



SOUTHERN FUSIFORM RUST *of* SLASH *and* LOBLOLLY PINE *in the* ALABAMA PIEDMONT

JACK T. MAY
Associate Forester

J. F. GOGGANS
Assistant Forester

MANY farmers and other land owners have planted loblolly and slash pine seedlings during the past 20 years. In many instances they have found their plantations heavily infected with southern fusiform rust caused by the fungus *Cronartium fusiforme*. This disease kills many trees, or it weakens them to the extent that they are easily blown over. Such direct control measures as spraying or cutting all infected trees are impractical. Therefore, more dependence could well be placed on those cutting practices that might keep losses within reasonable limits.

The Alabama Agricultural Experiment Station completed recently a study of approximately 400 forest plantations in the Piedmont Region. The occur-

rence of southern fusiform rust was a part of this general study. The plantations examined in the Piedmont Region ranged from 5 to 13 years old.

Observations made in this study relating to the disease and practical cutting methods that may be used in infected stands are summarized in this leaflet.

DESCRIPTION *of the* DISEASE

The disease has been commonly called southern pine blister rust, fusiform canker, and fusiform rust. Stem and branch cankers on southern pines caused by the disease were of minor

AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE

E. V. Smith, *Director*

Auburn, Alabama

economic importance 20 years ago. However, the disease has increased to the point that it is today an important factor to be considered in growing loblolly and slash pine. To a large extent, this increase has been caused by wide spread planting of the more susceptible trees. Loblolly and slash pines have been planted on lands originally occupied by longleaf pine, and oaks have invaded the cut-over or partially stocked lands.

The disease is similar to many other rusts in that it must have an alternate host. It can not spread directly from pine to pine. The alternate hosts are oak trees. Water, willow, and laurel oaks are the most important carriers of the disease, but blackjack, bluejack, southern red, turkey and live oaks also may be hosts.

The infection cycle, from pine to oak and back to pine, usually takes place in the spring. The first signs of the disease appear on pine trees early in March. The fruiting cankers on pine produce masses of orange-colored spores resembling powder. This orange colored powdery material is carried in the air by wind or air currents. The spores, which come in contact with oak leaves, produce brownish, hair-like bristles on the under side of the leaves. These hair-like bristles bear very small dark spores which can grow on the pine trees. These small dark spores are carried in the air until they die or come in contact with watery parts of the pine tree. Infection takes place on the growing pine needles or on the tender, new stem or branch tips. As a rule, infection does not occur through the bark.

Southern fusiform rust on pines may be recognized by long spindle-shaped swellings on the stem or branches. These swellings, or cankers, often rupture and cause breaks in the bark and wood. In early spring, masses of orange spores may appear in the cracks created by the swelling. Sometimes little, if any, swelling takes place, but pitch pushes out from the cankerous area.

SOUTHERN FUSIFORM RUST DAMAGE

The southern fusiform rust fungus causes only minor injury to its alternate hosts, the oaks. A small amount of leaf spotting is the only sign of the disease.

The disease affects loblolly and slash pines of all ages, from seedlings to mature trees. The amount of damage on any infected tree may vary from light to heavy. A trunk or stem canker always lowers the quality or reduces the usefulness of the affected tree. More important, a trunk canker may kill the tree. It may weaken the stem to such an extent that it is easily broken by wind (Figure 1). Loss from stem infection is highest in trees of seedling to pole stage.

Branch infections that never reach the stem have little effect on growth or use of the tree. Branch infections occurring within about 15 inches of the trunk, as in Figure 2, often spread and develop into stem cankers, as shown in Figure 3. Branch infections also serve as a large source of spores for spread of the disease.

Results of the Piedmont Region study showed that about one-fourth of all the trees in unmixed plantations of loblolly and slash pine were infected with stem or branch cankers. In the plantations examined, 14 per cent of the loblolly pine stems and 17 per cent of the slash pine stems were infected. The slight difference between the amount of infection on the two species is not important. Individual stands were found with more than one-half of the trees in a diseased condition. In one 13-year-old loblolly pine plantation, 116 trees per acre were found on the ground due to this disease.

Damage that would not be important in heavily stocked natural stands may often prove serious in plantations that start with fewer trees per acre. The average survival of slash pine in the pure plantations observed in the Piedmont study was one-half of the original



FIGURE 1. Stem of a slash pine broken at the point of southern fusiform rust infection. Stem infection losses are highest in trees from seedling to pole stage.

FIGURE 2. Limb infection shown here was less than 15 inches from the stem of the tree. Such infection will finally reach the stem if limb is not pruned.

FIGURE 3. This is what happens if infected limbs are not pruned. In this case the limb infection has moved into the stem of the tree.

trees planted. The average survival of loblolly pine in the pure plantations observed was 8 out of every 10 trees planted. The reduction in the number of trees caused by the greater loss of slash pine can be overcome by planting at a closer spacing than that required for loblolly. Plantations with poor stands emphasize the need for proper and light cutting practices.

Total losses in natural stands and in plantations will vary with:

1. Species of pine
2. Number of trees per acre
3. Amount of infection
4. Cutting practices.

TIMBER STAND IMPROVEMENT and UTILIZATION

The heights at which cankers were observed on the trees indicated that much of the infection took place within the first 5 years after planting. Swelling of the stem or branch can usually be noticed during the first or second year after infection occurs. In the Piedmont study, it was found that the older saplings were not infected as often as the younger seedlings. When making early cuttings, it is advisable to select the better trees that are to be left for the final harvest. These trees should not have stem infection. An attempt should be made to use the worst infected trees in the first cutting. Otherwise they may die before the next cutting.

Pruning of the infected branches before the swelling reaches the trunk will reduce losses in plantations and in natural stands. Prunings can save many trees that later can be cut at a profit. All branches bearing cankers less than 15 to 18 inches from the stem (Figure 2) should be pruned on seedlings and saplings that are otherwise clear of stem infection. Swellings that have reached the trunk must be treated as stem infections, because the trees will eventually be killed or their value will

be lowered. Pruning is most effective before the trees are 10 feet high. However, pruning should not be neglected on older trees that have branch infection closer than 15 to 18 inches from the stem.

Trees with stem canker should not be cut just because they are diseased. They may be permitted to grow as long as there is a normal increase in size or until they can be cut at a profit. With a constantly increasing market for fence posts and pulpwood, commercial thinnings are possible in young stands with trees of 5 inches or larger in diameter at breast height. A 5-inch diameter tree will often furnish three or four posts of 6-foot length, if used to a minimum of 2 inches inside bark at the small end. Small fence posts when treated, will last as long as larger posts.

The crown length in relation to total height of the tree is a good indicator of the time when thinnings are needed. When the crown length becomes shortened to about one-third of the total height, some of the trees must be cut. Otherwise there is a reduction in diameter growth as a result of competition of the crowns for direct sunlight and growing space. Early thinnings or salvage cuttings are made to remove the most severely damaged and stem-cankered trees. Such cuttings should reduce the number of trees in the stand by one-fourth to one-third of the total. Badly damaged trees, such as those that have had the bark killed by canker and the wood partially destroyed (Figure 4), may show signs of bending or breaking off. They should be cut before they break and fall over. Small trees, such as the one shown in Figure 6, do not contain any commonly usable material. They can be left until the next thinning, by which time they will probably be large enough for post material. Trees that have not been too badly damaged (Figure 5) may often be left until a second thinning and then removed as either pulpwood or post material.

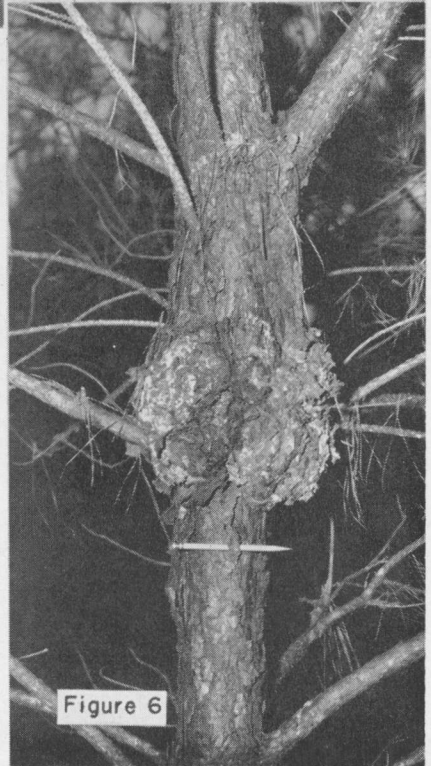


FIGURE 4. Severity of stem infection is shown by depth to which pencil is inserted at point of infection. This tree is likely to be blown over by wind.

FIGURE 5. This type of infection is not serious enough to justify immediate cutting. At a later thinning, it can be removed either for pulpwood or fence posts.

FIGURE 6. Small trees with large infections, as shown here, should be cut and used as soon as they are large enough for fence post material.

In a sample thinning of a 13-year-old loblolly pine stand near Auburn, the more heavily infected trees and trees of poor form were removed. With an original spacing of 6 by 6 feet, the survival was nine out of ten trees. Of the trees that had died, about one-half had been killed by the southern fusiform rust between the 10th and 13th year. One-fourth of the remaining trees had serious infection. The thinning removed about 40 per cent of the stand and yielded 1,100 fence posts per acre, or equal to about 8½ cords of pulpwood. Another thinning after about 5 years might remove the remaining trees with stem infections and poor shape or form. The next thinning will leave the stand in good condition for the development of a final crop of timber. These remaining trees can yield such valuable products as sawlogs, poles, and piling.

RECOMMENDATIONS *for* TREATMENT *of* YOUNG PINE STANDS

Loblolly and slash pine can be grown by farmers and other land owners in the Piedmont Region of Alabama without undue losses from the southern fusiform rust if proper treatments and cutting methods are used. Recommendations for such practices include:

1. Pruning of infected branches.
2. Early thinnings that use the worst infected stems as soon as they are large enough for fuelwood, fence posts, or pulpwood. Any stem-infected tree that is not in immediate danger of being killed or blown down should be left to grow unless its removal would benefit near-by trees.
3. Periodic thinnings that salvage additional badly infected trees before they are killed or blown down.