Environment and Natural Resources Trust Fund
2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 094-D1

Project Title: Mitigating Bee Pollinator Decline in Minnesota

Total Project Budget: $ $315,000

Proposed Project Time Period for the Funding Requested: 3yrs, July 2009-July 2012

Other Non-State Funds: $ $0.00

Priority: A3. Technical Assistance for Conserving Land

First Name: Vera **Last Name:** Krischik

Sponsoring Organization: U of M

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Region:	County Name:	City / Township:
Statewide	Ramsey	St. Paul

Summary: Honey bees and other bee pollinators are in serious decline in Minnesota. We will research the effects of neonicotinyl insecticides on bees and develop management plans to promote pollinators.

Main Proposal: 1008-2-042-proposal-2009UMKrischikproposal.doc

Project Budget: 1008-2-042-budget-2009UMKrischikbudget.xls

Qualifications: 1008-2-042-qualifications-2009UMKrischikproject managers.doc

Map:

Letter of Resolution:

PROJECT TITLE: Mitigating Bee Pollinator Decline in Minnesota

PROJECT SUMMARY: Honey bees and other bee pollinators are in serious decline in Minnesota. We will research the effects of neonicotinyl insecticides on bees and develop management plans to promote pollinators.

PROJECT STATEMENT: We have submitted a similar proposal with a reduced research plan to the Emerging Issues Account, which has a smaller funding limit. We realize the proposal does not fit specifically into any of the targeted priorities, but felt it was a serious issue and merited attention. MN agriculture is dependent on bees for crop production from apples and cherries to squash. Blueberries and tomatoes are pollinated by bumble bees. The value in the US of the increased agricultural yield and quality achieved through pollination by honey bees alone was $9.3 billion in 1989, and increased to $14.6 billion in 2000. Continued loss of bees will have an impact on the natural resources and economy of MN.

Pollinators in general are experiencing serious decline and honey bee colonies have been experiencing conspicuously high mortality due to an event now called Colony Collapse Disorder (CCD). This issue has been addressed by the National Research Council report, the congressional research report, testimony by the National Academy of Sciences to the US Congress, and the media in newspapers and television programs. For the first time in the US, a group at Pennsylvania State University is investigating what weakens bees, such as the interaction of *Varroa* mites in the hive and virus. Also, other pathology, such as exotic viruses and fungi, are under study. However, systemic neonicotinyl insecticides are also considered as a major factor in bee decline. After its ban in 1998, French researchers found that the seed treatment Gaucho (imidacloprid) is translocated from seeds to nectar and pollen and alters bee behavior. In May 2008 a large number of bees died in Germany and caused 5 neonicotinyl insecticides, including imidacloprid, to be banned as seed treatments.

However, in the US use of these 5 neonicotinyl insecticides is very common in greenhouse, landscapes, and crops. Our research at the University of Minnesota demonstrated that nectar and pollen from plants treated with soil applications of imidacloprid contained 10 to 40 times more imidacloprid than from a Gaucho-seed treatment. These levels of imidacloprid caused high mortality of beneficial insects, such as lady beetles, lacewings, and small parasitic wasps that are predators on pest insects. The amount of imidaclopird found in nectar of 2 flowering plants was 20 ppb - 41ppb from a single soil application compared to 1.9 ppb imidacloprid in sunflower nectar and 0.6 to 0.8 ppb in canola nectar from a seed treatment. However, the effects of these higher levels of imidacloprid on bees have not been investigated.

This project will address bee decline with research and then outreach activities discussing the data. We will study 2 of the chemicals, imidacloprid and thiamethoxam, on bee mortality and behavior. We will determine the amount of neonicotinyl translocated to nectar and pollen from a soil application by Liquid Chromatography-Mass Spectrometry residue analysis, which is expensive. We will spike artificial nectar with the level found in nectar and monitor bee behavior, nesting, recruitment to food, mortality, and other behavioral parameters. The results of this research will have national interest as we contribute data on one factor that may be responsible for pollinator decline and can be mitigated through altered management tactics.

Another factor contributing to pollinator decline is the lack of research on plants that provide nectar and pollen for pollinators. Most plant recommendations are derived from published lists that were not based on bee research. When you study these recommended plants in the field, many are not visited by bees. However, proper bee plants in crop borders, roadsides, and in urban landscapes would supplement the diet of honey bees and other bees, luring them out of insecticide treated and often less nutritionally rewarding agricultural crops.

This research will mitigate bee decline through understanding contributing factors, such as the role of insecticides in the foraging environment. We will work with stakeholders on alternative insecticides that deliver pest management with less harm to bees. Also, availability of bee plants in naturalized areas will lure bees out of treated areas. We will discuss our research-based information in various outreach activities, such as workshops, grower's talks, and CUES website. We will work with state agencies and an advisory group to disseminate information on how to protect and promote bees.

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I. DESCRIPTION OF PROJECT RESULTS

Result 1. Determine the amount of neonictoinyl insecticides in nectar and pollen.
Investigate the effects of these insecticides on bee colony and bee behavior.
Develop management plans to reduce the use of systemic insecticides where bees are foraging.
Work with state agencies and commodity groups to deliver this message. **Budget: $200,000**

Deliverable	Completion date
	July, 2012

1A. Research results from each summer placed on the web at www.entomology.umn.edu/cues. Create advisory panel with stakeholders and meet every 6 mo to discuss research. Provide articles and talks in state and commodity group newsletters. Publish results in peer reviewed journals.

Result 2. Research which native plants provide the best nectar and pollen for bee pollinators.
Develop management plans to use pollinator plants in conservation plantings, roadsides, rain gardens, and shoreland re-vegetation to lure bees out of treated areas. **Budget: $115,000**

Deliverable	Completion date
	July, 2012

2A. Research results from first summer placed on the web at www.entomology.umn.edu/cues Create advisory panel with stakeholders and meet every 6 mo to discuss research. Provide articles and talks in state and commodity group newsletters. Publish results in peer reviewed journals

II. PROJECT STRATEGY AND TIMELINE

A. Project Partners: Create an advisory panel with stakeholders
1. MN Honey Producers: letter of support, resolution at last meeting, letters commercial beekeepers
2. MN Hobby Bee Keepers: letter of support
3. Xerces Society
4. MN Landscape and Nursery Association
5. Watershed districts
6. MDA, DNR

B. Project Impact
Maintain economic viability of natural resources and agricultural commodities needing pollinators.

C. Time
Three years are needed to perform experiments and deliver research-based recommendations to stakeholders

D. Long-Term Strategy NA

Project Budget

Mitigating Bee Pollinator Decline in Minnesota, Krischik, Dept Entomology, University of Minnesota

IV. TOTAL PROJECT REQUEST BUDGET

BUDGET ITEM	AMOUNT	% FTE
Personnel: Post Doc $35,000+17.14%fring=$41,000 x 3yrs=	$123,000	100%
Graduate student $20,000+$14,000 tuition+health=$34,000 x 3yrs=	$102,000	100%
Research supplies: Chemical analysis, bee rearing supplies, cages, plants, publishing, travel to commodity and state meetings for 3 yrs, $30,000/yr	$90,000	
Contracts:	NA	
	$ -	
	$ -	
Equipment/Tools:	NA	
Acquisition (Including Easements):	NA	
Restoration:	NA	
Other:	NA	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$315,000	

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Remaining $ From Previous Trust Fund Appropriation (if applicable):	NA	
Other Non-State $ Being Leveraged During Project Period:	NA	
Other State $ Being Spent During Project Period:	NA	
In-kind Services During Project Period: Krischik inkind 30% of $87,000 ; Spivak inkind 20% of $100,000 for 3 yrs	$138,000	
Past Spending: Research funds 2004-2008, 5 published papers on topic	$100,000	

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Project Manager Qualifications and Organization Description

The project cooperators are 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. Bees use resources in both managed agriculture ecosystems and natural ecosystems. Determining ways to prevent pollinator loss and promote functioning sustainable ecosystems are a goal of these researchers. Equipment and facilities are available for this research. The collaborators have over 20 years of research expertise and publications in this area.

Dr. Vera Krischik, Assoc. Professor and Ext. Urban Landscapes**,** Entomology, St. Paul, UMinnesota
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 USDA, Washington DC from 1988-1994. She teaches a Pesticide Use Course and Ornamental and Turf IPM Course. She has published papers on the non target effects of imidacloprid on beneficial insects. She has two books: one published by John Wiley entitled " Microbial Mediation of Plant Insect Interactions" and another published by the MN Agricultural Experiment Station on "IPM of Midwest Landscapes": She is director of CUES: Center for sustainable urban ecosystems, that promotes natural resource management. www.entomology.umn.edu/cues

Dr. Marla Spivak, Professor and Extension Apiculture, Entomology, St. Paul, UMinnesota
Marla obtained her PhD from the University of Kansas in 1989, and was a post-doctoral fellow at the University of Arizona from 1989-1992. She teaches courses on Social Insects, Bee Management, and Scientific Communication and Ethics. Her responsibilities include research, teaching and extension for the 5 state area (MN, WI, IA, SD, ND). Research projects center around bee health and breeding, include understanding the neural mechanisms mediating honey bee hygienic behavior and the social behavior of bumblebee, *Bombus impatiens*.