TITLE: Evaluating Black Ash (*Fraxinus nigra*) Decline in the upper Mid-West

LOCATION: Minnesota, Michigan, Wisconsin

DURATION: Year 1 of 2-year project **FUNDING SOURCE:** Base

PROJECT LEADER: Brian Palik, USDA Forest Service, North Central Station, 218-326-7116, bpalik@fs.fed.us

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PROJECT OBJECTIVES: 1. Use FIA and FHM plot data to assess the regional extent of black ash decline in the upper Mid-West. 2. Relate decline occurrence and variation to mapped landscape-scale climatic, physiographic, and edaphic data. 3. Using results from objectives 1 and 2, conduct field evaluations of decline and mortality percentage within selected heavily impacted ecosystems. 4. For these on the ground surveys, quantify relationships between decline severity and cultural features, such as roads and forest management activity.

JUSTIFICATION: Our proposed project addresses the selection criteria as follows:

a. The project is directly linked to FHM detection monitoring, which is indicating widespread black ash decline in parts of the region;
b. Geographic scale: black ask is wide-spread in the mid-west and northeastern region. Our results will be useful for interpreting decline patterns over much of this region.
c. Biological impact and/or political importance. Black ash is a significant tree component of riverine and palustrine wetlands throughout the region. Its decline and widespread mortality will fundamentally alter the function of these ecosystems and result in a reduction in availability of a unique timber resource, as well as a valued source of wood for native American basketry.
d. Because the project will utilize available data, with only limited collection of new field data, it has a high probability of successful completion.

DESCRIPTION:

a. Background:

Black ash decline has been noted in the upper mid-west and the northeast recently and over the last decade (Livingston and White 1997; USDA Forest Service 2004). The favored hypothesis to explain this phenomenon is May drought (Livingston et al. 1995; Livingston and White 1997). It is at this time that ring-porous species, including black ash, fill new vessels prior to leaf expansion. Drought stress during this critical period greatly weakens the tree, leading to decline and ultimately mortality. The actual regional extent of decline is not well quantified, nor is there a good understanding of how decline varies within the region, or how landscape factors may predispose trees to stress. For example, the probability of drought stress varies as a function of climatic,

physiographic, and edaphic variation. Understanding if decline varies in relation to mapped spatial data that integrates these landscape characteristics will facilitate development of models to predict the occurrence of decline phenomena.

There are several regional factors that make understanding black ash decline more complex, but also a priority. First, black ash occurs in wetlands that once supported American elm. Loss of a second dominant tree species from these ecosystems would likely have consequences on ecosystem function. Being able to predict when and where loss may occur will be important ecologically. Second, the emerald ash borer (EAB) is now causing significant ash mortality in parts of the region. Despite best efforts to halt its spread, the possibility exists that this exotic pest will impact ash over a wider geographic area in the Lake States region. Understanding black ash decline prior to potential impact from EAB will be important for understanding the true ecological impact of this pest. Finally, mortality of black ash in wetlands often is associated with cultural features that disrupt site hydrology, e.g., roads that block flow across a wetland, causing one side of the road to be too wet. Understanding how site level factors contribute to black ash decline is important for understanding the severity of a regional, drought induced decline phenomenon.

b. Methods: Our project will utilize readily available data derived from FIA/FHM plots, as well as available mapped spatial data on landscape ecosystem. We will utilize existing FIA and FHM plot data to quantify black ash decline in Minnesota, Wisconsin, and Michigan (Objective 1). We will stratify sampling of plot data within regional landscape ecosystems in each state (e.g., Albert 1995 for Michigan) to quantify variation in decline as a function of regional ecosystem climate, physiography, and soil (Objective 2). We will use results from Objective 2 to select apparent highly impacted ecosystems in Minnesota for field evaluation, quantifying percent decline and mortality at selected sites (Objective 3). Finally, at the field locations, we will relate black ash decline severity (percent of tree impacted) to cultural features that may alter site hydrology, including road location and constructed drainage and recent timber management activities (Objective 4).

c. Products: This project will produce 1) maps of black ash decline and severity within Michigan, Wisconsin, and Minnesota, stratified within regional landscape ecosystems; 2) a predictive understanding of the relationship between decline probability and landscape-scale site characteristics (climate, physiography, soil); 3) on-the-ground assessments of actual decline and mortality severity within regional ecosystems that appear to be heavily impacted based on FIA/FHM data; and 4) guidance as to the importance of on-site cultural features at increasing decline probability.

d. Schedule of Activities: Year 1-Idenfiy university cooperator and graduate student; assemble regional and spatial data; analyze and summarize regional data; identify regional ecosystems having apparent high decline rates for selected field sampling. Year 2-Field sampling of black decline and mortality in selected ecosystems in MN; identification of cultural features potentially influencing hydrology at selected field sites;

analyze and summarize field data; report of comprehensive project results.

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR 1				
Administration	Salary		0.2 FTE	NCRS
	Overhead	$7680		
	Travel		$1500	NCRS
Procurements	Contracting	$32320		
	Equipment			
	Supplies			
Total		$40,000		
YEAR 2				
Administration	Salary		0.2 FTE	NCRS
	Overhead	$7680		
	Travel		$1500	NCRS
Procurements	Contracting	$32320		
	Equipment			
	Supplies			
Total		$40,000		
Project Total		$80,000	$3000+ 0.4 FTE	

Literature Cited

Albert, Dennis A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 250 pp.

Livingston, W. H. A. Hager, A. S. white, and D. Hobbins. 1995. Drought associated with brown ash dieback in Maine. Phytopathology 85: 1558.

Livingston, W. H., and A. S. White. 1997. May drought confirmed as likely cause of brown ash dieback in Maine. Phytopathology 87: 559.

U.S.D.A. Forest Service. 2004. Lake States forest health watch. USDA Forest Service, Northeastern Area State and Private Forestry. August 1, 2004.