The optimum loblolly, shortleaf, and slash pine seedling

by

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The trend toward planting fewer seedlings per acre points up the need to concentrate on growing and planting optimum seedlings, had an 8 to 30 percent higher survival rate than nonmycorrhizal grade 1 and 2 stock, and mycorrhizal grade 3A loblolly pine seedlings. This means that grading is more important than ever and, if the tree planter must pay extra for the same nursery. All of this points out the need for continued refinement in nursery practices.

The optimum seedling should have some resistance to disease and insect damage. The stem or top must be long enough to handle in machine planting and stiff enough to withstand rain, ice, and wind. The root must be long enough to reach physiological condition in the seedlings which below the zone desiccated by grass roots. The optimum seedling should have some resistance to disease and insect damage. The stem or top must be long enough to handle in machine planting and stiff enough to withstand rain, ice, and wind. The root must be long enough to reach physiological condition in the seedlings which below the zone desiccated by grass roots. At the same time, the seedlings should not be so large that the weight unduly increases shipping charges or makes field handling difficult.

In their simplest form, the current grading rules specify that healthy, unbroken loblolly, slash, or shortleaf pine seedlings shall be culled if: 1) They lack secondary needles, 2) the root system is less than 5 inches long, or 3) the diameter at the root collar is less than 1/8 inch. Because many foresters reported good success in outplanting Grade 3 seedlings, Shoulders and Jorgensen (9, 12) divided this grade into two classes:

Grade A—Seedlings 3/32 to 4/32 inch in root collar diameter that had stiff woody stems and fascicled needles.

Grade B—Other grade 3 seedlings that lacked any of the above attributes.

Their grade 3A mycorrhizal slash pine seedlings survived as well as non mycorrhizal grade 1 and 2 stock, and mycorrhizal grade 3A loblolly pine seedlings. A number of investigators (1) (2) (4) (5) (6) (18) have tried nursery bed selection as an easy method of selecting seedlings of superior phenotypes. In this method, seedlings in the middle of the bed that stand out because of height, vigorous appearance, sturdy stem, and freedom from insect damage and disease are outplanted for comparison with average adjacent stock. In general, the survival of these carefully chosen seedlings-variously called "super", "select" or "outstanding"—has been quite similar to that of the control seedlings. Height growth of the selected stock has been greater but, with one exception (6), probably not different enough to excite the interest of the field forester. It is noteworthy that the select seedlings were not overly large, being well within Wakeley's Grade 1, and that the control seedlings were generally Grade 2.

Particularly important causes of differences in physiological quality seem to be: (1) Differences in mineral nutrition; (2) differences in stored food reserves of the seedlings; (3) differences in water tension under which the seedlings are grown; and (4) fungicidal sprays, spreaders, adhesives, rodent repellent sprays, or other sprays applied at lifting time and presumably affecting the transpiration of the seedlings immediately after they are planted. All emphasize the need for continued refinement in nursery practices.
Silker (13) also studied the survival and growth of pine seedlings of various sizes and characteristics in east Texas. He suggested that "premium" seedlings be considered as those with 50 percent fascicled needles, stem diameter exceeding 3/20 inch, and with 6- to 12-inch top length for loblolly, and 6- to 9-inch top length for slash. Larger slash pine seedlings than this attained greater growth in good planting years, but did not have as consistently good survival rates in dry years.

In two studies established by the author near Oxford, Miss., the survival rate of loblolly seedlings ranging from 0.2 to 1.0 feet in height immediately after planting was nearly perfect. Growth during the first two and three growing seasons after outplanting was not significantly correlated with seedling size at the time of planting.

However, differing site conditions, soils, and rainfall patterns most assuredly make comparison of one study with another impossible.

The real pay-off in any planting study is the final determination of the effect of "treatment" on yield. In one of Wakeley's Bogalusa, La., loblolly and slash pine planting studies (17) at age 30, the Grade 1 stock consistently exceeded the Grade 3 stock in survival rate, mean total height, mean d.b.h., percentage of dominant plus codominant trees per acre, rough pulpwod per acre, and sawtimber per acre.

With a few minor exceptions, values for the Grade 2 stock were intermediate between those for Grades 1 and 3. In mean d.b.h. and in pulpwod per acre, Grade 1 significantly exceeded Grade 2 and Grade 2 significantly exceeded Grade 3. At a 6 x 8 foot spacing, the yield per thousand planted Grade 1 slash exceeded that of the Grade 2 slash by 26 percent, and the grade 3 slash by 100 percent. Comparative advantages of similarly planted loblolly were 59 percent and 125 percent. These differences were accentuated by unequal sizes for loblolly and 8 to 12 inches for slash. Comparisons of arrangements of grades in 1-2-3 order in sites, plant Grade 2's and the smaller Grade 1 seedlings, i.e., those with top lengths of 6 to 10 inches, however, only because the grades of 4 to 7 inches for shortleaf. Seedlings already differed markedly in crown size at the time of planting, and size at the time of planting were as follows: 2/20 - 66 percent; 3/20 - 74 percent; and 4/20 - 83 percent. It was this difference in survival that resulted in the yields from the sturdiest stock consistently produce large seedlings and being significantly greater. For example, 1-0 shortleaf pine planting stock consistently produce large seedlings and being significantly greater. For example, 1-0 shortleaf pine planting stock

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What Nutrients Do Pines Need?

Farmers fertilize their corn crops. Stockmen provide supplemental food for their range cattle. Having seen the benefits from these practices, forest managers are asking if they should be fertilizing their pine trees.

Adding fertilizer to bring soil nutrients into balance probably will improve growth and vigor of pine trees if done right. That is the opinion forest scientist Eugene Shoulders expresses as he talks about his work to develop land management practices to maximize growth and quality of southern pines on the Coastal Plain soils of the Gulf region.

In the past, physical properties such as texture, depth, and available moisture were the soil characteristics most often used to estimate site productivity, said Shoulders, a Southern Forest Experiment Station researcher at the USDA Forest Service laboratory at Pineville, Louisiana. But land managers now want to know if they can greatly improve tree growth by adopting agronomic practices, such as fertilization.

Forest fertilization is a proven and acceptable management practice in limited areas of the South. But for most of the area, general use will probably have to wait until exact amounts and specific kinds can be reliably prescribed for individual soils. Shoulders said. He and his fellow researchers are on the way to providing at least some of the prescriptions.

In certain areas of the South, a single nutrient, usually phosphorus, is very deficient in the soil. There have been pronounced responses where supplemental feeding has been tried. Often, though, a combination of nutrients is needed rather than a single element. Loblolly pine may require a slightly higher level of nutrients than slash pine.

In their response to mineral nutrients, trees are influenced by their physiological condition and genetic make up, and also by various environmental conditions. Fertilization at planting time may be ineffective unless competition from grasses and other vegetation is controlled. Shoulders said researchers find the complex responses difficult to anticipate. Spectacular gains from fertilization may depend as much on developing strains of southern pines that are unusually responsive as on solving other problems in pine nutrition.

In a new publication, Shoulders and his coworker William H. McKee, Jr., consider both soil and plant aspects of the problem. They summarize knowledge of chemical properties that determine the ability of soils to hold nutrients added for pines, and they evaluate results of a number of greenhouse and field studies. They also outline areas where additional information is needed. Their discussion is concerned chiefly with pine growth on the Coastal Plain soils of Arkansas, Louisiana, Mississippi, and Texas. Much of it, however, applies equally well to other parts of the South.


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