

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

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**Subd: 06c**

**Project Title:** Emerald Ash Borer Landscape Management Impacts

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**Category:** E. Aquatic and Terrestrial Invasive Species

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**Total Project Budget:** \$ 340,000

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

**Other Non-State Funds (secured):** \$ 0

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**Summary:**

Our goals are to protect water quality and nontarget species by researching whether insecticides used for managing EAB runoff into plants and soil and affect beneficial insects and birds.

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**Location:**

**Region:** Statewide

**Ecological Section:** Statewide

**County Name:** Statewide

**City / Township:**

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## 2011-2012 MAIN PROPOSAL

**PROJECT TITLE: 124E, Landscape management of EAB: Nontarget consequences, Vera Krischik, D Entomology, UMinnesota**

### I. PROJECT STATEMENT

Management of EAB in landscapes employs two methods, removal of dead or dying trees and annual treatment of ash with insecticides. Efficacy tests on insecticides for controlling EAB larvae were performed during the last 6 years in EAB infested states. These recommendations were posted on the web in May 2009 in a multistate (Michigan, Ohio, Indiana, and Wisconsin), nonpeer reviewed report <http://extension.entm.purdue.edu/eab/pdf/NC-IPM.pdf> and summarized in a website <http://extension.entm.purdue.edu/eab/>

The research presented in the report was performed in states where rainfall and soil moisture levels are higher than MN. MN receives rainfall on average of 26 in/yr which is 32% less rainfall than Ohio (38 in/yr) where most of the research was performed and less rainfall than the other EAB infested states (Indiana, 39 in/yr, Illinois, 33 in/yr, and Michigan, 32 in/yr). The report recommends a soil drench of imidacloprid as one of the best control options for small ash trees, but the ability for a tree to uptake imidacloprid depends on soil moisture and tree physiology. The insecticide producer recommends insecticide application only in spring or fall, but consumers and professionals will apply insecticides in summer when lack of rainfall will prohibit the uptake of imidacloprid by tree roots, potentially resulting in runoff to other landscape plants, distant soil, and hard surfaces. Also, ash trees often physiologically shut down in dry, hot weather, further preventing uptake of insecticide. In addition, trunk injections of emamectin benzoate (Tree-Age), a recently registered insecticide is promoted as offering the best efficacy. The insecticide was previously registered for use in farmed salmon.

We know of no research investigating the implications of such large volume of yearly imidacloprid applications to urban soils on runoff and potential offsite soil contamination. If landscape plants growing near ash trees uptake imidacloprid from runoff, then the insecticide can be translocated to pollen and nectar and kill good insects that control pest insects, called beneficial insects. In 2004, imidacloprid was registered as a restricted use pesticide and not permitted for homeowner use on the sandy soils of Long Island, New York, due to well contamination. The concern was, "Additionally, imidacloprid has now been detected at a golf course monitoring well (0.43 ppb) and at monitoring wells near trees (0.2 to 5.1 ppb) that have been treated with imidacloprid by trunk injection for the Asian Longhorned Beetle (ALB)" [http://pmep.cce.cornell.edu/profiles/insect-mite/fenitrothion-methylpara/imidacloprid/imidac\\_reg\\_1004.html](http://pmep.cce.cornell.edu/profiles/insect-mite/fenitrothion-methylpara/imidacloprid/imidac_reg_1004.html) In September 2009, a group of concerned citizens in Wooster, MA asked the USDA not to continue with a plan to use imidacloprid to protect trees from an invasive exotic tree pest due to potential nontarget effects <http://www.safelawns.org/blog/index.php/2009/09/imidacloprid-what-you-must-know-now/>

The overall goals are to protect water quality and nontarget species by researching whether insecticides used for managing EAB move away from ash into other landscape plants and soil. We plan to study: 1) the effects of soil moisture and time of application on uptake of insecticides, concentrations in trunk, and potential hazards of these concentrations to sapsuckers and woodpeckers, 2) uptake of insecticides by plants growing under ash trees and potential nontarget effects on beneficial insects, 3) movement of insecticides away from the site of placement, and 4) development of MN based insecticide recommendations to protect water quality and nontarget species.

**II. DESCRIPTION OF PROJECT ACTIVITIES. Total budget: \$340,000**

**Activity 1:** Research the effects of application month and soil moisture on the uptake of insecticide into ash. **Budget: \$168,000**

Outcome	Completion Date
1. Three levels of soil moisture (no watering, 1/2in additional water/wk, and 2in water/wk) applied in May August, and September on concentration of imidacloprid and emamectin benzoate in leaves, xylem, and phloem at 3 seasonal times (May, July, August, and September).	2013
2. In a subset of trees in 1, reapply imidacloprid in season 2 and measure in season 3.	2013
3. Through published toxicology data determine if concentrations found in ash cause mortality in sap-feeding birds.	2013

**Activity 2.** Research the uptake of insecticides into other plants growing under insecticide-treated ash. **Budget: \$122,000**

Outcome	Completion Date
1. Determine concentration of imidacloprid and emamectin benzoate in leaves, pollen, and nectar for landscape plants growing under treated ash.	2013
2. Determine the effects of these concentrations on behavior and mortality of beneficial insects (lady beetles, green lacewing, and parasitic wasp).	2013

**Activity 3.** Research the movement of insecticides away from treated ash. **Budget: \$50,000**

Outcome	Completion Date
1. Determine concentration of imidacloprid and emamectin benzoate in soil at 3 distances from treated ash.	2013

**Activity 4.** We propose to share our data with EPA, state agencies, city foresters, landscape managers, and municipalities to develop best management practices for protecting ash, water quality, and nontarget species. **Budget: \$0**

Outcome	Completion Date
1. Develop MN based EAB management recommendations that protect water quality and nontarget species from insecticides used for EAB	2013

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

Partners are 3 faculty members in the Department of Entomology; Drs. David Ragsdale (Field Crop Pest Management), Vera Krischik (Landscape Plant Pest Management), and Brian Aukema (New Forest Entomologist). Letters of support were gathered for the 2009 LCCMR submission, "122-D Reducing spread of Japanese beetle and emerald ash borer".

1. MNLA, MN Landscape Association
2. MNTGF, MN Turf and Grounds Foundation
3. MPRB, Minneapolis Park and Recreation Board
4. MGCSA, MN Golfcourse Superintendents Association
5. Mark Stennes, certified arborist
6. June Mathiowetz, Sustainability Project Coordinator, City of Minneapolis

**B. Timeline Requirements**

The project requires 3 years of research for field work and analysis.

**C. Long-Term Strategy and Future Funding Needs**

Advocate proper insecticide use for EAB to prevent potential insecticide contamination to runoff, soils, and nontarget beneficial insects. We will share our data with EPA, MN Pollution Control Agency, MDA, DNR, commodity groups, and municipalities dealing with EAB management.

**Project Budget: 124E** Landscape management of EAB: Nontarget consequences

Vera Krischik UM Entomology

**IV. TOTAL PROJECT REQUEST BUDGET**

<b>BUDGET ITEM</b>	<b>TOT AMT</b>
<b>Result 1:</b> Research effects of soil moisture on translocation of imidacloprid from roots to xylem/phloem in cambium to leaves of ash. Determine if MN low moisture soils cause imidacloprid not to be translocated, but instead runoff into soil. Use 3 levels of soil moisture (none, 1/2"wk irrigated and 2"wk irrigated) for 3 methods of application (passive drench, high pressure drench, injection). Measure insecticide residue in cambium, leaves, plants under trees, and soil at 3 distances from tree. Research on trees on UM Campus, MPRB land, and golf courses.	
<b>Personnel:</b> Graduate Student \$19.39/hr + fringe (16.86% health insurance and \$12,012 tuition) 3% increases each year	\$111,789
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<b>Contracts:</b>	
<b>Subtotal personnel:</b>	\$223,578
<b>Research supplies:</b> Bioassays in UMN Quarantine Facility on St. Paul Campus, rearing cages, bioassay containers, beneficial insects from insectaries, equipment for applying insecticides, insecticides, smaller DBH ash trees to be planted on St. Paul campus	\$24,000
<b>Residue analysis:</b> Measure amount of imidacloprid in leaves, cambium, leave/pollen/nectar of plants under trees, and soil adjacent to tree with ELISA quick test and HPLC-mass spec	\$86,422
<b>Travel:</b>	
<b>Publication:</b> Cost for duplicating management recommendations, factsheets, handouts for use at meetings and talks. Publication costs for research papers.	\$6,000
<b>Subtotal supplies:</b>	\$116,422
<b>TOTAL ENVIRONMENT &amp; NATURAL RESOURCES TRUST FUND \$ REQUEST</b>	<b>\$340,000</b>
<b>Acquisition (Including Easements):</b>	NA
<b>Restoration:</b>	NA
<b>Other:</b>	NA

**V. OTHER FUNDS**

<b>SOURCE OF FUNDS</b>	<b>AMOUNT</b>
<b>Other Non-State \$ Being Applied to Project During Project Period:</b>	
<b>Other State \$ Being Applied to Project During Project Period:</b>	NA
<b>In-kind Services During Project Period:</b>	NA
<b>Remaining \$ from Current ENRTF Appropriation (if applicable):</b>	NA
<b>Funding history: USDA SARE grant 2010 \$175,000: Bayer Chem Co 2004-2008 \$90,000</b>	\$265,000

## **Landscape management of EAB: Nontarget consequences**

### Project Manager Qualifications and Organization Description

Dr. Vera Krischik, Assoc. Professor, Ecology of Urban Landscapes, Department of Entomology, University of Minnesota, St. Paul Campus

Vera is a tenured Faculty in the Entomology Department of the College of Food, Agricultural and Natural Resource Sciences at the University of Minnesota. One of the goals of the College is to develop viable food and agricultural systems, while maintaining healthy natural resources. The PI has over 30 years of research expertise and publications in the area of ecology, pest management, pesticides, and biological control. Space, equipment and facilities are available for the research at the University.

Vera obtained her PhD from the University of Maryland in 1984, was a researcher at the New York Botanical Garden (NSF sponsored Visiting Professor for Women, 1991-1993), and was an IPM coordinator at the USDA, Washington DC from 1988-1994. Since 1995, she is a professor in the Department of Entomology, University of Minnesota. She teaches 2 courses: ENT 5009, Pesticides and ENT 4015, Ornamental and Turf IPM. She has 6 published papers on the non target effects of imidacloprid on beneficial insects and 2 published papers and 2 in manuscript on the proper use of imidacloprid for landscape plants. She has two books: one published in 1991 by John Wiley entitled "Microbial Mediation of Plant Insect Interactions" and another published in 2004 by the MN Agricultural Experiment Station on "IPM of Midwest Landscapes", 316 pp. She has partnered with MDA, DNR, MNLA, MNTGF, and watershed districts for her outreach and research programs and publications. She has developed a plant restoration bulletin and poster in cooperation with the DNR and Ramsey Watershed District. She teaches at least 5 large workshops each year on proper pesticides use in cooperation with MDA and MNLA. She has trained 6 graduate students and 1 post doc. She is director of CUES: Center for sustainable urban ecosystems that promote natural resource management, online at [www.entomology.umn.edu/cues](http://www.entomology.umn.edu/cues).

Dr. Krischik was contacted by MN National Public Radio on June 23, 2009 for an interview on the non-target effects of imidacloprid on birds and bees.

Papers associated with imidacloprid, online at

[www.entomology.umn.edu/cues/krischiklab/krischik.htm](http://www.entomology.umn.edu/cues/krischiklab/krischik.htm):

1. Tenczar, E. G., and V. A. Krischik. 2007. Comparison of standard (granular and drench) and novel (tablet, stick soak, and root dip) imidacloprid treatments for cottonwood leaf beetle (Coleoptera: Chrysomelidae) management on hybrid poplar. *J. Econ. Entomol.* 100: 1611-1621.
2. Krischik, V. A., A. Landmark, and G. Heimpel. 2007. Soil-applied imidacloprid is translocated to nectar and kills nectar-feeding *Anagyrus pseudococci* (Girault) (Hymenoptera: Encyrtidae) *Environ. Entomol.* 36(5): 1238-1245.
3. Rogers, M. A., V. A. Krischik, and L. A. Martin. 2007. Effect of soil application of imidacloprid on survival of adult green lacewing, *Chrysoperla carnea* (Neuroptera: Chrysopidae), used for biological control in greenhouse. *Biological Control* 42(2): 172-177.
4. Gupta, G., and V. A. Krischik. 2007. Professional and consumer insecticides for the management of adult Japanese beetle on hybrid tea rose. *J. Econ. Entomol.* 100(3): 830-837.
5. Tenczar, E. G., and V. A. Krischik. 2006. Management of cottonwood leaf beetle (Coleoptera: Chrysomelidae) with a novel transplant soak and biorational insecticides to conserve coccinellid beetles. *J. Econ. Entomol.* 99(1): 102-108.
6. Smith, S. F. and V. A. Krischik. 2000. Effects of biorational insecticides and imidacloprid on four coccinellid species (Coleoptera: Coccinellidae). *J. Econ. Entomol.* 93(3): 732-736.
7. Smith, S. F. and V. A. Krischik. 1999. Effects of systemic imidacloprid on *Coleomegilla maculata*. (Coleoptera: Coccinellidae). *Environ. Entomol.* 28(6): 1180-1195.

