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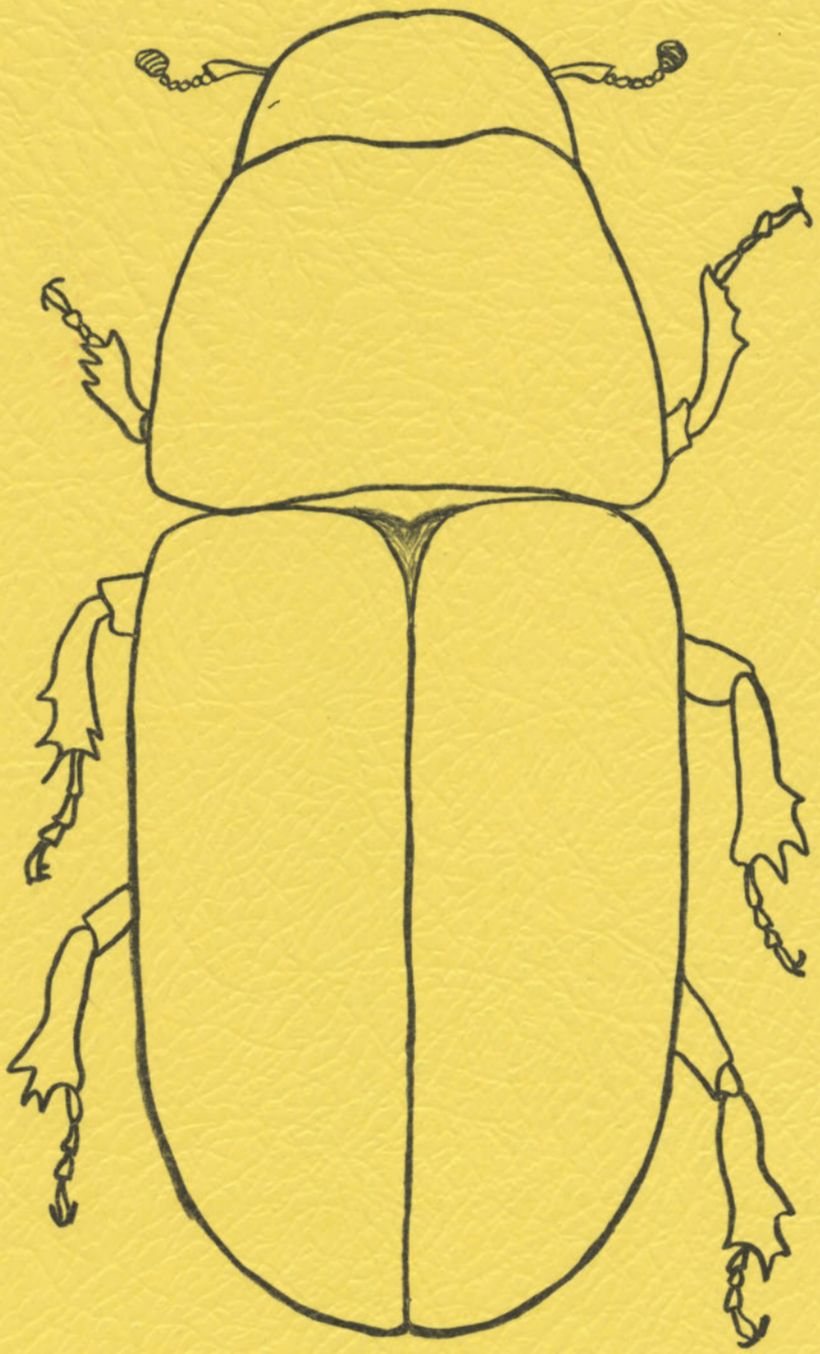

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EVALUATION OF BLACK TURPENTINE BEETLE INFESTATIONS ON SAND HILLS STATE FOREST IN SOUTH CAROLINA

By

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ABSTRACT

Aerial sketch map and ground surveys of Sand Hills State Forest located in northeastern South Carolina indicate black turpentine beetle (Dendroctonus terebrans Oliv.) activity to be approaching epidemic levels. Survey data analysis reveals that there are 12.2 spots and 63.5 infested trees per M acres of host type on the 92,000 acre forest. Timber losses estimated from the aerial and ground phases of the survey are 10,537 board feet of sawtimber and 2.2 cords of pulpwood per M acres of host type. Prompt removal of infested material through commercial sales is recommended throughout the forest.

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INTRODUCTION

The black turpentine beetle has always presented a slight problem on Sand Hills State Forest, but in June and July, 1970 Commission foresters in the area recognized an apparent, above normal increase in the population. It was observed that the majority of the trees in the spots they were encountering showed no signs of fading or reddening.

After delaying two months, hoping that a greater percentage of the attacked trees would by then be displaying discoloration symptoms, the aerial sketch map survey was performed on September 24 and 25, 1970. The subsequent ground survey was conducted from September 26 through October 23, 1970. Participants in the surveys included personnel of the S. C. State Commission of Forestry from Sand Hills State Forest, Columbia and Camden District offices, and P. J. Barry, Entomologist with the Division of Forest Pest Control in Asheville, N. C. The purpose of this survey was to evaluate pine bark beetle infestations, and primarily those of the black turpentine beetle, and estimate mortality caused by them.

SURVEY METHODS

A Cessna, Model 172 aircraft was contracted to complete the aerial sketch map survey. The crew consisted of a pilot, a tracker, and two observers. Aircraft speed was maintained at approximately 90 m.p.h. throughout the survey at an altitude of 800 - 1,000 feet above sea level. Twenty-six north-south flight lines spaced at one mile intervals gave 100 percent survey coverage. Observers recorded the location and estimated the number of red and fading pine trees for a distance of one-half mile on their respective sides of the aircraft.

Approximately 19 percent of the total number of spots recorded during the aerial survey phase were examined during the ground survey to determine the causal agents involved, obtain mortality data, and evaluate the bark beetle population.

RESULTS

The survey encompassed 92,000 gross acres (see Fig. 1), of which 69,500 were considered host type.[2/] A total of 436 spots containing an estimated 1045 trees were recorded during the aerial survey (see Table 1). Correcting these figures for observer errors according to Aldrich et al., (1958) and air to ground ratio factors,[3/] the original aerial survey data was expanded to an estimated 851 spots containing 8122 trees.

2/ Defined as any stand in which 25 percent or more of the stems are pine.

3/ Air to ground ratio factor is defined as the factor obtained from the ratio of the total trees estimated in a given spot size category during the aerial survey phase to the total trees recorded for that spot size category during the ground survey phase.

During the ground survey, examinations were made on 82 spots containing 1058 trees, 575 of which were currently infested with bark beetles (see Table 2). The black turpentine beetle was the primary causal agent in 42 spots with ips engraver beetles (Ips spp.) being responsible for the remaining 40 spots.

Pine host species attacked were pond (Pinus serotina Michx.), longleaf (P. palustris Mill.), slash (P. elliottii Engelm.), and loblolly (P. taeda L.).

Fifty-nine of the 82 spots ground checked contained infested trees and 54 percent of the trees examined in these spots were infested. The survey results indicate that there are 12.2 spots and 63.5 infested trees per M acres of host type on Sand Hills State Forest (see Table 3). Of the 1058 trees checked during the ground survey, 55 percent were green, 35 percent red, and 10 percent fading.

From survey data analysis, total mortality due to pine bark beetles, and primarily the black turpentine beetle, is estimated at 732,349 board feet and 151.3 cords (see Table 4). These figures represent an estimated stumpage value of $26,691.35. The ground survey results indicated 72 percent of all trees examined fell into the sawtimber class, 27 percent into the pulpwood class, and one percent into the non-merchantable class.

DISCUSSION

A number of difficulties were encountered during the survey. As can be observed from the ground survey data summary (Table 2), 55 percent of all trees examined displayed no crown symptoms of bark beetle attack and consequently could not be observed during the aerial survey. The absence of ips engraver beetle association with most of the black turpentine beetle spots was credited as being responsible for the high percentage of attacked trees falling into the green category. This not only created high air to ground ratio factors, but made the location of high infestation areas containing large numbers of trees impossible without checking every recorded spot.

This initially was the case. However, during the first week of ground checking, the ground crews noticed an attack pattern of the black turpentine beetle. It was observed that the beetle was concentrating in stands primarily in and adjacent to drain areas and especially those which had been cut during the previous year. Pond and longleaf pines were the primary host species attacked since they comprised the majority of the type in these areas.

Intensive salvage operations conducted throughout the forest since and as a result of the February, 1969 ice storm, together with drought conditions which existed during the spring and summer months of 1970, are speculated as the agents responsible for the epidemic population build-up of the black turpentine beetle on Sand Hills State Forest.

The survey results indicate ips engraver beetle populations to be endemic and timber losses attributable to them as acceptable. Lightning damage was found to be initially responsible for the majority of the spots where Ips spp. were considered to be the primary causal agents.

RECOMMENDATIONS

1. It is recommended that black turpentine beetle infested trees and other salvable timber be promptly salvaged through commercial sales when economically feasible. When such methods are employed, it is imperative that stumps be kept as low as possible and damage to green, unattacked trees in the residual stand be held to a minimum.

   It is further suggested that periodic, monthly inspections be made of the salvaged stands beginning three weeks following the completion of a cutting operation and continuing to January, 1971. The purpose of these inspections being early detection of any reoccurrence of black turpentine beetle activity.

2. A 100 percent aerial sketch map survey of Sand Hills State Forest is scheduled for January 27, 1971. The primary objective of this survey will be to locate remaining black turpentine beetle spots for the purpose of suppression and reduction of timber losses.

ACKNOWLEDGEMENTS

An expression of appreciation is made to Patrick J. Barry and William H. Clerke, both of the Asheville Office, Division of Forest Pest Control, for their most helpful assistance in completing portions of this survey.

REFERENCES

Observation Limits for Aerial Sketchmapping Southern Pine Beetle in the Appalachians, 1958, by Aldrich, R. C., R. C. Heller, and W. F. Bailey. Jour. For. 56(3): 200-202.

Merchantable Rough Cord Volume Table published in the S. C. State Commission of Forestry Management Policy Manual.

Tables for Estimating Board-Foot Volume of Timber, by Clement Measvage and J. W. Girard. U. S. Forest Service, USDA, 94 pp., illus.

For extra copies of this report or further information on the survey, contact:

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FIGURE 1. AERIAL SKETCH MAP SURVEY OF SAND HILLS STATE FOREST SEPTEMBER 1970

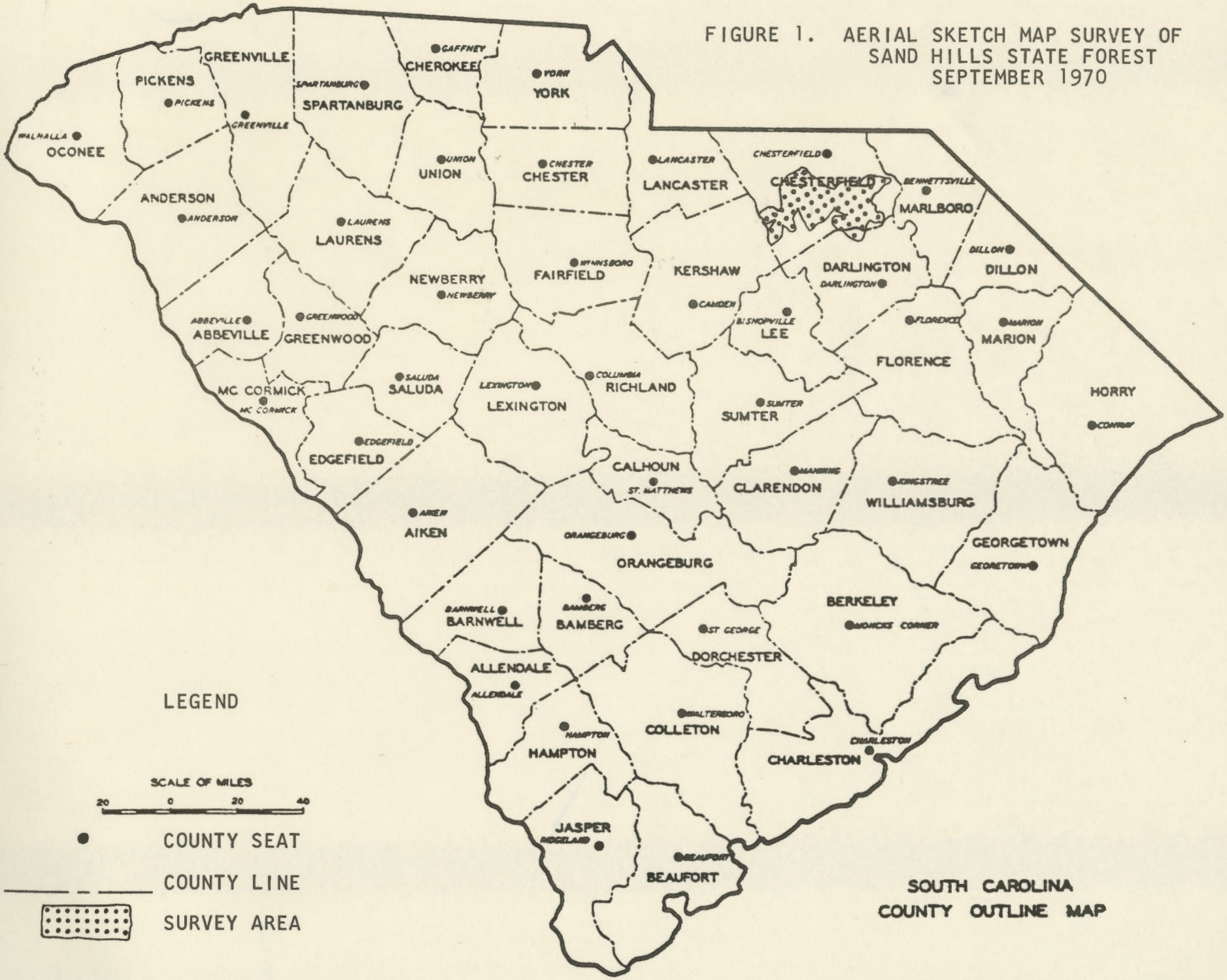

TABLE 1. SUMMARY OF AERIAL SURVEY DATA

SPOT SIZE CATEGORY	NUMBER OF SPOTS RECORDED	NUMBER OF TREES RECORDED
Single	246	246
2 - 5	158	418
6 - 20	31	331
21 - 50	1	50
51+	0	0
TOTAL	436	1,045

TABLE 3. LEVEL OF PINE BARK BEETLE INFESTATION, SAND HILLS STATE FOREST, SEPTEMBER 1970

SURVEY AREA		NUMBER OF SPOTS PER M ACRES HOST TYPE	NUMBER OF INFESTED TREES PER M ACRES HOST TYPE	NUMBER OF SUCCESSFULLY ATTACKED TREES PER M ACRES HOST TYPE
Cross Acres	Host Type Acres 1/			
92,000	69,500	12.2	63.5	116.9

1/ Stands with 25 percent or greater of the stems comprised of pine were considered host type.

TABLE 2. SUMMARY OF GROUND SURVEY DATA 1/

CAUSAL AGENTS		SPECIES	NUMBER OF INFESTED TREES				NUMBER OF EMERGED TREES			
Primary	Secondary		Greens	Faders	Reds	Total	Greens	Faders	Reds	Total
	None	Longleaf	161	11	7	179	16	8	25	49
BLACK	*Ips* spp.	Longleaf	5	0	0	5	0	0	5	5
TURPENTINE	None	Pond	244	4	8	256	54	49	177	280
BEETLE	*Ips* spp.	Pond	2	4	1	7	1	1	6	8
	None	Slash	55	1	1	57	1	1	6	8
	None	Loblolly	8	0	0	8	0	2	15	17
Sub Total			475	20	17	512	72	61	234	367
	None	Longleaf	9	3	18	30	7	7	71	85
	B. T. B.	Longleaf	0	2	2	4	1	1	3	5
IPS spp.	None	Pond	8	1	10	19	2	3	12	17
	B. T. B.	Pond	1	0	1	2	0	0	0	0
	None	Slash	3	2	0	5	2	0	4	6
	None	Loblolly	0	2	1	3	0	0	3	3
Sub Total			21	10	32	63	12	11	93	116
TOTAL			496	30	49	575	84	72	327	483

1/ Data collected from 82 spots containing 1,058 trees.

TABLE 4. MORTALITY ATTRIBUTED TO PINE BARK BEETLES BY TIMBER CLASS, VOLUME AND ESTIMATED VALUE 1/

TIMBER CLASS	VOLUME		ESTIMATED VALUE 4/	
	Per M Acres of Host Type	Total Acres of Host Type	Per M Acres of Host Type	Total Acres of Host Type
SAWTIMBER	10,537 board feet 2/	732,349 board feet	$368.81	$25,632.25
PULPWOOD	2.2 cords 3/	151.3 cords	$ 15.24	$ 1,059.10
TOTAL			$384.05	$26,691.35

1/ Based on the total number of green, fading, and red pine trees (attacked successfully by bark beetles) obtained during aerial and ground survey phases and corrected for air to ground ratio factors (involving trees) and observer errors (involving spots) according to Aldrich et al. (1958).

2/ Sawtimber volume computed using Scribner Log Rule and appropriate Girard Form Class (obtained during ground survey for each spot checked).

3/ Pulpwood volume based on diameter, total tree height (feet), and Form Class 72 using Merchantable Rough Cord Volume Table from the South Carolina State Commission of Forestry Management Policy Manual.

4/ Sawtimber and pulpwood values computed on $35/M board feet and $7/cord, respectively.