

TITLE: Validation of FHM/FIA data for predicting dogwood occurrence in conjunction with a dogwood anthracnose hazard risk rating system

LOCATION: All states within US Forest Service Regions 8 & 9

DURATION: Year 3 of 3-year project **FUNDING SOURCE:** None

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PROJECT OBJECTIVES:

The objective of this project will be to utilize Forest Health Monitoring and Forest Inventory and Analysis (FHM/FIA) data to predict *Cornus florida* L. (Flowering dogwood) population trends as it relates to the impacts and distribution of dogwood anthracnose (causal organism: *Discula destructiva* Redlin). Primary objectives will be to: 1) determine historical numbers and population structures of dogwood in eastern North America based on FIA data; 2) determine current numbers and population structures of dogwood and the relationship to site factors implicated in disease severity (including, but not limited to, site index, slope, aspect, stand age, distance to opening or stream); 3) predict future dogwood mortality based upon current population structure; 4) determine the proportion of variability of dogwood occurrence that can be explained based upon site factors thought to be important in relation to dogwood anthracnose versus tree-level FHM/FIA data collected about dogwoods such as crown position and light exposure; and, 5) validate final disease hazard risk and impact rating predictions by stratifying linear transect cruises through risk areas ranging from none-to-low-, moderate-, high-, or severe-hazard.

JUSTIFICATION:

This project addresses two forest health indicators for flowering dogwood tracked through the FHM program: 1) deviations from expected dogwood mortality based on the FHM risk map and, 2) effect of fragmentation on disease severity by measuring distance from pith to crown openings. These will be addressed by FHM/FIA database mining and comparing these results to a hazard and impact rating system. The results will continue to be ground-truthed to resolve the regional impacts of dogwood anthracnose where dogwoods still occur across the

forested landscape. The intention of this project is to demonstrate whether data collected routinely as part of regular FHM/FIA fieldwork incorporated with existing hazard model structure is sufficient to explain historical dogwood population trends and project them into the future within known confidence intervals.

DESCRIPTION:

a. Background:

Preliminary evaluations of flowering dogwood population numbers using Mapmaker Program version 1.7 of the FIA database Retrieval System for Kentucky, Maryland, North Carolina, Pennsylvania, Tennessee, and West Virginia showed that dogwoods have declined by approximately 50% since the late 1980's (unpublished data). For example, the total number of flowering dogwoods one-inch in diameter and larger has declined from 938,000,000 trees in 1984 to approximately 434,000,000 trees in 2002 in North Carolina. This is of importance to landowners and forest managers because dogwood is an important shade, ornamental and wildlife tree and during the past 20 to 30 years dogwood has been suffering the impacts of dogwood anthracnose, an introduced disease caused by *Discula destructiva*. Given that the disease has been established throughout much of eastern North America during that period, it is timely and critical that the full impacts of dogwood anthracnose be determined, stand conditions where dogwoods still thrive be described to both guide management efforts and determine areas of potential disease-resistance, and the potential for future disease impacts be described based upon current impacts from dogwood anthracnose. This project proposes to address all of three of these issues by statistically and spatially within a Geographic Information System (GIS) comparing past and existing FHM/FIA dogwood data to permanently maintained dogwood anthracnose impact plot data and to current dogwood occurrence in relation to an existing dogwood anthracnose hazard and impact rating system previously developed by Forest Health Protection.

b. Methods:

This project is proposed to consist of three main activities:

1. First, dogwood anthracnose hazard rating and impact rating maps will be produced for eastern North America previously developed but never validated and slightly revised and updated using current GIS tools available, such as newer USGS digital elevation models.
2. The second activity will involve FHM/FIA database mining to determine past and current dogwood population trends and where dogwoods occur within the landscape in relation to crown condition and site factors.
3. The last activity will consist of linear transects to inventory dogwood number and condition in selected forested locations in areas modeled in hazard rating from none- to low-moderate-, high- and severe-hazard to dogwood anthracnose.

FHM/FIA data will be analyzed statistically to determine the extent of variability that can be attributed to each of several site factors thought to be important to disease development, such as the database allows. FHM/FIA data will be further grouped in broad ecological units to describe the effects of dogwood anthracnose across forested ecosystems of eastern North America and the potential for impacts on forest management activities and wildlife production. All data will also be entered into a GIS system for production of maps to graphically illustrate past dogwood numbers, current dogwood numbers, hazard rating and impact rating of dogwood anthracnose, and predicted future dogwood abundance and changes.

c. Products:

The primary product from this project will be a description of historical changes in dogwood, and a characterization of those changes through development of a dogwood anthracnose risk rating model.

1. Poster to be presented at the following national FHM meeting.
2. Updated information for following Summary Report: Forest Health Monitoring in the South, yearly report
3. Technology transfer through presentations at meetings/training sessions such as the Southwide Forest Pathology Workshop
4. Updated information on dogwood anthracnose for the Forest Health Protection website
5. FHM 'fact sheet' format summary of project
6. Cooperation and technology transfer to governmental and NGO wildlife organizations

d. Schedule of Activities:

1. Spring & summer 2006: All field work completed.
2. Winter & spring 2007: Publication of final report, map, poster, FHM fact sheet, production of materials for Forest Service website(s) and future extension and training sessions, such as photographs and a PowerPoint slideshow summation of project.

e. Progress/Accomplishments:

As of November 1, 2006 this project has not been finalized so we are requesting a one-year extension to this project and with no additional funding required. The current status of the whole project however, is completion no later than FY2007 (October 31, 2007). Data for all forested FIA plots that contained at least one living or dead dogwood tree for the states of Maryland, North Carolina, Tennessee, Virginia and West Virginia have been "cleaned up" for analysis with SAS but the statistical tests have not been completed. The largest obstacle blocking timely completion of this project was the enormous task of tracking individual FIA plots across three measurement cycles in five states, all of which used differing methods throughout the three cycles. This data and plot reconciliation has been completed by Bill Smith but took approximately 18 months longer than was expected as the enormity of the task was far greater than was realized at the onset of this project. All field data has been collected and the data analyzed. Our preliminary findings are that dramatic changes have occurred to the population structures of dogwoods throughout their range and that future losses are expected to continue to be severe but also environmentally predictable.

COSTS:

	Item	Prior FHM EM Funding	Requested FHM EM Funding	Other- Source Funding	Source
YEAR		2005-2006	2007		
Administration	Salary				NFS
	Overhead				
	Travel				FHP
Procurements	Contracting (Validation, Surveying)				RTP NC NPS
	Publication				
	Supplies				FHP
		\$50,000	\$0		