

**Environment and Natural Resources Trust Fund  
2015 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 085-D**

Minnesotas Newest Invasion: European Gypsy Moth is Here

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

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**Total Project Budget:** \$ 350,000

**Proposed Project Time Period for the Funding Requested:** 3 years, July 2015 - June 2018

**Summary:**

Last year, the MDA trapped more gypsy moths than all previous years combined. This collaborative MDA-UMN project conducts additional surveys and characterizes the threat to Minnesota's oak and aspen trees.

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**Location**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

Picture of gypsy moth in Minnesota

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



## I. PROJECT STATEMENT

**Overview:** This project focuses on the newest forest insect to establish in Minnesota, the European gypsy moth. Gypsy moth is an invasive moth whose caterpillars feed on over 300 species of trees and shrubs. Stripping the trees bare in summer weakens them, making them susceptible to other insects and diseases. The Minnesota Department of Agriculture has been surveying the eastern border of the state for gypsy moth since the early 1970s, expecting its arrival. Moths have been periodically trapped and eradicated since then, although an influx in 2005 gave the moths a toe-hold that couldn't be extinguished despite best efforts. Last year, unfortunately, more than 70,000 moths were captured along the North Shore – equal to the total number captured statewide over the previous three decades. **Gypsy moth has now established in Minnesota. This project focuses on survey efforts and research efforts to determine how it may affect our native broadleaf forests.**

**The problem:** European gypsy moth was brought from France to Medford, MA in the 19<sup>th</sup> century by a French astronomer looking to interbreed the moths with native caterpillars and produce better silk. Unfortunately, the moths escaped, unleashing a slow-moving westward and southward invasion that has now reached Minnesota. Surprisingly, female moths cannot fly. The insect primarily spreads by larval ballooning on silk threads and unintentional movement of egg masses on outdoor household articles. Gypsy moth tends to undergo periodic outbreaks during which entire forests (especially of oak and aspen) can be defoliated and weakened. The insect is also a human health nuisance. Not only are thousands of caterpillars and their droppings unappealing around dwellings, hairs from the caterpillars and moths can cause allergic respiratory reactions to sensitive individuals.

**Gypsy moth in Minnesota:** Much work has been done nationwide on gypsy moth over the past one hundred years. We know which trees it will likely target in Minnesota, and we know much about trapping and suppression strategies (such as biological control and microbial insecticides without non-target effects to bees or mammals). **There are two key knowledge gaps unique to Minnesota that could yield better management:**

1. **Survey untrapped state areas.** . The MDA receives federal funding from the "Slow the Spread" program to trap and treat a portion of the state adjacent to the established population. Funding from APHIS combined with state general funds provides an additional layer of traps to the west of the STS zone. The remainder of the state is trapped every 4-5 years on a rotational basis. This gap in trapping leaves large areas of high-value forest un-monitored for several years, wasting valuable time for detection and management of satellite populations.
2. **Determine how gypsy moth will affect our oak and aspen trees.** These two species are heavily favored by the gypsy moth and have been killed by repeated feeding in other states. However, gypsy moth is a new pressure in Minnesota and we are unsure how our forests will be affected. Research from Wisconsin, for example, indicates that the response of aspen to insect feeding can be highly variable between genetic clones. Moreover, we have our own native caterpillar problem in forest tent caterpillar. This insect also feeds on oak and aspen and defoliates millions of deciduous trees on approximate 10-12 year cycles. It is possible that such historic defoliation has "primed" our trees to greater resistance to feeding. Alternatively, large scale feeding may simply make our trees *more* susceptible to secondary damage from gypsy moth so the problem may be unexpectedly compounded. It is important to understand how these insects will share these resources.

Our goal is to gain an understanding of how fast the insect is invading, paying attention to potentially unsurveyed satellite populations, and determine how it behaves on our native trees, interacting with our most significant native caterpillar. By understanding these problems we may be able to refine control and management strategies as gypsy moth continues to establish.



**Environment and Natural Resources Trust Fund (ENRTF)**

**2015 Main Proposal**

**Project Title:** *Minnesota’s newest invasion: European gypsy moth is here*

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1:** *Survey of Minnesota broadleaf forests for gypsy moth*

**Budget: \$75,000**

Two temporary technicians will be hired by the MDA to survey for gypsy moth populations for two years in early to mid-summer. Sites will be selected so as to augment on-going trapping by the USDA Forest Service. Trappers will use traps baited with a highly-effective synthetic pheromone.

Outcome	Completion Date
1. Identification of survey sites	12/31/2015
2. Determination of presence/absence of gypsy moth	06/30/2018

**Activity 2:** *Determine resistance of Minnesota’s aspen and oak resource*

**Budget: \$159,125**

A graduate student and undergraduate summer worker (U of M) will conduct feeding trials of gypsy moth on both of these host species. These individuals will quantify the defensive capacities of the trees as well as their impact on the gypsy moth.

Outcome	Completion Date
1. Response of Minnesota aspen and oak trees to defoliation by gypsy moth	06/30/2017
2. Performance of gypsy moth on Minnesota aspen and oak trees	06/30/2018

**Activity 3:** *Determine how gypsy moth will interact with forest tent caterpillar*

**Budget: \$115,875**

Gypsy moth is known to have deleterious effects on native insects through indirect competition. Given these two insects share several species of host trees, the same graduate student and another undergraduate worker will measure how gypsy moth feeding at various levels will affect the performance of forest tent caterpillars and vice versa.

Outcome	Completion Date
1. Characterize interactions between forest tent caterpillar and gypsy moth	06/30/2018

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

Similar to the ongoing emerald ash borer and mountain pine beetle projects on surveys, biocontrol, detection, and monitoring, this proposal is a joint partnership with the MDA and the University of Minnesota.

**Receiving funds:** The MDA (Lucia Hunt) will lead survey efforts. The U of M (Aukema) will lead the characterization of invasibility of Minnesota’s aspen and oak forests through studies of tree defense and insect performance. **Not receiving funds:** Both institutions will provide in-kind equipment, facilities, intellectual input, and GIS/technical support, and we will collaborate with the DNR and other federal agencies.

**B. Project Impact and Long-Term Strategy**

The LCCMR has not spent any funds on the emerging gypsy moth problem to date. Between 1980-2010, the USDA Forest Service has spent \$120,618,706 and states have spent a combined \$144,608,179 on suppression of gypsy moth populations. The MDA receives federal “Slow the Spread” money to suppress low density populations through aerial spraying of biorational pesticides. The USDA Farm Bill is currently supporting a joint MDA-UMN project surveying locations of a special genetic type of European gypsy moth found in higher frequencies in Minnesota than other states. This type typically feeds on *more* species of trees than regular moths. These two sources of in-kind funding complement the proposed work to fill in survey gaps and determine how this insect will impact Minnesota’s native forest communities.

**C. Timeline Requirements**

The project will run for three years from 7/1/2016 to 6/30/2019. We anticipate by 2019 gypsy moth will be firmly entrenched in Minnesota but we will have increased understanding how it will interact with Minnesota’s oak and aspen resources and how to refine current management strategies.

## 2015 Detailed Project Budget

Project Title: Minnesota's newest invasion: European gypsy moth is here

### IV. TOTAL ENRTF REQUEST BUDGET 3 years

<b>BUDGET ITEM</b> (See "Guidance on Allowable Expenses", p. 13)	<b>MDA AMOUNT</b>	<b>U of M AMOUNT</b>
<b>Personnel: Activity 1 (Survey):</b> MDA, two part time MDA technician staff two years (\$33,000 incl. of 14.6% benefits), one part time MDA scientist three years (\$7,500/yr) to monitor and place gypsy moth trap lines in conjunction with federal APHIS trapping <b>Activity 2 (MN oak and aspen resource):</b> 0.5FTE U of M PhD student 3 years (\$21,250 indexed at 2.5% x 3), one 0.67FTE student worker 3 years (\$10K with 8% benefits x 3), 3 years faculty partial summer support during summer moth trapping (\$15,000 indexed at 2.5% per year, inclusive of 20% benefits). <b>Activity 3 (Interaction between GM and native caterpillar):</b> Other half of 0.5FTE U of M PhD student 3 years (\$21,250 indexed at 2.5% x 3), one 0.67FTE student worker 3 years (\$10K with 8% benefits x 3) to help with feeding trials	\$ 55,500	\$ 221,250
<b>Equipment/Tools/Supplies: Activity 1 (Survey)</b> Two gypsy moth trap lines of 600-700 traps in "gap" areas not funded federally (\$3,500; insect lures, miscellaneous trapping supplies (ropes, plastic bags, gloves, vials, cups, etc.. <b>Activity 2 (MN oak and aspen resource):</b> Field supplies (netting, vials, rope, screening, water picks, etc. \$4,400 over three years) and leaf chemical analysis work (insect cages, solvents, etc.; \$20,000) <b>Activity 3 (Interaction between GM and native caterpillar):</b> \$5,250 over 3 years for greenhouse space rental and rearing supplies	\$ 3,500	\$ 29,650
<b>Travel: Activity 1 (Survey):</b> Rental vehicle and fuel for trap monitoring June - Oct, 2 years (\$8,000 x 2). <b>Activity 2 (MN oak and aspen resource):</b> Four month UMN fleet vehicle rental \$3,200 plus 5K miles at \$0.40/mile each year 3 years; some of this will be shared with Activity 3; \$1,000 lodging for sporadic overnight stays when necessary (est. 10 / summer and fall); \$1500 each of three years to attend collaborative meetings to discuss or disseminate results (e.g., North Central Forest Pest Workshop, Upper Midwest invasive Species Conference) <b>Activity 3 (Interaction between GM and native caterpillar):</b> none	\$ 16,000	\$ 23,100
<b>Additional Budget Items:</b> Printing costs for dissemination of results (e.g., poster presentation at regional invasive species meeting) \$1000 over three years	\$ -	1000
<b>Subtotals:</b>	\$ 75,000	\$ 275,000
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	\$	350,000

### V. OTHER FUNDS

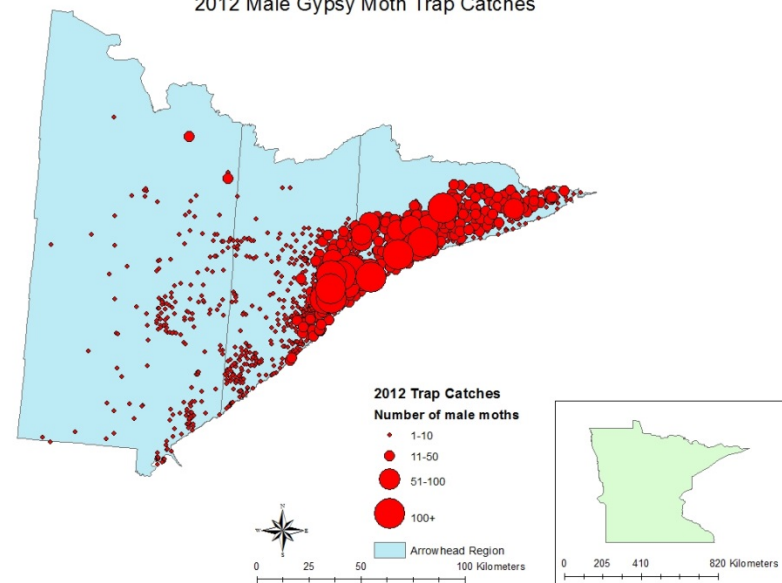
<b>SOURCE OF FUNDS</b>	<b>AMOUNT</b>	<b>Status</b>
<b>In-kind Services During Project Period:</b> Field equipment, lab equipment and lab space, computing/software, GIS and data management (\$40,000 for U of M, \$15,000 for MDA), graduate student advising/mentoring throughout academic year as student is prepared to join ranks of professionals combatting MN's invasive species (\$40,000 at U of M)	\$ 155,000	<i>secured</i>
<b>Funding History:</b> <b>\$140K - USDA APHIS Farm Bill.</b> This federal grant (secured) is allowing us to examine a unique genetic strain of gypsy moth in Minnesota that is mixed in to the existing population in very low densities. This strain typically eats more different types of plants than regular gypsy moths, but we know little about its geographic prevalence or why it is mixed in to the existing population. That work does <b>not</b> duplicate this proposal or fund this work, but compliments these plans. <b>In addition,</b> the state will continue to receive federal aid to help delineate the moth invasion on an annual basis. As described in the proposal, however, there are large areas of forest monitored only once every 4-5 years depending on the rotation. This proposal will help fill those areas so we detect satellite infestations much more quickly.	\$ 140,000	<i>secured</i>

# European Gypsy Moth: Minnesota's Newest Invasive Species

This project is a partnership between the MDA and UMN



2012 Male Gypsy Moth Trap Catches



## **Project Director Qualifications and Organization Description**

### **Minnesota's Newest Invasion: European Gypsy Moth is Here**

This proposal is a joint partnership with the MDA and the University of Minnesota similar to the ongoing emerald ash borer and mountain pine beetle projects funded by LCCMR on survey, detection, monitoring, and biological control,

**Dr. Brian Aukema** will administer the project at the University of Minnesota. Prof. Aukema oversees the Forest Insect Research Laboratory where his students work on a variety of forest pest problems of both native and invasive species in the state of Minnesota and beyond (e.g., emerald ash borer on ash, gypsy moth on oak and aspen, thousand cankers disease on walnut, eastern larch beetle on tamarack, and more). Students he has taught can be found in a wide variety of resource professional positions, from city arborists to federal government program administrators.

Prof. Aukema has successfully administered more than \$1.6 million in research project funding to date from a wide variety of state, province, federal, and industrial sources. He has received early career awards for Creativity and Innovation (Government of Canada) and a McKnight Land-Grant award recognizing him as a promising early career faculty member at the University of Minnesota. Recently, he received the Department of Entomology's 2013 FAME award from the graduate students: Faculty Award for Mentorship in Entomology.

**Ms. Lucia Hunt** of the Minnesota Department of Agriculture will be responsible for the survey work proposed in conjunction with Ms. Natasha Nelson. Lucia is the state gypsy moth coordinator in the MDA's plant protection division with responsibilities for prevention, detection, and response to invasive insect pests. Natasha helps to coordinate trapping locations and moth collection each summer.