Environment and Natural Resources Trust Fund
2011-2012 Request for Proposals (RFP)

LCCMR ID: 119-E

Project Title: Research and Implementation of Emerald Ash Borer Biocontrol

Category: E. Aquatic and Terrestrial Invasive Species

Total Project Budget: $ $660,000

Proposed Project Time Period for the Funding Requested: 3 yrs, July 2011 - June 2014

Other Non-State Funds: $ 0

Summary:

Our goal is to suppress EAB with biological control. Our objectives are to assess bioagent winter survival potential, develop release and monitoring methods, and implement EAB biocontrol.

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Web Address

Location

Region: Statewide

Ecological Section: Statewide

County Name: Statewide

City / Township:

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ Employment	_____ TOTAL _____%

2011-2012 MAIN PROPOSAL

PROJECT TITLE: Research and implementation of emerald ash borer biological control

I. PROJECT STATEMENT

Biological control is 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 April 2009, EAB was detected in a natural ash stand outside Victory, WI, just across the Mississippi River from southeastern Minnesota where future detections are anticipated. In May 2009, Minnesota's first EAB was detected in St. Paul and has since been found in over 100 trees in Ramsey and Hennepin Counties. 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, tiny, stingless wasps (parasitoids) that control EAB in Asia would be released to control EAB in Minnesota. EAB biocontrol was initiated by USDA researchers. The bioagents were tested to ensure that they will not adversely impact native insects and are approved for release. USDA rears the parasitoids for release in EAB impacted states, but cannot produce enough to meet demand. Our project would complement USDA efforts and provide valuable information for Minnesota's EAB biocontrol program that we will implement.

The project goal is to establish bioagent populations that suppress EAB and minimize EAB damage. Our objectives are to assess bioagent winter survival potential, develop release and monitoring methods, and successfully implement EAB biocontrol in Minnesota.

- **EAB bioagent winter survival potential:** EAB bioagents are native to regions that are climatically similar to southern Minnesota where we anticipate utilizing biocontrol. However, an assessment of winter survival potential throughout Minnesota, particularly in the north, would guide decisions about which species to release where.
- **Develop bioagent release and monitoring methods:** To maximize the chances of successful EAB biocontrol with limited bioagent availability, we need to develop efficient methodologies. We need to learn what quantity of bioagents to release at a site and to develop techniques to monitor EAB and bioagent populations and confirm bioagents are having the desired impact.
- **Implementation:** EAB biocontrol is cutting edge and Minnesota will be one of the first states to utilize it. We need to develop and enact an EAB biocontrol strategy statewide. Management recommendations resulting from the above research will be incorporated as soon as the information is available.

EAB biocontrol is too new to know how well it will work. Many large ash trees may be lost before bioagent populations build to sufficient levels for control. This proposal will support work to learn the best strategies to maximize EAB biocontrol success.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: <u>Assessing bioagent cold hardiness</u> (Budget: $ 195,000) Cold hardiness 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 conducted by one graduate and two

undergraduate students advised by Dr. Robert Venette with the Forest Service and the University of Minnesota (U of M). This project complements Dr. Venette's research on EAB larval cold weather survival potential.

Outcome	Completion Date
1. Measure bioagent cold hardiness	06/30/2014
2. Develop predictive model and map of expected bioagent survivorship	06/30/2014
Research recommendations will be implemented immediately and published after completion.	

Activity 2: Develop methods for bioagent release and monitoring (Budget: $ 220,000)
Three species of EAB bioagents are approved for release. To optimize their effectiveness, two questions need to be answered. 1) How do EAB densities interact with their biocontrol agents? To answer, we will release different densities of these biological control agents at EAB infestations then monitor these populations for three years. 2) What are effective methods for bioagent monitoring? To answer, we will statistically relate the number of bioagents captured to those reared at multiple sites and infestation types. This research will be conducted by one graduate and two undergraduate students advised by Dr. Brian Aukema at the U of M.

Outcome	Completion Date
1. Species specific release methods developed.	06/30/2014
2. Species specific monitoring methods developed	06/30/2014
Research recommendations will be implemented immediately and published after completion.	

Activity 3: Coordinate Minnesota's biological control implementation (**Budget:** $ 245,000)
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.

Outcome	Completion Date
1. Phase one implementation strategy for Minnesota developed	06/30/2012
2. Webpage and print materials developed for outreach	04/30/2013
3. Potential release sites delimited and assessed	04/30/2014
4. Field data collected and entered in a geodatabase	06/30/2014

III. PROJECT STRATEGY

A. Project Team/Partners

Receiving funds: EAB biocontrol 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 release and 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.

B. Timeline Requirements

The project will run for three years from 7/1/2011 to 6/30/2014.

C. Long-Term Strategy and Future Funding Needs

EAB biocontrol is new and in the first phase of implementation (initial releases and monitoring). The research we propose will yield information and techniques that will improve the second phase of EAB biocontrol implementation (efficient methods and broad bioagent distribution).

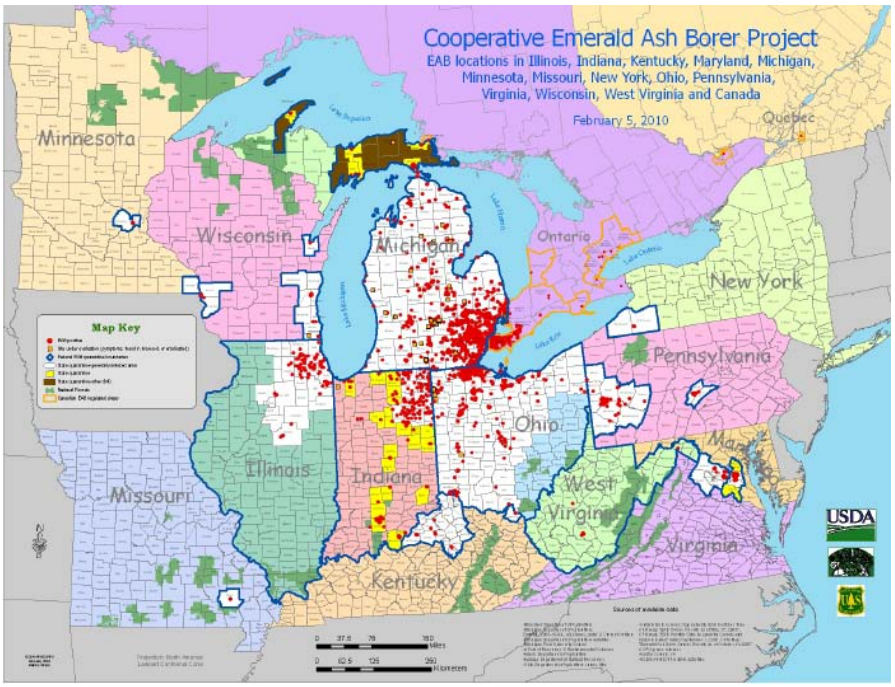
2011-2012 Research and implementation of emerald ash borer biological control budget

IV. TOTAL TRUST FUND REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel: Total	**$521,000**
U of M: One 3 year PTE faculty (1 mo./yr) mean salary $8,200/mo plus fringe benefits @ 7% for method development research (Activity 2)	$26,322
U of M: Two 3 year FTE graduate students mean salary $28,500/yr plus fringe benefits @ 25% for bioagent cold-hardiness (Activity 1) and method development (Activity 2)	$213,750
U of M: Four 3 year PTE-FTE 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)	$82,637
MDA: One 3 year FTE Research Scientist 1 (RS1) mean salary $44,500/yr plus fringe benefits @ 47.5% for EAB biocontrol implementation (Activity 3)	$198,413
Equipment/Tools/Supplies:	**$37,000**
Equipment includes 3 handheld GPS units (2 for Activity 2 and 1 for Activitiy 3, $500 each) and 2 ultralow precision temperature chest freezers (Activity 1, $7,000 each)	$15,500
Tools include chain saws and safety gear	$2,000
Supplies include insect rearing tubes, field supplies such as insect collection traps and containers, and lab supplies such as insect diet/media and insect containers/cages ($8,000 each for Activities 1 & 2 and $3,000 for Activity 3)	$19,000
Travel: Travel to/from research sites and outreach activities in MN.	**$85,000**
Three 6 mo. vehicle rentals (3 @ $700/mo for 6 mo. for 3 yr - includes milage) and fuel (3 @ approx. $200/mo for 6 mo./yr for 3 yr) to be used for all 3 activities.	$48,600
Meals and lodging for all 3 activities (approx. 40 days of travel/yr for 3 yr for 7 employees - 4 undergrad students, 2 grad students, 1 EAB biocontrol coordinator - and approx. 10 days of travel/yr for 3 yr for the 3 co-principal investigators)	$36,000
Additional Budget Items: Publications include heavy-duty tree signs that indicate where bioagents are released (approx. 100 signs for $1,000), approx. 4 journal articles ($500-$1,000 each), scientific meeting posters (5 @ $200 each), distribution posters (approx. 3,500 copies of 11 x 17" posters for $5,000), and other outreach materials such as fact sheets/brochures (approx. 5,000 copies for $6,000)	**$17,000**
TOTAL ENVIRONMENT & NATURAL RESOURCES TRUST FUND $ REQUEST	**$660,000**

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period:	$ -	
Other State $ Being Applied to Project During Project Period:	$ -	
In-kind Services During Project Period: 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 biocontol implementation ($15,000 at MDA)	$ 170,000	secured
Remaining $ from Current ENRTF Appropriation (if applicable):	$ -	
Funding History:	$ -	



Emerald ash borer (EAB) distribution in North America: EAB was detected at each site with a red dot and white represents a quarantined county. Minnesota's ash populations are concentrated in north central and northeastern Minnesota and the Mississippi River Valley in southeastern Minnesota. In addition, ash was frequently planted in urban and rural landscapes. These ash populations are large enough to sustain the growth and spread of EAB infestations.

EAB juvenile and adult stages: EAB larva (left) tunnels and feeds under ash bark, pupates, then chews a hole in the bark to emerge as an adult (middle) that can reproduce and spread (right).

EAB bioagents approved for field release: *Spathius agrili* (left), *Tetrastichus planipennisi* (middle), and *Oobius agrili* (right). All three are parasitoids, or small wasps that do not sting people but instead attack EAB. *Spathius agrili* and *T. planipennisi* attack EAB larvae. *Oobius agrili* attacks EAB eggs (pictured above right). Killing EAB larval and egg stages prevents them from developing into adult beetles that can reproduce and spread.

Project title: Research and implementation of emerald ash borer biological control

Qualifications

Project Manager
Monika Chandler, M.S., Biological Control Program Coordinator, Minnesota Department of Agriculture
Monika has ten years of biological control experience. This includes a LCMR project titled "Assessing the Establishment of *Aphthona* spp. Released for Control of Leafy Spurge, *Euphorbia esula* L., in Minnesota" with Luke Skinner, David Ragsdale, and Dharma Sreenivasam. Her responsibilities as a biological control program coordinator are to:

- Coordinate with public and private land managers to implement leafy spurge and spotted knapweed biological control statewide
- Develop biological control projects geared toward pesticide reduction
    - Development of biological control for common tansy project coordinator for the United States
    - Study the efficacy of biological control for Canada thistle
    - Initiate biological control of gypsy moth in Minnesota
- Produce and present educational programming for training and outreach activities in order to keep researchers, agricultural professionals, and land managers apprised of biological control methods and advances
- Build and utilize a Geographic Information System (GIS) to track biological control releases and target infestation changes over time

Co-Investigators
Robert Venette, Ph.D., Research Biologist with the USDA Forest Service and Adjunct Associate Professor with the University of Minnesota
Rob's research focuses on the invasion biology and population ecology of exotic species, modeling pest population dynamics, risk assessment, and biological control. Currently, he is studying the cold-hardiness of EAB. This study will relate to our proposed research "Assessing bioagent cold-hardiness".

Brian Aukema, Ph.D., Forest Entomologist and Assistant Professor with the University of Minnesota
Brian's research focuses on the landscape ecology of forest insects. He studies plant-insect and predator-prey interactions, population dynamics, chemical ecology, and the application of statistical tools to environmental problems. His interests include insect outbreaks and disturbances, dispersal, sampling, invasion biology, and biological control.

Organization Description

The Minnesota Department of Agriculture's Plant Protection Division will lead implementation and coordinate Minnesota's EAB biocontrol program. This agency is responsible for plant protection (Minnesota Statute 18G.01) so is the lead agency on EAB in Minnesota.

Doctors Venette and Aukema at the University of Minnesota will lead the research projects: Assessing bioagent cold-hardiness and method development for bioagent release and monitoring. The University of Minnesota is the foremost research institution in the state.