



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2016 Work Plan

Date of Report: December 4, 2015

Date of Next Status Update Report: January 1, 2017

Date of Work Plan Approval:

Project Completion Date: June 30, 2019

Does this submission include an amendment request? No

PROJECT TITLE: Determine Impacts on Wildlife from Emerald Ash Borer Infection of Black Ash Forests

Project Manager: Gerald Niemi

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Location: Statewide

Total ENRTF Project Budget:

ENRTF Appropriation: \$334,000

Amount Spent: \$0

Balance: \$334,000

Legal Citation: M.L. 2016, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

I. PROJECT TITLE: Determine Impacts on Wildlife from Emerald Ash Borer Infection of Black Ash Forests

II. PROJECT STATEMENT:

This project will examine the impacts of emerald ash borer (EAB) and adaptive management on bird, mammal, and herptile diversity in Minnesota's black ash forests. Black ash swamps cover over one million acres of northern Minnesota and provide critical habitat for wildlife. The future of Minnesota's black ash swamps is critically threatened by EAB, which has been destroying native populations of ash throughout the Great Lakes Region. In October 2015, EAB was confirmed in Duluth, the doorstep of black ash in northern Minnesota. Loss of this forest type following EAB infestation will have significant impacts on wildlife. This project will yield critical information for anticipating impacts of EAB on wildlife diversity in northern Minnesota.

Although impacts to wildlife are certain, the magnitude and relative degree of impact to individual species and species diversity is unclear. Given the continued and rapid westward spread of EAB, there is an urgent need to understand how wildlife that are dependent on black ash forests will be impacted following its arrival. This project will build upon past and current projects funded by LCCMR [239: Emerald Ash Borer Ecological and Hydrological Impacts and 082-D: Emerald Ash Borer Ecological/Hydrological Impacts- Phase II] that focus on assessing potential impacts of EAB in black ash forests as related to hydrology, tree regeneration, and native plants communities. Large-scale networks of research sites in black ash swamps have been established to assess EAB impacts and evaluate potential mitigation strategies. The initial phase (239) of this work has already identified significant impacts of EAB and pre-emptive harvesting on native plants and forest hydrology, including loss of native plant diversity and increased flooding. These major alterations will likely lead to a loss of wildlife species diversity in black ash habitats. Importantly, there is a large knowledge gap related to which wildlife species inhabit black ash wetland forests and how they will respond to ecosystem changes following EAB. These limitations seriously constrain our ability to predict EAB impacts to wildlife and develop strategies for mitigation.

Funding for this project will be used to measure seasonal bird, mammal, and herptile diversity in black ash stands. This project will use eight experimental research sites that simulate EAB mortality and adaptive management strategies for EAB (clearcutting and group selection harvests) to assess the impacts of EAB on wildlife communities. Utilizing existing experiments aimed at developing strategies for increasing the resilience of black ash forests to EAB will provide information not only about EAB impacts but also impacts of mitigation strategies to wildlife. We will also survey 30 additional black ash wetlands across northern Minnesota, which will provide critical information for developing landscape-level plans and vulnerability assessments for wildlife associated with these forest types. Data from both of these approaches will provide baseline information about the types of wildlife that use black ash habitats throughout the year and support future wildlife monitoring efforts as EAB spreads in Minnesota.

The goals of this proposed project are to:

- 1) Provide baseline information to assess existing conditions and establish a long-term monitoring program for wildlife communities in black ash forests to support future monitoring efforts as EAB spreads;
- 2) Evaluate the effects of mitigation and adaptation strategies on wildlife communities under simulated invasion scenarios to quantify long-term impacts on species diversity; and
- 3) Identify vulnerable wildlife species and develop recommendations and strategies to maintain biodiversity.

The overall goal of our proposed project is to provide foundational data that will inform and improve long-term black ash management objectives, maintain ecological health of black ash forest systems, and conserve Minnesota's bird, small mammal, and herptile diversity. Findings of this study will be used by state and federal agencies to address the threat of EAB throughout the state.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 1, 2017:

Project Status as of July 1, 2017:

Project Status as of January 1, 2018:

Project Status as of July 1, 2018:

Project Status as of January 1, 2019:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Quantify the long-term impact of EAB and adaptive management on bird, mammal, and herptile diversity.

Description:

We will establish long-term wildlife monitoring plots in the eight existing experimental sites established in the initial EAB project (239) to assess the long-term impacts of EAB on wildlife diversity. The experimental sites are large-scale manipulations of black ash forests that allow for assessment of the ecological impacts of EAB. These sites also incorporate experimental adaptive management actions, clearcutting and group harvests, to assess potential strategies for sustaining the ecological functions of black ash systems after EAB infestation. Each experimental site has four levels of ash mortality that were implemented in four acre plots (n=8 for each mortality treatment). The ash mortality levels at these experimental sites were as follows: 1) retain all ash (control), 2) simulated EAB mortality girdling all ash >10 cm in diameter, 3) group selection harvests (remove groups of ash in 0.1 acres covering 20% of unit), and 4) harvest of all ash (clearcutting). Harvests and girdling occurred in the winter of 2011. We will establish permanent wildlife monitoring plots in the experimental sites to quantify differences in the species composition of birds, mammals, and herptiles in control sites compared to simulated EAB mortality and adaptive management sites. Experimental sites will be monitored seasonally for two years to provide a comprehensive assessment of EAB and adaptive management impacts on wildlife diversity.

Phase 2 (LCCMR Project 082-D) of the EAB project will identify 30 additional black ash swamp sites to conduct hydrologic monitoring and vegetation sampling across northern Minnesota. These sites will be used to fully represent the range of conditions and vulnerabilities of black ash swamps in the state and will span the primary Native Plant Communities (NPCs) in which black ash constitutes a significant component (NPC types Northern Wet Ash Swamp (WFn55) and Northern Very Wet Ash Swamp (WFn64)). We will survey these sites to assess bird, mammal, and herptile diversity. These additional sites will provide data about wildlife communities across Minnesota and complement data from experimental sites. Together these data will provide important baseline information about wildlife diversity in black ash stands across northern Minnesota.

We will use a variety of wildlife survey techniques and technology depending on site specific characteristics and time of year to obtain comprehensive information about wildlife communities in black ash forests. Avian survey techniques will include point counts, modified territory mapping, and digital audio recorders (DARs). Sherman traps, track stations, and camera traps will be used to survey mammals. Survey methods for herptiles include frog call surveys in the spring, digital audio recorders, time constrained searches, and surveys of coarse woody debris. Together these methods will provide a comprehensive estimate of biodiversity in black ash forests.

Wildlife survey methodology overview:

1. Experimental sites: (n= 32; 8 replicates)
 - a. Spring: Frog surveys, camera traps (mammals), DARs (survey for frogs, owls, resident bird species), track plates (mammals).
 - b. Summer: Modified territory mapping (birds), DARs (birds, frogs), camera traps (mammals), track plates (mammals).
 - c. Fall: small mammals traps, DARs (birds), camera traps (mammals), track plates (small mammals)
 - d. Winter: DARs (resident bird species), camera traps (mammals)
2. 30 additional sites across Minnesota
 - a. Spring: Frog surveys , DARs (survey for frogs, owls, resident bird species)
 - b. Summer: Point counts (birds), DARs (birds, frogs), camera traps (mammals)
 - c. September: Camera traps (mammals), track plates (small mammals), and DARs (birds)
 - d. Winter: DARs (resident bird species), camera traps (mammals)

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 227,278
Amount Spent: \$ 0
Balance: \$ 227,278

Outcome	Completion Date
1. Establish 30 long-term monitoring plots and develop protocol for measuring wildlife diversity in black ash forests.	December 2016
2. Quantify bird, small mammal, and herptile diversity in 30 black ash research sites.	December 2018
3. Final report and activity results submitted.	June 2019

Activity Status as of January 1, 2017:

Activity Status as of July 1, 2017:

Activity Status as of January 1, 2018:

Activity Status as of July 1, 2018:

Activity Status as of January 1, 2019:

Final Report Summary:

ACTIVITY 2: Develop and implement recommendations for mitigating wildlife impacts of EAB in black ash forests.

Description:

Impacts of EAB on wildlife are likely to occur; however, the magnitude and relative degree of impact to individual species and species diversity is unclear. There is a large knowledge gap related to which wildlife species inhabit black ash wetland forests and how they will respond to ecosystem changes following EAB. For this reason, it is difficult to make specific hypotheses until data are collected in black ash forests. However, the major alterations to black ash habitats, such as an increase in ponding and tree mortality, in EAB simulated sites will likely lead to changes in wildlife species composition. For example, in bird communities we expect decreases in ground nesting species abundance and diversity but a potential increase in wetland associated and waterfowl

species in EAB simulated sites compared to control sites. Similarly, we expect decreases small mammal diversity but increases in herptile diversity in EAB simulated sites compares to control sites. Analyses of data from Activity 1 will address general hypotheses related to predicted habitat changes in black ash stands. Because alterations to black ash forests will likely impact taxa and specific species in different ways, we will test species specific impacts along with species composition and diversity, to fully assess impacts of EAB on wildlife.

We will use data collected from Activity 1, along with vegetation data collected in the initial phase and Phase 2 of the EAB project to test how wildlife have responded to EAB and adaptive management alternatives. These tests will allow us to build models to predict and further to test how wildlife species and communities will respond to ecosystem changes following EAB. Pairing the habitat information with the wildlife survey data from the experimental plots in addition to the landscape level survey sites will determine the magnitude of biodiversity change that could be expected for black ash wetlands following EAB infestation. These models will allow us to identify vulnerable wildlife species in the context of Minnesota’s forest wildlife and overall impacts on wildlife communities.

In Phase 2 of the EAB project (LCCMR Project 082-D), the distribution, extent, and configuration of black ash forests across northern Minnesota will be mapped based on multispectral and multi-temporal satellite digital data and regional forest inventories. We will use the forest composition maps depicting the extent and characteristics of black ash forest across northern Minnesota created in Phase 2 to determine areas with the highest degree of vulnerability to EAB. Estimates of changes in species composition and diversity obtained from wildlife models will be paired with maps of black ash to determine where EAB may have the greatest impact on wildlife throughout the state. The overall results of this modeling effort will allow us to identify vulnerable wildlife species, develop recommendations and strategies for long-term conservation of species diversity in Minnesota, and identify prioritization of areas for mitigation.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 106,722
Amount Spent: \$ 0
Balance: \$ 106,722

Outcome	Completion Date
1. Incorporate bird, small mammal, and herptile data into forest landscape models.	December 2018
2. Quantify long-term effects of EAB and adaptive management on species diversity and identify vulnerable wildlife species.	April 2019
3. Develop mitigation strategies and publish project summaries aimed at wildlife biologists within the state	June 2019

Activity Status as of January 1, 2017:

Activity Status as of July 1, 2017:

Activity Status as of January 1, 2018:

Activity Status as of July 1, 2018:

Activity Status as of January 1, 2019:

Final Report Summary:

V. DISSEMINATION:

The overall goal of our proposed project is to improve long-term black ash management objectives, maintain ecological health of black ash forest systems, and conserve Minnesota’s bird, mammal, and herptile diversity. The information will be transferred to resource managers in the state (MNDNR) and federal agencies (USFS) to address the threat of EAB throughout the state. Manuscripts detailing project results will be written and submitted for publication in peer-reviewed journals. A fact sheet summarizing principal findings of this project will be distributed to LCCMR members and legislators at the state and federal level. Results will be presented at state and national forest and wildlife management conferences. All reports and publications from this project will be made available via the Natural Resource Research Institute web site.

Description:

Status as of January 1, 2017:

Status as of July 1, 2017:

Status as of January 1, 2018:

Status as of July 1, 2018:

Status as of January 1, 2019:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 293,590	1 project manager at 0.5% FTE each year for 3 years (\$3,300); 1 co-investigator at 36.3% FTE each year for 3 years (\$71,670); 2 post-doctoral researchers at 30% FTE each year for 3 years (\$115,540); 1 graduate research assistant at 40.78% FTE for year 2 (\$36,680); 2 field technicians at 30% FTE each year for 3 years (\$53,000); 1 undergraduate research assistant at 35% FTE for year 2 (\$9,700); administrative support at 2% FTE each year for 3 years (\$3,700).
Equipment/Tools/Supplies:	\$ 20,000	Sherman traps (\$2,500); pitfall supplies, including flashing and buckets (\$1,000); Trail cameras (\$4,500); digital audio recorders (\$10,000); and digital audio analysis software (\$2,000).
Travel Expenses in MN:	\$ 20,000	Mileage (\$15,000); lodging (\$5,000)
Other:	\$ 410	GIS lab services
TOTAL ENRTF BUDGET:	\$ 334,000	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation: 5.4 FTEs

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF

Appropriation: N/A

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
Anthony D’Amato, University of Vermont (in-kind support)	\$ 30,000	\$ 0	Salary and fringe of \$10,000 each year for 3 years for effort spent on project activities.
State			
Gerald Niemi, project manager (cash support)	As needed	-	If awarded, NRRI will contribute time and effort as needed for successful completion of the project without requesting further funds from LCCMR.
Foregone F&A funding of 52% MTDC (TDC less grad student tuition and fringe (\$334,218 less \$30,923)	\$ 157,600	\$ 0	Indirect costs on personnel, travel, supplies, and other (GIS lab fees) related to work on the sponsored project
Robert Slesak, MN Forest Resources Council (in-kind support)	\$ 35,000	\$ 0	Salary and fringe of 0.1 FTE each year for 3 years for effort spent on project activities.
Brian Palik and technician, USDA Forest Service (in-kind support)	\$ 30,000	\$ 0	Salary and fringe in amount of \$5,000 per person per year for 3 years for effort spent on project activities.
TOTAL OTHER FUNDS:	\$ 157,600	\$	

VII. PROJECT STRATEGY:

A. Project Partners: The project team includes Dr. Gerald Niemi and Dr. Alexis Grinde from the Natural Resources Research Institute, Dr. Rob Slesak from the MN Forest Resources Council, Dr. Brian Palik from the USFS Northern Research Station, and Dr. Anthony D’Amato from the University of Vermont.

B. Project Impact and Long-term Strategy: This proposal is a part of a larger effort to develop strategies to minimize the impacts of emerald ash borer on black ash forests in Minnesota. Results of this project will provide baseline information to evaluate the long-term impacts of emerald ash borer on wildlife populations throughout Minnesota and identify best practices to maintain wildlife diversity in Minnesota’s forests.

C. Funding History: N/A

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List: N/A

B. Acquisition/Restoration Information: N/A

IX. VISUAL COMPONENT or MAP(S): See attached

X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than January 1, 2017; July 1, 2017; January 1, 2018; July 1, 2018; and January 1, 2019. A final report and associated products will be submitted between June 30 and August 15, 2019.

**Environment and Natural Resources Trust Fund
M.L. 2016 Project Budget**



Project Title: Determine Impacts on Wildlife from Emerald Ash Borer Infection of Black Ash Forests

Legal Citation: M.L. 2016, Chp. xx, Sec. xx, Subd. xx

Project Manager: Gerald Niemi

Organization: Natural Resources Research Institute, University of Minnesota Duluth

M.L. 2016 ENRTF Appropriation: \$334,000

Project Length and Completion Date: 3 years, June 30, 2019

Date of Report: 12/04/2015

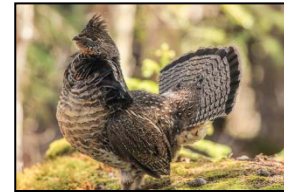
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Quantify the long-term impact of EAB and adaptive management on bird, small mammal, and herptile diversity.		Develop and implement recommendations for mitigating wildlife impacts of EAB in black ash forests.					
Personnel (Wages and Benefits)	\$189,278	\$0	\$189,278	\$104,312	\$0	\$104,312	\$293,590	\$293,590
Gerald Niemi, Project Manager: \$3,300 (66.3% salary, 33.7% benefits); 0.5% FTE each year for 3 years								
Alexis Grinde, Co-Investigator: \$71,670 (82.4% salary, 17.6% benefits); 36.3% FTE each year for 3 years								
2 Post-doctoral Reseachers: \$115,540 (77.6% salary, 22.4% benefits); 30% FTE each year for 3 years								
Graduate Research Assistant: \$36,680 (58% salary, 42% benefits including fringe and tuition reimbursement); ~40.78% FTE for year 2								
2 Field Technicians: \$53,000 (92.1% salary, 7.9% benefits); 30% FTE each year for 3 years								
Undergraduate Research Assistant: \$9,700 (100% salary, 0% benefits); 35% FTE for year 2								
Administrative Support: \$3,700 (72.6% salary, 27.4% benefits); 2% FTE each year for 3 years								
Equipment/Tools/Supplies	\$20,000	\$0	\$20,000				\$20,000	\$20,000
100 Sherman traps (\$25 each) for small mammal monitoring of wildlife habitat use at field sites. (\$2,500)								
Pitfall supplies for small mammal and herptile monitoring; flashing and buckets at each site. (\$1,000)								

30 trail cameras (\$150 each) for longer-term monitoring of wildlife habitat use at field sites.								
10 digital audio recorders (\$1,000 each) for longer-term monitoring of bird and frog habitat use at field sites. (\$10,000)								
Analysis software (Song Scape), required to analyze digital audio data. (\$2,000)								
Travel expenses in Minnesota								
Due to the high number of study sites and logistics associated with visiting and measuring black ash wetland sites \$20,000 is budgeted for domestic travel within Minnesota. This money will be used to pay for mileage (75%) and lodging (25%) for researchers, field technicians, and graduate and undergraduate students. Mileage costs are associated with rental of a field vehicle through the University of Minnesota motorpool for four field sessions per year for 2 years. Travel reimbursement will follow University of Minnesota protocols.	\$18,000	\$0	\$18,000	\$2,000	\$0	\$2,000	\$20,000	\$20,000
Other								
Natural Resources Research Institute GIS Lab services for personnel and computer services, 100 hours at \$4.10/hr	\$0	\$0	\$0	\$410	\$0	\$410	\$410	\$410
COLUMN TOTAL	\$227,278	\$0	\$227,278	\$106,722	\$0	\$106,722	\$334,000	\$334,000



Emerald Ash Borer and Black Ash: Wildlife Impacts

Minnesota's black ash forests provide important habitat and food resources for many wildlife species including mammals, birds, and amphibians.



Loss of black ash due to emerald ash borer can shift forested wetlands to sedge wetlands.

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How will these changes impact Minnesota's wildlife and how can species diversity be maintained in the face of emerald ash borer infestation?



