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Fusiform Rust Trends in East Texas

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ABSTRACT. Four surveys of pine plantations in East Texas between 1969 and 1984 indicate that fusiform rust (*Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. fusiforme) infection rates are increasing on slash pine (*Pinus elliottii* Engelm. var. *elliottii*) and either decreasing or about constant on loblolly pine (*Pinus taeda* L.). Currently, stem infections occur on about 1 in 2 slash pines and 1 in 14 loblolly pines.

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Fusiform rust is a devastating disease in slash and loblolly pine plantations in the southern United States. Trees with stem infections frequently die prior to harvest due to stem girdling or breakage, and if infected trees survive to harvest, they may be suitable only for pulpwood (Anderson and Mistretta 1982).

The incidence of rust on planted loblolly and slash pine trees in East Texas has been reported in three earlier surveys:

1. A 1969 survey reported by Mason and Griffin (1970) sampled loblolly and slash pine plantations throughout East Texas. Only stem infections were tallied.
2. A 1976 fusiform rust survey reported by Walterscheidt and Van Arsdale (1976) sampled natural and planted stands of loblolly pine and planted stands of slash pine throughout East Texas. Trees with either stem and/or branch galls were considered infected with fusiform rust.
3. A 1980 survey reported by Texas Forest Service (1982) sampled loblolly and slash pine plantations only in Southeast Texas. Trees were tallied separately by stem infections and branch infections.

Even though these earlier surveys sampled a wide range of

stand types and recorded rust occurrence using different tallying systems, we feel that it will be useful to forest managers to compare the results of these three surveys with fusiform rust occurrence data collected throughout East Texas during 1982–84.

CURRENT SURVEY

During the summers of 1982–84 the East Texas Pine Plantation Research Project¹ installed 256 permanent, monumented plots in site-prepared loblolly and slash pine plantations in East Texas owned by the participating forest industries (Lenhart et al. 1985). Each plot is in a different plantation, and the sampled plantations are well distributed on industrial forestlands throughout East Texas. A plot consists of two adjacent 100-ft square subplots 60 ft apart, one of which will remain unthinned, and the other will receive future thinnings.

One hundred and seventy-eight plots are in loblolly pine plantations and 78 in slash pine plantations. However, for rust infection to be tallied with confidence, a plantation had to be at least 5 years old. As a result, 79 loblolly and 38 slash pine plots were available for analysis (Table 1).

Within a subplot, the occurrence of fusiform rust (among

¹The ETPPRP is administered by the School of Forestry at Stephen F. Austin State University with the following participating industries: Champion International Corporation, International Paper Company, Owens-Illinois, Inc., and Temple-EasTex, Inc. Their continuing support is appreciated.

other observations) was recorded for each planted pine as an:

1. *Infected Stem*—Gall on stem or on a live branch within 12 in. of the stem.
2. *Infected Branch*—Gall on a live or dead branch more than 12 in. from the stem.

Rust occurrence in the subplots that are to remain unthinned are compared in this paper with the three earlier rust surveys.

TRENDS

These four surveys can be used to depict trends in the level of plantation rust infection from 1969 to 1984 (Table 2). East Texas is defined as including counties in both Northeast Texas and Southeast Texas, while Southeast Texas includes only those counties in the southern half of East Texas.

Between 1969 and 1984, the incidence of rust on slash pine stems in East Texas increased from 8 to 46%, a 475% infection increase, while rust incidence for loblolly pine stems remained about the same (6% to 7%). During this same period, for plantations in Southeast Texas, slash pine stem-infection rates increased from 19% to 47%, or a 147% increase, and the occurrence of stem infections on planted loblolly pines in Southeast Texas changed from 25% to 9%, or a decrease of 64%.

In 1969, planted slash and loblolly pine in East Texas had similar stem infection rates—8% and 6%, respectively. By 1984, a planted slash pine is almost 7 times more likely to have a stem infection than a planted loblolly pine tree—46% and 7% respectively. For plantations in southeast Texas, slash pine fusiform rust infection rates are increasing, and loblolly pine infection rates are decreasing. Currently, a slash pine tree in southeast Texas is 16 times more likely to have a rust-infected stem than a loblolly pine.

DISCUSSION

These data show a more severe rate of fusiform rust infection for

Table 1. Distribution of survey plots by species and age classes for planted loblolly and slash pine in East Texas.

Species	Plantation age (yr)													Total
	5	6	7	8	9	10	11	12	13	14	15	16	17	
Loblolly	11	5	12	10	4	9	8	11	2	1	3	2	1	79
Slash	3	9	8	5	3	1	3	0	1	4	0	1	0	38

Table 2. Fusiform rust incidence in pine plantations by survey year and geographic location in Texas.

Species and rust location	Survey year			
	1969	1976	1980	1984
.....%				
.....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.

slash pine than for loblolly pine, and the differences between infection rates appear to increase with time. Some differences may be artifacts of different sampling methods, but we believe that changing forest management practices may be affecting the occurrence of rust infection in East Texas.

A principal factor affecting the changing infection rates may be intensive mechanical preparation of a site, when a natural stand is converted to a planted stand (Johnson 1977). Since about 1970, this has been a common silvicultural practice in East Texas. After shearing and chopping operations, hardwood sprouting usually occurs, and many of these sprouts are oaks (*Quercus* spp.), the alternate hosts to the fusiform rust-causing fungus.

After site preparation, the resulting plantation in East Texas may often be better characterized as a mixed pine-hardwood stand rather than a pure pine stand. A large population of oaks scattered among the planted pines is usually associated with a high incidence of

rust infection (Squillace and Wilhite 1977). On these mechanically prepared sites, slash pine is severely affected, because it is more susceptible to fusiform rust than loblolly (Goddard and Wells 1977).

It is difficult to explain the decrease in loblolly infection rates in Southeast Texas from 25% to 18% to 9% over an eight-year period. Changes may be due to (1) different sampling methods (for example, in 1976, data from both natural and planted loblolly pine stands were combined); (2) varying ages of sampled plantations, (3) different procedures for recording infection location, and (4) sampling variation.

Rust-resistant strains of slash and loblolly pine trees were not planted in East Texas until about 1980. As more acres are planted with rust-resistant varieties of pines, infection rates are expected to decline. No rust-resistant varieties are included in the ETPPRP, and no information is known on the seed sources and genetic stock for the plantations and trees sampled in the three earlier surveys.

Even though the four surveys on which the trends are based employed different sampling methods and definitions of tree infection, differences in infection rates between the two species appear too significant to ignore. Rust-infected slash pine stems at the 50% level may have an impact on plantation management decisions, especially thinning schedules and thinning intensity, and may even indicate shorter rotations. A shortfall of wood expected to be available for utilization as sawlog and plylog may occur. Loblolly pine should be the species of choice for planting in East Texas and particularly the southeastern part of East Texas. □

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