

**Environment and Natural Resources Trust Fund (ENRTF)
2010 Work Program**

Date of Report: November 24, 2009
Date of Next Progress Report: January 2010
Date of Work Program Approval:
Project Completion Date: June 30, 2015

I. PROJECT TITLE: Ecological and Hydrological Impacts of Emerald Ash Borer

Project Manager: Anthony D'Amato
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Location: Aitkin, Beltrami, Cass, Itasca, Koochiching, and St. Louis Counties (see Figure 1).

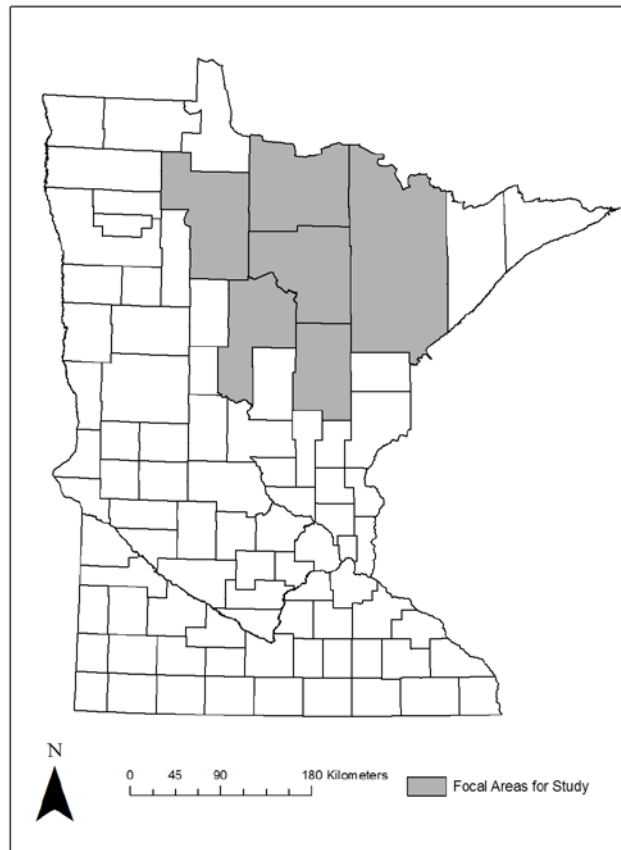


Figure 1. Counties within which the study of impacts of EAB on black ash systems will be conducted.

Total ENRTF Project Budget:	ENRTF Appropriation	\$ 636,000
	Minus Amount Spent:	\$ 0
	Equal Balance:	\$ 636,000

Legal Citation: M.L. 2010, Chp. 362, Sec. 2, Subd. 6b

Appropriation Language:

\$636,000 is from the trust fund to the Board of Regents of the University of Minnesota to assess the potential impacts of emerald ash borer on Minnesota's black ash forests and quantify potential impacts on native forest vegetation, invasive species spread, and hydrology. This appropriation is available until June 30, 2015, by which time the project must be completed and final products delivered.

II. PROJECT SUMMARY AND RESULTS:

The Emerald Ash Borer (EAB) has been decimating ash throughout the Great Lake States and is currently advancing into Minnesota, threatening the future of the ash forests that occur across much of the state. Of particular concern is the impact EAB will have on the ecology and functioning of black ash swamps, which cover over one million acres in Minnesota and represent the state's most common ash forest type. Black ash trees grow and thrive in swamps and occupy a unique wet niche where few other tree species grow. As a result, EAB impacts on black ash swamps will likely be extreme, resulting in dramatic changes in native plant communities and increasing the potential for invasion by exotic plant species.

This project will increase our understanding of the ecological and hydrological impacts of EAB through the establishment of a network of research sites in black ash forests in Minnesota. Treatments simulating EAB-induced ash mortality will be implemented at each site to characterize how the loss of ash from these systems will impact native plant communities, the spread of invasive species, and site hydrology. In addition, the survival and growth of a mixture of planted tree seedlings will be evaluated to determine what species might be able to mitigate the ecological impacts of the loss of black ash from these forests. Results from this project will allow for predictions into how EAB will affect northern Minnesota's forests and will inform management recommendations for mitigating impacts of this exotic insect.

III. PROGRESS SUMMARY AS OF November 24, 2009: NA

IV. OUTLINE OF PROJECT RESULTS:

RESULT/ACTIVITY 1: Develop a network of research sites within black ash forests to assess impacts of EAB on biodiversity and productivity

Description: We will locate and establish 12 study sites within black ash forests in northern Minnesota. Experimental treatments at each site will include three levels of ash loss (retain all ash, simulated EAB mortality by girdling all ash, or harvest all ash) and two levels of planting (planting or no planting). Each experimental ash-loss treatment will be a minimum of 20 acres to allow for assessment of hydrological impacts of EAB.

Summary Budget Information for Result/Activity 1: ENRTF Budget: \$ 143,475
Amount Spent: \$ 0
Balance: \$ 143,475

Deliverable/Outcome	Completion Date	Budget
1. Work with MNDNR, USFS, and counties to identify black ash forest sites	October, 2010	\$25,500
2. Conduct pre-harvest measurements of forest conditions	November, 2010	\$87,360
3. Implement treatments (carry out timber sales and girdle trees)	March, 2012	\$30,615

Result Completion Date: March 2012

RESULT/ACTIVITY 2: Determine the impacts of ash mortality from EAB on native plant communities, survival and growth of possible replacement tree species, spread of invasive species, and hydrologic patterns

Description: To assess the impacts of EAB on native plants, tree regeneration, invasive species, and hydrology, we will plant seedlings and monitor their survival and growth, characterize the abundance of native and invasive plant species in unplanted areas, and assess changes in hydrology following ash mortality. Seedlings will consist of a mix of species adapted to lowland forest conditions, allowing us to address questions related to appropriate species for increasing the resiliency of ash swamps to EAB. Results concerning the impacts of ash mortality on native plant communities, tree regeneration, and hydrology will be summarized in public project reports and conveyed to managers through outreach activities.

Summary Budget Information for Result/Activity 2: ENRTF Budget: \$ 426,204
Amount Spent: \$ 0
Balance: \$ 426,204

Deliverable/Outcome	Completion Date	Budget
1. Plant seedlings and conduct post-harvest measurements	October, 2011	\$107,360
2. Assess plant communities, planted seedlings, and hydrology for 4 years	October, 2014	\$300,835
3. Develop and publish project summaries aimed at resource managers working with black ash swamps within the state	June, 2015	\$18,009

Result Completion Date: June 2015

RESULT/ACTIVITY 3: Determine potential for spread of EAB into northern Minnesota

Description: The potential for EAB to impact black ash communities in Minnesota hinges on the cold tolerance of this insect. We will conduct laboratory experiments investigating the tolerance of EAB larvae to winter temperatures commonly occurring in northern Minnesota. Findings from these experiments will be integrated into models predicting the potential spread of EAB throughout the state. Results concerning the cold tolerance and potential spread of EAB strategies will be summarized in public project reports and conveyed to managers through outreach activities.

Summary Budget Information for Result/Activity 3: ENRTF Budget: \$ 66,321
 Amount Spent: \$ 0
 Balance: \$ 66,321

Deliverable/Outcome	Completion Date	Budget
1. Determine the cold tolerance of EAB	November, 2012	\$34,200
2. Incorporate results into models of EAB spread	November, 2013	\$25,326
3. Publish project summaries aimed at resource managers working with black ash swamps within the state	June, 2014	\$6,795

Result Completion Date: June 2014

V. TOTAL ENRTF PROJECT BUDGET:

Personnel: \$589,000. These funds will be used to support salary and fringe for two graduate students; one for four years and the other for 2 years. Graduate fringe is budgeted at 0.7694 of salary load and includes tuition for the academic year, health care for the fiscal year, and social security and Medicare for 6.5 pay periods (summer). One of these graduate students will be responsible for collecting and analyzing vegetation data associated with Results 1 and 2, whereas the other graduate student will be responsible for Result 3. These funds are also for supporting salary and fringe (0.1812) for a post-doctoral research associate for four years. This post-doctoral research associate will be responsible for ecohydrological analyses and measurements associated with Results 1 and 2. Salary and fringe (0.3230) for a research associate for three years (0.5 FTE) is also budgeted. This research associate will be responsible for identifying field sites, overseeing treatment implementation, and coordinating field research crews. Finally, salary and fringe (0.0743) for two summer students is budgeted for four years to assist with field measurements associated with Results 1 and 2. Note ENRTF are not being used to pay any PI salaries.

Contracts: \$ 0

Equipment/Tools/Supplies: \$22,000. These funds will be used for buying equipment associated with Results 1 and 2. Equipment includes rebar for permanently marking plot centers (\$550), supplies for constructing wells for monitoring hydrology at each site (\$15500), Haglof distance measuring equipment (\$700), stake whiskers for marking subplots (\$110), calipers for measuring seedling growth (\$320), supplies for constructing frames for measuring understory vegetation (\$150), draw knives and pruning saws for girdling trees (\$1000), gloves for field crews girdling trees (\$60), diameter tapes for measuring overstory trees (\$150), and data loggers for micrometeorological measurements (\$3460)

Acquisition (Fee Title or Permanent Easements): \$ 0

Travel: \$25,000. Due to the high number of study sites and logistics associated with establishing the harvest treatments and baseline data collection, \$25,000 is budgeted for domestic travel within Minnesota. This money will be used to pay for mileage (75%) and lodging (25%) for researchers, the field technician, post-doc, graduate students, and undergraduate students. Mileage includes trips from UMN St. Paul campus to 12 field sites located across northern Minnesota.

Additional Budget Items: \$ 0

TOTAL ENRTF PROJECT BUDGET: \$636,000

Explanation of Capital Expenditures Greater Than \$3,500: NA

VI. PROJECT STRATEGY:

A. Project Partners: In addition to the Project Manager, other project team members are noted below.

Peter Reich
Department of Forest Resources
University of Minnesota
St. Paul, MN

Alan Ek
Department of Forest Resources
University of Minnesota
St. Paul, MN

Grant Domke
Department of Forest Resources
University of Minnesota
St. Paul, MN

Robert Slesak
Minnesota Forest Resources Council
St. Paul, MN

Brian Palik
USDA Forest Service
Northern Research Station
Grand Rapids, MN

Rob Venette
USDA Forest Service
Northern Research Station
St. Paul, MN

B. Project Impact and Long-term Strategy:

Due to the large component of Minnesota's forested landbase dominated by black ash systems, there is a critical need for research that can assess the potential impacts of EAB on our ash forests, as well as generate management strategies for maintaining the functioning of these systems, even after EAB has arrived. This project is intended to be a 5-year study. This time period is necessary to allow for research site identification, treatment implementation, and 4 years of post-treatment measurements. Importantly, having multiple measurement years to assess tree seedling survival and hydrological changes following ash mortality will be critical for generating well-informed management and conservation strategies aimed at minimizing the impacts of EAB on black ash swamps. This proposed project will build upon an existing project examining the decline of black ash within northern Minnesota established with \$160,000 in grants from the USDA Forest Service (USFS). Project participants are committed to long-term maintenance and monitoring of sites established in this proposed project. Although we anticipate subsequent proposals to LCCMR, we are also seeking additional funds from the USDA, US Forest Service Forest Health Monitoring Program, and the National Science Foundation

C. Other Funds Proposed to be Spent during the Project Period: University of Minnesota and US Forest Service North Central Research Station will provide in-kind support of 0.25 FTE for a grand total of \$107,000. In addition, \$160,000 of grants from the USDA Forest Service will be used towards Result 1.

D. Spending History:

VII. DISSEMINATION:

The final product of this project will be an interpretive report describing (a) the early impacts of black ash mortality on the native plant communities and hydrology of black ash forest systems in northern Minnesota, (b) the survival and growth of other tree species to conditions resulting from black ash mortality, and (c) predictive models of emerald ash borer spread based on cold tolerance and life cycle characteristics. This report will be made available on the internet as a Department of Forest Resources Staff Paper Report. In addition, several manuscripts will be written based on this research 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 management and forest health conferences, and notably to agency and individual participants in the Sustainable Forests Education Cooperative. All reports and

publications from this project will be made available via the Department of Forest Resources web site.

VIII. REPORTING REQUIREMENTS: Periodic workprogram progress reports will be submitted not later than January 2011, July 2011, January 2012, July 2012, January 2013, July 2013, January 2014, July 2014, and January 2015. A final workprogram report and associated products will be disseminated by June 30, 2015, or by the completion date as set in the appropriation

IX. RESEARCH PROJECTS: See attached addendum.

Attachment A: Budget Detail for 2010 Projects												
Project Title: Ecological and Hydrological Impacts of Emerald Ash Borer												
Project Manager Name: Anthony D'Amato												
Trust Fund Appropriation: \$636,000												
2010 Trust Fund Budget	<u>Result 1 Budget:</u>	Amount Spent (date)	Balance (date)	<u>Result 2 Budget:</u>	Amount Spent (date)	Balance (date)	<u>Result 3 Budget:</u>	Amount Spent (date)	Balance (date)	TOTAL BUDGET	TOTAL BALANCE	
	Develop a network of research sites within black ash forests to assess impacts of EAB on biodiversity and productivity	11/24/2009	11/24/2009	Determine the impacts of ash mortality from EAB on native plant communities, survival and growth of possible replacement tree species, spread of invasive species, and hydrologic patterns	11/24/2009	11/24/2009	Determine potential for spread of EAB into northern Minnesota	11/24/2009	11/24/2009			
BUDGET ITEM												
PERSONNEL: wages and benefits	Salary and fringe for two graduate students; one for four years and the other for 2 years. Graduate fringe is budgeted at 0.7694 of salary load and includes tuition for the academic year, health care for the fiscal year, and social security and Medicare for 6.5 pay periods (summer)	35,100	0	35,100	106,604	0	106,604	66,321	0	66,321	208,025	208,025
	Salary and fringe (0.1812) for a post-doctoral research associate for four years.	75,239	0	75,239	150,478	0	150,478				225,717	225,717
	Salary and fringe (0.3230) for a research associate for three years (0.5 FTE)	39,348	0	39,348	78,696	0	78,696				118,044	118,044
	Salary and fringe (0.0743) for two summer students for four years	9,304	0	9,304	27,910	0	27,910				37,214	37,214
	Non-capital Equipment / Tools Equipment includes rebar for permanently marking plot centers (\$550), supplies for constructing wells for monitoring hydrology at each site (\$15500), Haglof distance measuring equipment (\$700), stake whiskers for marking subplots (\$110), calipers for measuring seedling growth (\$320), supplies for constructing frames for measuring understory vegetation (\$150), draw knives and pruning saws for girdling trees (\$1000), gloves for field crew girdling trees (\$60), diameter tapes for measuring overstory trees (\$150), data loggers for micrometeorological measurements (\$3460)	6,000	0	6,000	16,000	0	16,000				22,000	22,000
	Travel expenses in Minnesota Due to the high number of study sites and logistics associated with establishing the harvest treatments and baseline data collection, \$25,000 is budgeted for domestic travel within Minnesota. This money will be used to pay for mileage (75%) and lodging (25%) for researchers, the field technician, post-doc, graduate students, and undergraduate students. Mileage includes trips from UMN St. Paul campus to 15 field sites located across northern Minnesota.	7,500	0	7,500	17,500	0	17,500				25,000	25,000
COLUMN TOTAL		\$172,491	\$0	\$172,491	\$397,188	\$0	\$397,188	\$66,321	\$0	\$66,321	\$636,000	\$636,000