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Incidence and Impact of Damage to and Mortality Trends of Florida's Timber, 1987

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March 1994

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Foreword

The Southeastern Forest Experiment Station, headquartered in Asheville, NC, periodically inventories and evaluates forest resources in Florida, Georgia, North Carolina, South Carolina, and Virginia. The Southern Region, Forest Health Staff unit, provides training, field support, and evaluation of the data on forest insects, diseases, and other damaging agents.

The forest damage information presented here was gathered during the fifth and sixth inventories of Florida's forest resources. More information was gathered in the latest inventory than in previous ones. This information makes it possible to estimate damage incidence and trends in mortality.

This Bulletin describes damage incidence and mortality trends, but does not recommend specific prevention measures. Residents of Florida who need technical assistance with forestry problems on State and private land should contact:

State Forester
Florida Division of Forestry
3125 Conner Boulevard
Tallahassee, FL 32699

Abstract

In 1987, Florida had 15.0 million acres of timberland, containing 20 billion cubic feet of timber. Approximately 190 million cubic feet of timber were lost annually to mortality and cull between 1980 and 1987. The annual cost of this loss was $78.1 million. Among broad management classes–pine plantation, natural pine, oak-pine, upland hardwoods, and bottomland hardwoods–the greatest loss occurred in bottomland hardwood stands. Approximately half of the loss occurred in nonindustrial private forests. Fusiform rust caused the greatest damage to pines, but weather and logging activities also caused serious volume losses. Hardwood borers and basal defects were the most significant causes of damage in sawtimber-size hardwoods. Increases in hardwood and softwood sawtimber mortality occurred across all management classes between 1980 and 1987.

Keywords: Insect damage, disease damage, fusiform rust, bark beetles, forest insects, forest diseases.

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Forest Inventory and Analysis (FIA) crews surveyed Florida's forests in 1980 (fifth survey) and 1987 (sixth survey), and recorded damage to and mortality of sample trees. Damaging agents and causes of mortality were identified where possible. This Bulletin reports conditions observed during the sixth survey, the associated costs, and changes in mortality between the two surveys. It was not possible to directly compare damage trends between the two surveys because new damage categories were added in the sixth survey.

Inventory Procedures

Inventory procedures have been described in detail by the USDA Forest Service (1985). Some of them influence the kinds of information that can be compiled and the ways in which data can be interpreted. This Bulletin explains procedures and definitions that affect the understanding of survey results.

In each inventory, plots are visited only once, and the visit may take place at any time of year. Records, therefore, are kept only for damaging agents that produce symptoms or signs in all seasons. The agents or damage must be easily identified, and trees must be at least 1 inch in diameter at breast height (d.b.h.) to be included in the survey. Effects of seedling diseases (for example, brown-spot needle blight of longleaf pine) and of hardwood defoliation (which is not apparent in winter) are not included in this survey. On the basis of these limitations, the following damaging agents were recognized in the 1987 survey:

Insects
- Bark beetles
- Hardwood borers
- Other insects

Fire

Animals
- Beaver
- Sapsucker

Weather
- Flooding
- Lightning

Diseases
- Basal defects
- Branch stubs
- Fusiform rust
- Other rusts
- Hardwood cankers
- Littleleaf disease
- Root rots
- Other diseases

Other damaging agents
- Dieback
- Form (damaging)
- Damage caused by people
- Suppression and stagnation
- Turpentining
- Logging and related

The "Definitions" section of this Bulletin describes the signs and symptoms associated with these categories.

Forest Health trained the crews in the use of a Damage Identification Handbook prior to the field survey. During the survey, data collected by the crews were field-checked to ensure accuracy and consistency. Crew members also received specimen kits and forms to aid in identifying types of damage. It is important, however, to recognize that the data reported here were gathered by people experienced in forest inventory rather than by entomologists and pathologists.

Three factors cause the incidence and impact data to be understated. First, as explained previously, certain types of damage, such as that by hardwood defoliators, are excluded. Second, the damage caused by some agents, such as root-decay organisms, is extremely difficult to identify. Third, some damaging agents, such as southern pine beetles, cause trees to die rapidly, and inventory crews viewing the trees up to 7 years later may be unable to determine the cause of death. As a result, mortality estimates are accurate, but the numbers of deaths that can be attributed to specific agents are underestimated.

In spite of these problems, data reported here are important. They show that losses are significant, and they may help managers to plan forest protection programs.

Sampling Procedures

The inventory employs a sampling procedure designed to provide reliable statistics primarily for the entire State, for large groups of counties, and for tree species with relatively large total volumes in the State. Accordingly, errors associated with relatively minor species like American beech exceed those for major species like slash pine. Procedures are documented in "Florida's Forests" (Bechtold and others 1990).

Computations

Tree-size categories were: 1.0 to 5.0 inches d.b.h. for saplings; 5.0 to 9.0 inches d.b.h. for softwood poles; 5.0 to 11.0 inches d.b.h. for hardwood poles; 9.0 inches d.b.h. and above for softwood sawtimber; and 11.0 inches d.b.h. and above for hardwood sawtimber.

Merchantable and total cubic volumes were estimated with volume prediction equations. These equations were generated from volume measurements of standing and felled trees in Florida and from similar measurements of other trees throughout the Southeast.

Symptoms used to identify the causes of damage to living trees on the sample plots are described in the "Definitions" section. The percentage of incidence and the volume of cull associated with each damage class were determined for each species. Damage entries do not imply total-tree loss. The volume loss was determined by totaling the volume of cull associated with each damaging agent, by species. Only a part of the volume lost (due to cull) would fail to qualify for firewood or other commercial uses.

Although mortality of individual trees often could not be attributed to a specific agent, the volume loss from mortality was accurate for each tree species on each plot. By using total mortality by tree species, it was possible to calculate total volume loss for poles and sawtimber by species.

This Bulletin presents mortality and cull losses in both tabular and graphic form. Volumes and values of loss are given for each class of ownership (National Forest, other public, forest industry, and nonindustrial private) and broad management class (natural pine; pine plantation; oak-pine; and upland and bottomland hardwoods).

To estimate the value of the loss, an average age of harvest was calculated from FIA "removal" data by age, ownership, and species category. For each age class and type of loss, FIA volume loss data (in thousands of cubic feet) were converted to volumes per acre and "grown" to the assumed rotation age, based on the growth factors provided in tables 3.15-3.20 in "The South's Fourth Forest: Alternatives for the Future" (USDA Forest Service 1988). This process treats each age and ownership class as a group of acres in that class and estimates future volume affected by mortality with species-growth factors. Because large areas are involved, estimation of volume growth is not very precise. It was assumed that overestimates of volume due to the slow growth of trees in fully stocked stands are canceled by underestimates of volume in trees of a particular age class in understocked stands.

If the age class for volume loss was greater than the assumed rotation age, then growth was not calculated; it was assumed that the damaged trees could be harvested immediately. The resulting future harvest volumes were converted to board feet and cords with divisor factors of 200 cubic feet per thousand board feet and 90 cubic feet per cord.

Average statewide stumpage prices for the species and year of the FIA survey were taken from Timber Mart-South (Norris 1987) and increased from the year of the survey to 2030 by the real rates of increase for hardwood and softwood stumpage estimated in "The South's Fourth Forest: Alternatives for the Future." No further real increase in stumpage was assumed to occur after 2030. The resulting future stumpage values were multiplied by the estimated harvest volumes at rotation age.

All ownership classes except forest industry were assumed to have only a sawtimber product at rotation age. For forest industry land, a proportion of the softwood volume less than 25 years old and hardwood volume less than 30 years old was considered to be pulpwood.

Each age class future value was discounted to the present at a 4-percent real rate of interest and a time factor that equaled the difference between the assumed rotation age and the age class. Values of loss are based on an assumption that there would be a market available for the lost timber.

The analysis excluded timber on steep slopes where the cost of logging may be prohibitive. Thus, expected volume losses are conservative in all categories. Timber was assumed to have value only in areas where logging is

economically feasible. Furthermore, the analysis ignored the possibilities of ingrowth resulting from trees dying and accelerated growth of residual stems caused by mortality.

Total volumes and present values for mortality and cull loss were estimated for the 7.7 years between remeasurements. The annuity amount was calculated for the present value of loss over the 7.7 years to convert to an annual basis.

Mortality can be assumed to have occurred between surveys; however, cull loss is often a cumulative volume, and incremental loss between survey periods cannot be estimated until two survey periods are compared. For Florida, methods used for the fifth and sixth survey periods do not allow direct comparisons between the surveys. Data exhibited in the "Economic Losses" section are based on annual averages.

Results

In 1987, Florida had 15.0 million acres of timberland–4 percent less than in 1980. The survey results are presented in detailed tables that report mortality and cull by broad management class, ownership class, predominant tree species, and damaging agent. Interpreting some of the numbers presented in these tables requires information on forest acreage by broad management class and forest type. Removal figures will not equal the reported State totals, because the removals in this report do not include land clearing or timberland reclassified to reserved status. Similarly, the mortality figures will not equal the reported State totals because of rounding discrepancies. This information is provided for each management class. The following results are presented by broad management type.

Pine Plantation

Figure 1 shows the distribution of pine plantation plots across Florida. Between surveys, the aren of pine plantation increased from 3.3 to 4.0 million acres (fig. 2). Increases in pine plantation acreage are attributable to planting on former farmland and to the conversion of harvested stands of various types to plantations.

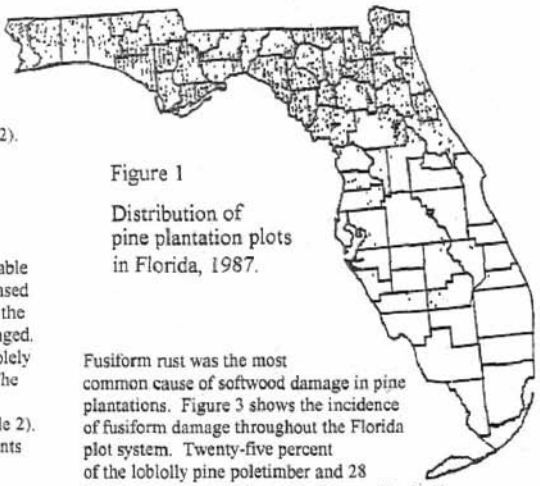

Figure 1

Distribution of pine plantation plots in Florida, 1987.

The total population of trees in the pine plantation management class increased between 1980 and 1987 (table 1). In 1987, the percentage of trees with damage increased with tree size: 12 percent of the saplings, 15 percent of the poletimber, and 18 percent of the sawtimber were damaged. The volume of associated cull is that which is caused solely by damaging agents that result in cubic or form cull. The associated cull volumes were 407,000 cubic feet for poletimber and 2,328,000 cubic feet for sawtimber (table 2). The large volume of cull associated with damaging agents in the sawtimber category is probably due to the high amount of fusiform rust reported in 1987 (table 3).

Table 3 shows the percentage of trees damaged in the pine plantation management class, by predominant tree species and type of damage. A type of damage was entered in the table if at least 5 percent of the trees in one of the size classes had that type of damage. Form damage, suppression, and stagnation were excluded from table 3 because they seldom indicate a serious problem. In a dense stand, some suppression of overtopped trees should be expected.

Fusiform rust was the most common cause of softwood damage in pine plantations. Figure 3 shows the incidence of fusiform damage throughout the Florida plot system. Twenty-five percent of the loblolly pine poletimber and 28 percent of the sawtimber were damaged by fusiform rust. Ten percent of the sand pine sawtimber trees suffered from diseases other than fusiform rust. These diseases included eastern gall rust and heart rot (Burns and Honkala 1990).

Table 4 shows annual removals and mortality, by tree species, for the pine plantation management class for 1980 and 1987. Increases in poletimber and sawtimber removals of all major tree species occurred between surveys. A significant amount of mortality in the poletimber population may be attributed to beetle outbreaks.

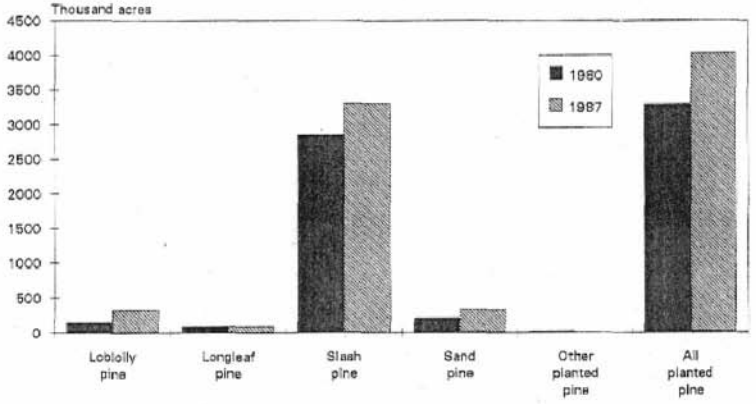

Figure 2–Distribution of timberland in pine plantation, by predominant tree species, in Florida, 1980 and 1987.

Brantley, Elizabeth A.; Redmond, Clair; Thompson, Michael. 1994. Incidence and impact of damage to and mortality trends of Florida's timber, 1987. Resour. Bull. SE-143. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 29 pp.

Incidence and impact of 22 damage types and mortality trends to the forest resources of Florida in 1987 are described. Acres affected, volume losses, geographic distribution, and economic impact are discussed. About 190 million cubic feet of timber were lost per year from 1980 to 1987, with an estimated annual dollar loss of $78.1 million.

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