REPORT NO. 72-2-9

OCTOBER, 1971
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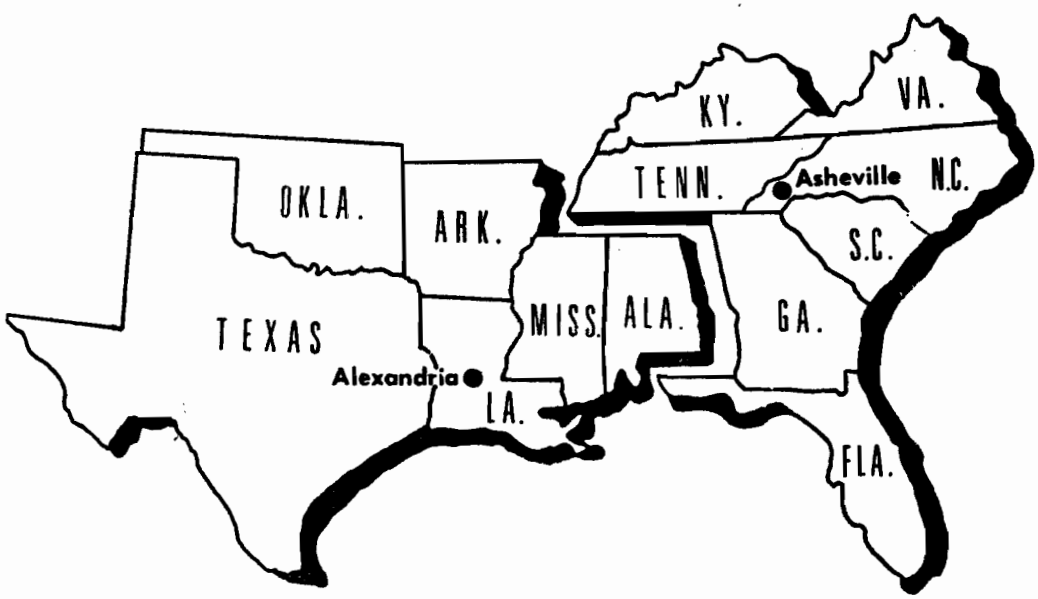
U. S. FOREST SERVICE
Pineville, Louisiana



U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
SOUTHEASTERN AREA, STATE AND PRIVATE FORESTRY
FOREST PEST MANAGEMENT GROUP

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ALABAMA LOBLOLLY PINE DIE-OFF EVALUATION

by

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ABSTRACT

A condition causing more than normal mortality in sawtimber sized loblolly pine trees on recently cut-over areas was first noticed in west central Alabama in 1959. Visible symptoms consisted of needle yellowing, shortening of needles, and reduced needle retention on the branches. In 1966, 24 one-quarter acre plots were established in the area to evaluate the condition. The condition of the dominant and codominant plot trees in 1966 is compared with the same trees in 1971. Analysis of the data indicates that the conditions causing the mortality had largely disappeared by the 1971 readings. Average mortality on the plots was less than one percent per year during the 5-year observation period.

INTRODUCTION

From time to time tree mortality or less severe symptoms occur in an area, or within a species, for which there is no apparent cause. This condition was true in the case of sweetgum blight and oak decline. A similar condition existed for loblolly pine in central Alabama. Since 1959, personnel of the Oakmulgee and Tuscaloosa Ranger Districts of the Talladega National Forest in Alabama have been concerned with more than normal mortality of loblolly pine *Pinus taeda*. According to reports, this mortality occurred most frequently in sawtimber sized trees in recently

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cut-over areas. Visible symptoms observed on dying trees are chlorotic needles, a tendency for the needles to be short, and short needle retention on live twigs. The condition appeared to be non-infectious as trees adjacent to each other may have one severely affected and the other healthy. Scientists from several agencies, including the Southern Forest Experiment Station, Southeastern Forest Experiment Station, Alabama National Forests, and Insect and Disease Control Offices, have visited and examined the affected area. This particular condition has been named loblolly pine die-off. Cursory examination by scientists from the above disciplines did not reveal any causal agent.

Initial causes of the condition considered were temperature, precipitation, and soil. Consideration of the temperature and precipitation patterns did not reveal any unusual periods of excessive or deficient rainfall or temperature fluctuations. An examination by soil scientists revealed that some of the loblolly pine in the area were growing on sites better suited to hardwoods. Excavation of roots revealed that there was excessive dying of feeder roots on some of the affected trees, but it was not known if this condition preceded or followed exhibition of top symptoms. Trees showing symptoms of die-off did not show any dramatic reduction in growth after inception of symptoms.

METHODS FOR EVALUATION

After preliminary observations it was decided to evaluate the condition by establishing plots in order to study individual trees for a period of five years. Twenty-four one-quarter acre plots were selected and established in the latter part of 1965 and early 1966. The plots were selected on the basis of amount of die-off present, with one-half of the plots established on dry sites and one-half on lower moist sites. Tree age on the plots ranged from 42 to 65 years.

The work plan called for data to be taken on the plots each year in February. The evaluation of symptoms was based on a classification of the foliage condition of the trees, similar to the one used in littleleaf classification. In order to obtain reliable data on the foliage, selected twigs were shot from the upper one-third of the crown using buckshot in a 20-gauge shotgun. The first data were taken on these plots in February 1966. Field data were taken only on the dominant and codominant trees on the plots. At each examination data were taken on needle color, needle length, and needle retention on the green twigs. Trees on these plots retained only the current year's needles. The values recorded for each measurement were added and each tree was then classified as being in one of five condition classes (Table 1).

TABLE 1

SYMPTOM CLASSIFICATION FOR LOBLOLLY PINE DIE-OFF

Needle Color	Green	0
	Greenish-yellow	.7
	Yellow	1.2
Needle Length	6.0" +	0
	5.0" - 5.9"	.5
	3.0" - 4.9"	1.0
	1.0" - 2.9"	1.5
Needle Retention[1/]	4.0" +	0
	3.0" - 3.9"	1.0
	2.0" - 2.9"	1.7
	1.0" - 1.9"	2.4

When the values of these three characters are added together, the ratings called tree conditions are:

Tree Condition		
	0 - 1.9	Class 1 - Healthy
	2.0 - 2.9	Class 2 - Light
	3.0 - 3.7	Class 3 - Moderate
	3.8 - 4.9	Class 4 - Severe
	5.0	Class 5 - Dead

1/ Needle retention is only for current year's needles.

RESULTS AND DISCUSSION

It is the purpose of this report to compare the data taken in 1966 with that taken in 1971. At the beginning of the evaluation there were 339 dominant and codominant trees on the 24 plots. During the period 1966-71, several trees died from causes other than die-off. In 1971, there were 328 trees that had been observed throughout the study. Figure 1 shows one of the plots in 1966 and again in 1971.

Table 2 shows the number of trees in each of the five condition classes in 1966 and in 1971. A close examination of the table shows that 6 plots show no difference, 13 plots are in better condition and 5 plots are worse. On an individual tree basis, 179 trees had improved, 53 were the same, and 96 had become worse. During the five year study period, a total of 14 trees died that could not be attributed to bark beetles, *Fomes annosus*, lightning, or other common causes. It is assumed that these trees died of the condition known as loblolly pine die-off.

During the 1971 examination, conks of *F. annosus* were found on old stumps on 10 of the plots, while eight plots had *F. annosus* near the plots. This condition is common following thinning or logging in pine stands. In spite of the presence of *F. annosus* on or near these plots, it is not believed that annosus is responsible for the decadent condition. This is not to say that *F. annosus* is not responsible for an occasional dead tree. While *Phytophthora cinnamomi* was isolated from the soil on some of the plots, the primary cause of the deterioration is not believed to be littleleaf. Shortleaf, while not common on the plots, did not appear affected where it was found.

As this deteriorated condition is apparently not caused by *F. annosus*, littleleaf, insects, foliage diseases, or heartrots, it is reasonable to assume that some of the loblolly pine in the Centerville, Alabama area is growing off site, and that the rotation age of such pine is considerably below that of loblolly growing on a good loblolly site. Soil scientists suggested that some of the poorly drained soils on which loblolly was growing was better adapted for hardwoods. The four percent mortality figure over a five year period is not considered unusual, as this is less than one percent per year. Some mortality can be expected in stands of this age. As the 1971 data shows considerable improvement over that of 1966 (Figure 2), it appears that this condition may have been caused by unusual physiological conditions that are presently being alleviated. No attempt is being made to pinpoint the cause of this abnormal mortality other than to say that the cause has largely disappeared.

A

B

Figure 1. Evaluation Plot Number 8. A. Plot as it appeared in 1966. B. Plot as it appeared in 1971. Although plot condition has deteriorated, surviving trees in photo appear in as good or better condition than in 1966.

TABLE 2

1966 AND 1971 TREE CONDITIONS ON 24 LOBLOLLY DIE-OFF EVALUATION PLOTS

Plot No.	Number of Trees	1966					1971				
		Healthy	Light	Moderate	Severe	Dead	Healthy	Light	Moderate	Severe	Dead
1	12	6	5	1	0	0	5	6	1	0	0
2	14	5	4	4	1	0	8	4	0	1	1
3	16	6	2	3	5	0	7	6	3	0	0
4	8	2	2	2	2	0	7	0	1	0	0
5	13	6	2	2	3	0	7	1	2	0	3
6	21	5	11	5	0	0	16	4	1	0	0
7	11	4	3	4	0	0	5	6	0	0	0
8	9	1	3	4	1	0	3	2	1	0	3
9	19	6	7	4	2	0	15	4	0	0	0
10	8	3	3	2	0	0	3	4	1	0	0
11	12	3	3	3	3	0	8	4	0	0	0
12	3	2	0	1	0	0	1	1	1	0	0
13	21	10	5	6	0	0	17	4	0	0	0
14	19	3	9	5	2	0	4	13	2	0	0
15	11	1	4	4	2	0	6	5	0	0	0
16	28	16	9	2	1	0	17	7	2	0	2
17	23	7	6	8	2	0	8	8	5	2	0
18	6	2	2	2	0	0	4	2	0	0	0
19	14	9	2	3	0	0	12	1	1	0	0
20	10	4	3	2	1	0	5	5	0	0	0
21	14	7	3	4	0	0	7	7	0	0	0
22	16	7	3	4	2	0	7	7	0	1	1
23	9	1	0	6	2	0	1	6	0	0	2
24	11	2	2	4	3	0	0	5	1	3	2
Total	328	118	93	85	32	0	173	112	22	7	14

Figure 2. Evaluation Plot Number 3. This plot was in poor condition in 1966 but this 1971 photo shows most trees to be healthy.

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Appreciation is extended to personnel of the Alabama National Forests for their help in establishing plots and taking data, and to H. D. Brown, currently with the St. Paul, Minnesota Pest Control Office for his participation.

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