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Research Report No. 1, Fusiform Rust Occurrence

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FUSIFORM RUST OCCURRENCE

by

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and

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REPORT NUMBER 1

TO

PARTICIPATING COMPANIES

IN THE

EAST TEXAS PINE PLANTATION RESEARCH PROJECT

A STUDY OF

LOBLOLLY AND SLASH PINE PLANTATIONS

IN

EAST TEXAS

CENTER FOR APPLIED STUDIES

SCHOOL OF FORESTRY

STEPHEN F. AUSTIN STATE UNIVERSITY

NACOGDOCHES, TEXAS 75962

November, 1985

This is the first report of a continuing series of reports describing results from the East Texas Pine Plantation Research Project.

Subject and content of each ETPPRP report will be regional in scope and of particular interest to loblolly and slash pine plantation owners in East Texas.

Any suggestions, ideas or comments will always be welcomed.

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A manuscript describing in detail the rust incidence trends between 1969 and 1984 has been accepted for publication sometime in 1986 in the Southern Journal of Applied Forestry.

J. David Lenhart
Project Director
November 22, 1985

FUSIFORM RUST OCCURRENCE

by

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ABSTRACT. Fusiform rust (*Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme*) infection occurs on 57% of planted slash pine (*Pinus elliottii* Engelm.) and on 11% of planted loblolly pine (*Pinus taeda* L.) trees on non-old-fields in East Texas. Future utilization of these planted pines may be affected by the rust infection rates.

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INTRODUCTION

Fusiform rust, caused by *Cronartium fusiforme* Hedgc. and Hunt ex Cumm., is a devastating disease in slash and loblolly pine plantations in the southern United States. Trees with rust cankers on stems may die prior to harvest due to girdling or breakage, or if the trees survive to harvest, they may be suitable only for pulpwood (Anderson and Mistretta 1982).

In East Texas, about two million acres of mixed pine-hardwood timber stands have been converted to loblolly and slash pine plantations, as a continuing silvicultural practice, which is expected to eventually result in about four million acres of pine plantations on non-old-fields by the turn of the century. However, conversion procedures usually involve intensive site preparation treatments, which may increase the incidence of fusiform rust and, thus, affect management decisions for timber utilization (Miller 1977).

This report characterizes fusiform rust infections occurring on the stem and branches of planted loblolly and slash pine trees in East Texas.

THE DATA

A total of 256 permanent monumented growth and yield plots was installed during 1982-84 throughout East Texas in unthinned loblolly and slash pine plantations on non-old-field sites (Lenhart et al. 1985).

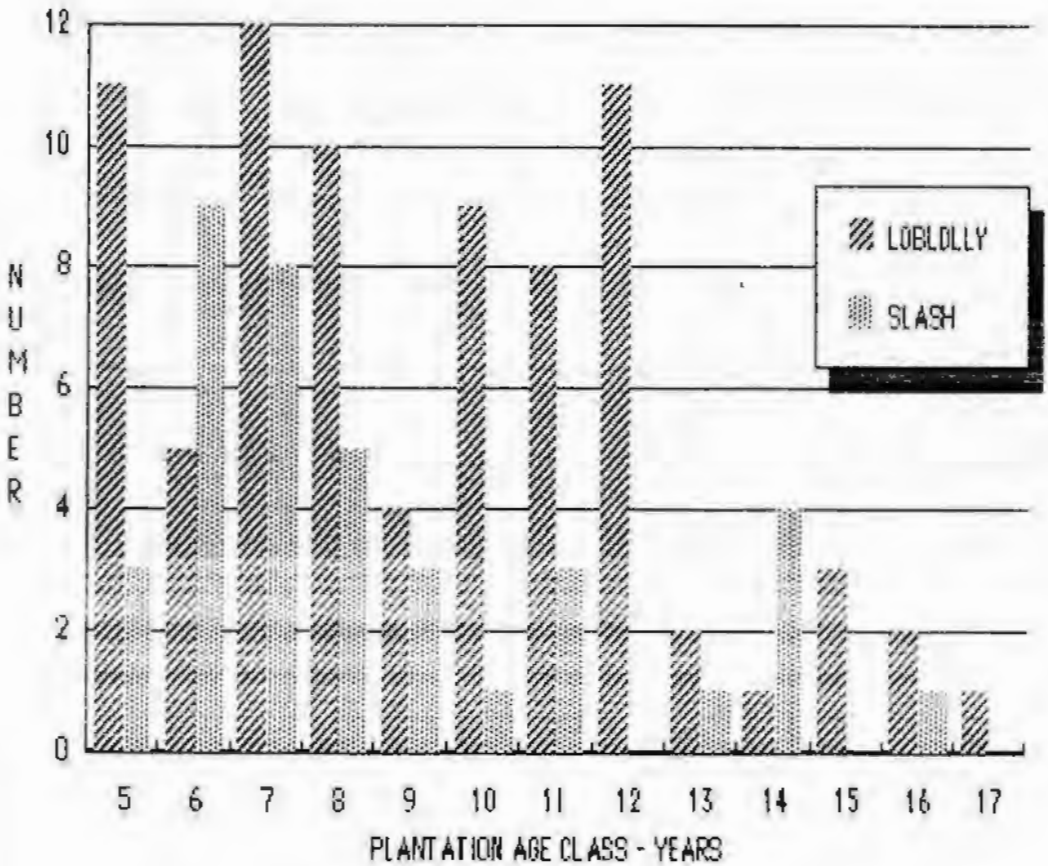
Each plot consists of two subplots -- one to remain unthinned and the other to receive thinning treatments. Within each 0.23-acre subplot, the planted pines were tagged and measured. If a plot was in a plantation at least 5 years old, the occurrence of fusiform rust could be evaluated with confidence. As a result, 79 loblolly and 38 slash pine plots were available for rust incidence analysis (Figure 1).

The two basic categories for describing the occurrence of fusiform are:

1. Infected Stem - A rust canker or gall occurs on stem or on a live branch within 12 inches of stem.
2. Infected Branch - A rust canker or gall occurs on a live or dead branch 12 inches or more from the stem.

Only values from the subplots to-remain-unthinned were analyzed in this study.

FIGURE 1. NUMBER OF PERMANENT PLOTS BY SPECIES AND AGE CLASSES.



OVERALL FUSIFORM RUST OCCURRENCE

One in nine (11%) loblolly pines had a rust infection occurring on either stem and/or branches. Almost three in five (57%) slash pines had a canker on either stem and/or branches.

The percentages of loblolly and slash pines with infection occurring on branches only was 4% and 11%, respectively.

Thus, 7% of the planted loblolly pines and 46% of the planted slash pines sampled had a stem canker. Branch cankers may also occur on some of these stem-infected trees.

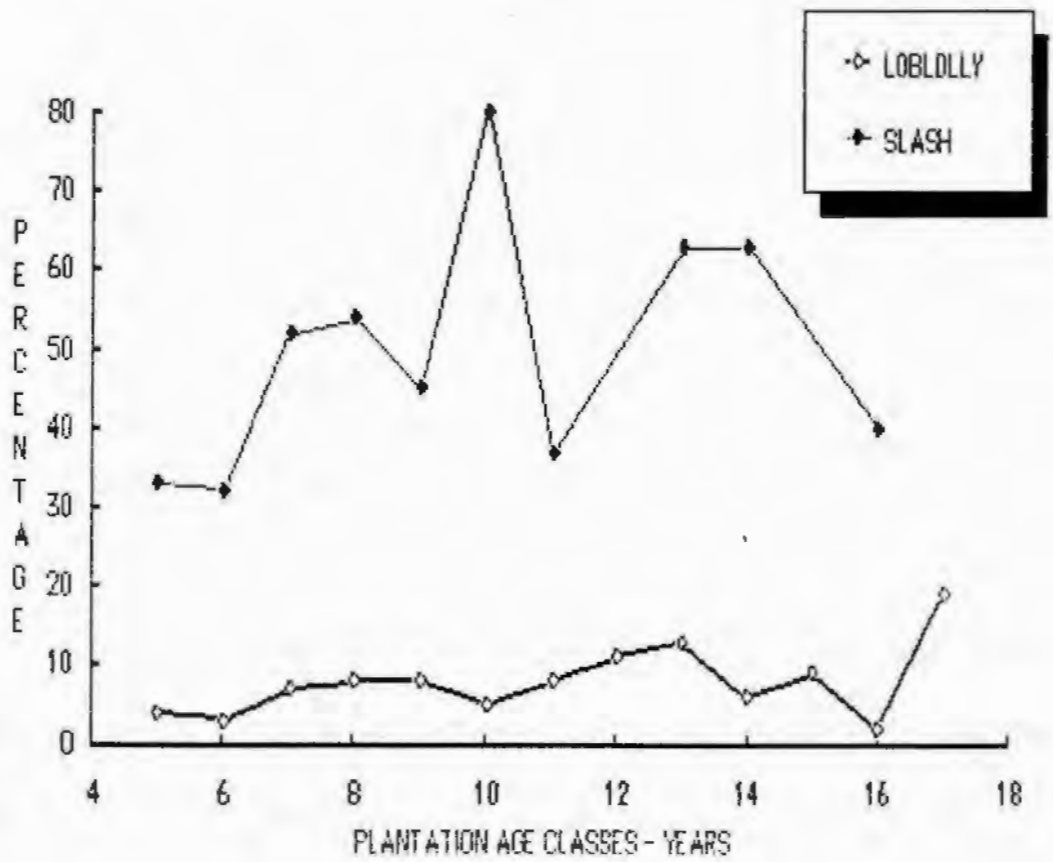
Based on the ETPPRP data, if a planted pine in East Texas is rust-infected, the infection is probably located on the stem, damaging the most valuable part of the tree. Due to the significance of rust-infected stems, this occurrence will be described in detail.

RUST INCIDENCE BY PLANTATION AGE CLASSES

The occurrence of rust-infected stems by plantation age classes for each species is shown in Figure 2.

Across these age classes, the incidence of rust in slash pine is always higher than loblolly pine. Between 5 years and 10 years, the incidence of rust-infected slash pine stems appears to be increasing, and after 10 years the occurrence is erratic. For loblolly pine, infection rates are about constant.

FIGURE 2. PERCENTAGE OF FUSIFORM RUST INFECTED STEMS BY SPECIES AND PLANTATION AGE CLASSES.



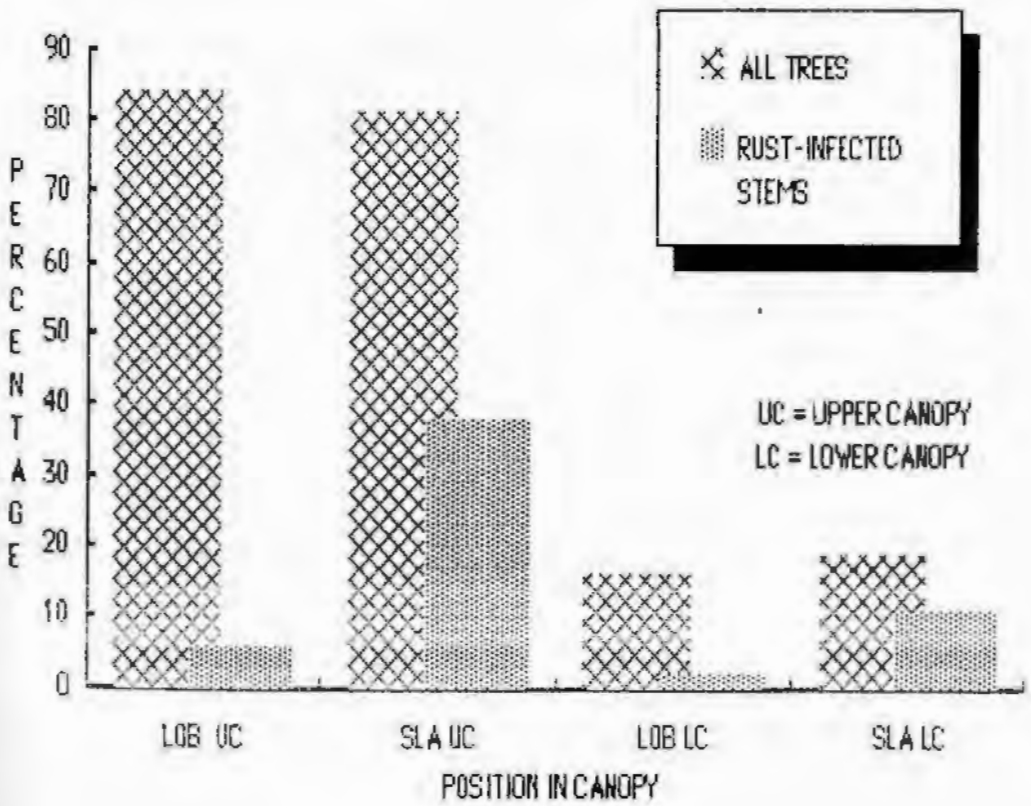
RUST-INFECTED STEMS BY TREE POSITION IN CANOPY

On 61 of the 79 loblolly pine and 22 of the 38 slash pine plots, the field crew was able to classify the tagged and numbered pine trees by crown class. This provided an opportunity to determine if the more vigorously growing trees (crowns in upper canopy) had different stem rust infection percentages than less vigorous trees (crowns in lower canopy). The percentages are shown in Figure 3.

It appears that the proportion of loblolly pines with rust-infected stems is about the same between trees with crowns in the upper canopy and lower canopy. Rust infections may not be effected by the vigor of the tree.

However, for slash pine the proportions differ between the two crown positions. A larger proportion of slash pines in the lower canopy have rust-infected stems than in the upper canopy. Perhaps rust infections are influenced by the vigor of the tree. Or maybe a tree that is infected early in its life is stunted and unable to ever achieve or maintain a dominant position.

FIGURE 3. PERCENTAGE OF TREES BY POSITION IN CANOPY FOR ALL TREES AND FOR RUST-INFECTED STEMS.



RUST INCIDENCE BY COUNTY

The percentage occurrence of rust-infected stems by species and county in East Texas is shown in Figure 4.

For slash pine, there is a definite pocket of high rust incidence in Newton, Jasper, Tyler and Hardin counties, where 50 percent or more of the stems are infected. This is 2 to 6 times higher than the occurrence of fusiform rust in the surrounding 5 counties.

For loblolly pine, rust-infected stem rates varied across East Texas. No east-west or north-south geographic trends are apparent.

LOBLOLLY

SLASH

Figure 4. Percentage of planted pine trees with fusiform rust on stems by species and county in non-old-field plantations in East Texas, 1984.

COMPARISON WITH EARLIER RUST SURVEYS IN EAST TEXAS

Table 1 shows the incidence of rust infection for three previous survey years -- 1969, 1976 and 1980 -- plus the current survey. However, comparison of infection rates between the surveys must be made with caution, due to different sampling methods, populations sampled and tree evaluation.

The 1969 survey reported by Mason and Griffin (1970) sampled loblolly and slash pine plantations throughout East Texas. Only stem infections were tallied.

The 1976 fusiform rust survey reported by Walterscheidt and Van Arsdale (1976) sampled both natural and planted stands of loblolly pine and only planted stands of slash pine throughout East Texas. Trees with either stem and/or branch galls were considered as infected with fusiform rust.

The 1980 survey reported by the Texas Forest Service (1982) sampled loblolly and slash pine plantations only in Southeast Texas. Trees were tallied separately by stem infections and branch infections.

For loblolly pine in East Texas, the infection rates have remained about the same between 1969 and 1984. However, the infection rates for loblolly pine in Southeast Texas have decreased between 1976

Table 1. Fusiform rust incidence in pine plantations by survey year and geographic location in Texas.

Species	Rust Location	Survey year 1969	1976	1980	1984
		Percent			
East Texas[a]					
Slash	Stem[b]	8			46
	Stem and/or Branches		30		57
Loblolly	Stem[b]	6			7
	Stem and/or Branches		9		11
Southeast Texas					
Slash	Stem[b]	19		32	47
	Stem and/or Branches		43	55	54
Loblolly	Stem[b]			8	3
	Stem and/or Branches		25	18	9

[a]Includes counties in Southeast Texas.
[b]May or may not also have rust-infected branches.

and 1984.

For slash pine in East Texas, the infection rates have increased dramatically between 1969 and 1984. Rust infection rates have also increased for slash pine in Southeast Texas.

CONCLUSIONS

In this current survey of pine plantations in East Texas, fifty-seven percent of the slash pines had a fusiform rust infection somewhere on the tree, while 11 percent of the loblolly pines had a rust infection. If a tree is infected, the infection is very likely to occur on the stem.

Stem infection rates for slash pine is almost 50 percent. Rust incidence of that magnitude may have serious implications for management of slash pine plantations. Thinning(s) may be required. The timing of the thinnings may be difficult to determine in order to effectively remove infected trees from the plantation. The production of sawlog or plylog size trees may be impossible. Shorter rotations may be necessary. Silvicultural treatments to remove hardwoods (especially oaks, *Quercus* spp.) may be required.

For East Texas, the species of choice for establishing plantations should be loblolly pine.

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