June 30, 2014. There are opportunities to leverage work conducted with these funds towards this project and vice versa.	$187,000	$	These funds support MDA staff working on EAB management.
State			
Field equipment, lab equipment and lab space, computing/software, GIS and data management ($40,000 for U of M, $10,000 for MDA),	$185,000	$	

graduate student advising and research management ($100,000 at U of M), project coordination and overseeing detection and sampling efforts ($35,000 at MDA)			
TOTAL OTHER FUNDS:	**$372,000**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners:

Receiving funds: Improving EAB detection is a collabrotive effort between MDA (**receiving $240,000**) and University of Minnesota (**receiving $360,000**). MDA will oversee the project and coordinate detection work among project partners and cooperators. U of M will lead research efforts for both evaluating EAB detection efficacy and evaluating the impact of temperature on dispersal capability of EAB. Other EAB projects at MDA will be leveraged to support this work where common goals are found. Both MDA and U of M will supply in-kind support through facilities, IT support, equipment and intellectional input.

Cooperators on this project will include entities with EAB infestations on or adjacent to their jurisdiction such as the cities of St Paul, Minneapolis and Shoreview, Ramsey County, DNR and DOT. We will work with cooperators to implement detection activities within their jurisdictions – particularly in the removal of branches for EAB sampling. Some cooperators may be able to donate their time for this work in-kind, other cooperators will be reimbursed for their services using ENRTF funds (**$75,000** total among all cooperators for the entire project – these funds will be passed through from the amount designated for MDA).

Not receiving funds: US Forest Service will provide in-kind support through use of facilities, equipment and intellectual input. Some cooperators at the local level will provide in-kind support through the use of staff and equipment as described above. Like other EAB work within Minnesota, the progress of this project will be shared with a wide group of stakeholders including federal and state agencies, local governments and industry groups.

B. Project Impact and Long-term Strategy:

A more thorough understanding of the capabilities and limitations of detection techniques for EAB will provide a more solid basis for local governments and other entities in making management decisions related to EAB. For instance, current recommendations on when to begin chemical treatment for EAB indicate that trees within 10-15 miles of known EAB infestations are at significant risk of becoming infested and should be considered for treatment. However, our experience in Minnesota indicates that a much tighter buffer should be considered around infested trees which would potentially lead to fewer chemicals used but with greater impact due to concentrating efforts where they are truly needed.

Municipalities are at great risk from EAB due to the heavy reliance on ash in urban areas. Currently, there are no guidelines based on quantitative studies as to what the most efficacious technique for EAB detection is, and what the results from using a given technique mean. Consequently, municipalities are left without good information for detecting EAB and consequently without good information for making decisions related to EAB management.

The outcomes from this project should provide municipalities and other local land managers in Minnesota with the information they need to more confidently assess the presence/absence or distribution of EAB in their community and as a result to plan the most appropriate management actions.

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
USDA APHIS PPQ – Funds for EAB detection survey (regional level)	$18,000	$330,000	$425,000	$375,000	$425,000
USDA Forest Service – Funds for EAB detection and management (local level)	$50,000	$40,000	$133,500	$133,500	$187,000

VIII. ACQUISITION/RESTORATION LIST:
N/A

IX. MAP(S):
N/A

X. RESEARCH ADDENDUM:
N/A

XI. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted not later than May 15, 2014, November 15, 2014, May 15, 2015, and November 15, 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: Improving Emerald Ash Borer Detection Efficacy for Control
Legal Citation:
Project Manager: Mark Abrahamson
M.L. 2013 ENRTF Appropriation: $ 600,000 between MDA ($240,000) and U of M ($360,000)
Project Length and Completion Date: 3 year project, to be completed June 30, 2016
Date of Update: October 15, 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	**Implement detection surveys for EAB to evaluate efficacy of different detection techniques under different abundances of EAB.**			**Implement field and laboratory experiments to examine factors affecting dispersal distances and winter survival of EAB**				
Personnel (Wages and Benefits) - Direct appropriation to MDA								
MDA Coordinator: $145,000 (62% salary, 38% fringe), 80% FTE	$145,000		$145,000			$0	$145,000	$145,000
Personnel (Wages and Benefits) - Direct appropriation to U of M								
- U of M Faculty Advisor: (79% salary, 21% fringe), 13% FTE (estimated $64,000) - U of M Graduate Students: Two students (47% salary, 53% fringe including tuition), 200% FTE (estimated $120,000) - U of M Undergraduate Students: Two students (92% salary, 8% fringe), 54% FTE (estimated $22,000)	$206,000		$206,000	$142,000		$142,000	$348,000	$348,000
Professional/Technical/Service Contracts - Direct appropriation to MDA								
Joint power agreement for removal of branches for EAB sampling with local government cooperators. Likely cooperators are City of St Paul, Minneapolis Park and Recreation Board, City of Shoreview, potentially others depending on survey design and ability of cooperators to provide in-kind services.	$75,000		$75,000			$0	$75,000	$75,000
Equipment/Tools/Supplies - Direct appropriation to MDA								
Supplies for conducting survey and sampling - includes, traps, lures, collection bags and vials, handheld tools for dissecting branches, personal protective equipment, etc.	$7,500		$7,500			$0	$7,500	$7,500
Equipment/Tools/Supplies - Direct appropriation to U of M								
Temperature sensors for recording within tree winter temperatures - 25 @ ~100 each			$0	$2,500		$2,500	$2,500	$2,500
Printing - Direct appropriation to MDA								
Outreach materials such as fact sheets, brochures, etc to provide guidelines regarding EAB detection based on study results (approximately 5,000 copies for $1,000)	$1,000		$1,000			$0	$1,000	$1,000
Travel expenses in Minnesota - Direct appropriation to MDA								
- Vehicle rental and fuel (estimated $9,000) - Meals and lodging for MDA Coordinator (15 days of travel per year for 3 years and MDA Project Manager (5 days of travel per year for 3 years - estimated $2,500)	$11,500		$11,500			$0	$11,500	$11,500
Travel expenses in Minnesota - Direct appropriation to U of M								
- Vehicle rental and fuel (estimated $750) - Meals and lodging for 2 graduate students and 2 undergraduate students (15 days of travel per year for 3 years) and approximately 5 days of travel per year for 3 years for 2 co-principal invesigators (estimated $3,000	$3,750		$3,750	$3,750		$3,750	$7,500	$7,500
Other - Direct appropriation to U of M								
Publications include approximately 2 journal articles ($500 - $1000 each), scientific meeting posters (2 @ $200 each)	$1,000		$1,000	$1,000		$1,000	$2,000	$2,000
COLUMN TOTAL	**$450,750**	**$0**	**$450,750**	**$149,250**	**$0**	**$149,250**	**$600,000**	**$600,000**

Improving EAB Detection Efficacy for Control

- EAB populations start small but eventually grow rapidly, the earlier control can be implemented the better (graph at right)

- In the early stages of infestation, larval numbers are few and trees may still be healthy (pictures below on left). Detecting EAB at this point provides options for control that may preserve trees

- In the later stages of infestation, larval numbers are tremendous and trees are dead (pictures below on right). Detecting EAB at this point is too late to preserve trees in this area.