

Incidence and Impact of Oak Decline in Western Virginia, 1986

Abstract

Oak decline incidence, distribution, and losses in the Northern Piedmont and Mountain Survey Units of Virginia were estimated from data collected during a 1986 inventory of Virginia's forests. Oak decline occurred on 1.1 million acres, and it was estimated to cause an annual mortality between 7.4 and 13.8 million cubic feet since the previous survey in 1977. Incidence and mortality volume were greatest in the Northern Mountain Unit. Oak decline affected about one-fourth of the oak stands on National Forests. Incidence was lower on other ownerships. Analyses of associations of species composition, site quality, age, and physiography with oak decline indicate that hazard rating may be possible. Highest incidence was associated with average to poor site quality, advanced stand age, xeric landforms, and stands with a high percentage of oak. Volume losses were greatest on high-quality sites and mesic landforms. The site index/age ratio appears valuable as a measure of physiological age and may be a better oak decline predictor than either site index or age alone. Reduced cutting, lengthened rotations, and problems with regenerating oaks are causes for concern, especially on public land, over whether oaks will be a major component of new stands on affected areas.

Keywords: *Quercus*, mortality, volume loss, forest management, tree age, stand condition, decline.

Introduction

Oak decline is a complex disease involving interactions between environmental and biological stresses and subsequent attacks by secondary pests. It causes crown dieback, reduces radial growth, and kills trees. Species in the red oak group are damaged more than those in the white oak group, and black and scarlet oak are most prone to mortality (Starkey and others 1989).

Since the early 1980's, reports of oak decline from Arkansas to Virginia have been increasing (Starkey and others 1989). Wide distribution, high timber value, and contributions to wildlife habitat make the oaks the most important group of upland hardwood tree species in the Southern United States. More than 65 million acres of southern timberland (35 percent of the total) are occupied by upland hardwood forest types in which oak species predominate (USDA Forest Service 1988). Oak decline is currently the most widespread disease problem in southern oak forests, but its distribution and the timber losses it causes have not been well documented.

The fifth forest inventory of Virginia was conducted by the Southeastern Forest Experiment Station's Forest Inventory and Analysis Work Unit (FIA) in 1986. This inventory provided an opportunity to

estimate oak decline incidence and losses over a wide geographic area. The objectives of the analyses were: (1) to determine the geographic distribution of oak decline in three Survey Units in western Virginia, (2) to estimate the acreage affected and the volume of timber killed, and (3) to examine relationships between disease severity and stand age, site quality, and physiography. One underlying purpose of the third objective was to identify promising factors for classifying vulnerability and risk in oak stands.

Description of Oak Decline

The disease generally progresses slowly over several years. It begins with a long-term predisposing stress such as prolonged drought or advanced age. Stressed trees are often subsequently damaged by short-term inciting factors such as insect defoliation, spring frosts, or acute drought. In their weakened condition, the trees may be attacked by insects and diseases that normally do not invade healthy trees (Manion 1981). At this point, classic decline symptoms appear. The most visible symptom of decline-affected trees is progressive dying back from the ends of branches, beginning at the top and outside of the crown and proceeding downward and inward. Less noticeable is a reduction in radial growth that may precede crown symptoms by years or even decades (Tainter and others 1990). Dieback may continue for several years and often terminates in mortality of affected trees. Local physiography and tree species composition may influence the patterns of damage in affected areas. The most important underlying factor when resource damage is severe may be a tree population dominated by senescent overstory oaks lacking in vigor (Mueller-Dombois and others 1983).

Oak decline can be distinguished from other diseases by: (1) relatively slow but progressive terminal branch dieback; (2) branch and bole sprouts and stagheaded crowns; (3) patterns of mortality related to site features, tree stress, and attacks of secondary insects and diseases; and (4) tree mortality usually peaking 2 to 5 years after stress (Wargo and others 1983). These characteristics were used by FIA crews to identify oak decline. Only dominant and codominant trees were considered in order to eliminate symptoms resembling decline but caused by suppression.