NURSERY PRACTICES FOR CHOCTAWHATCHEE SAND PINE

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Be careful with nursery site selection, follow a June-July schedule of fertilization, lift the seedlings by hand and plant them within 1 week.

Demand for and production of seedlings of the Choctawhatchee (*immuginata*) variety of sand pine (*Pinus clausa* (Chapm.) Vasey) have increased following reports (*1*), (*2*) that this variety of sand pine is the most promising pine for reforestation of several million acres of sandhill land in Florida, Georgia, and South Carolina. Unfortunately, operational scale sand pine planting programs have ranged from complete successes to total failures. Various explanations have been offered to account for these extremes in planting success. Failures have been attributed to incorrect nursery fertilization schedules, to improper lifting, handling, or storage of seedlings, and to improper planting methods.

This paper provides the information needed to give a Choctawhatchee sand pine (CSP) planting program a strong start. The recommendations for the seedling nursery are based upon procedures followed during the past 6 years a the Chipola Experimental Forest (near Marianna, Fla.) where 25,000 to 50,000 CSP seedlings have been produced each of these 6 years for experimental purposes. For the past 3 years essentially the same procedures have been used by private industry in Florida to produce for operational scale plantings about 1 million CSP seedlings annually.

Site Selection

Top priority should be given to nursery site selection. The comment made by Wakely (*4*) some 20 years ago that ". . . no step in artificial reforestation requires more care than does selecting the site for a permanent nursery . . . ." is certainly appropriate to the selection of a site for a CSP nursery. He goes on to say that "Buying a good site may cost far less than correcting unsuitable conditions on a poor one." We would add to these words of caution that some unsuitable conditions such as unsatisfactory physical properties of a nursery soil cannot be corrected at any price.

A deep, well-drained loamy sand of low to moderate fertility is an appropriate soil for a CSP nursery. Because subsurface drainage is as important as surface drainage, sites with heavy clay subsoils should be avoided. The slope of the seedbed area should not exceed 2 to 3 percent, but must not be absolutely flat because water will stand after rains. CSP seedlings become chlorotic, are stunted, and may eventually die if the nursery soil remains saturated for extended periods.

Sandhills are the natural habitat of sand pine, and such a site on the Chipola Experimental Forest in Calhoun County, Fla., has proven to be satisfactory for production of CSP seedlings. This soil is a deep, excessively drained Lakeland sand having the following chemical characteristics:

- pH — 5 .0 to 5.8
- Organic matter — 1 to 1.5 percent
- Cation exchange capacity — 2.5 to 3.5 me./100 mg
- Available nutrients (lbs./A) by ammonium acetate extraction (pH 4.8):
  - CaO — 350 to 400
  - P_2O_5 — trace to 1.5
  - MgO — 40 to 80
  - K_2O — 30 to 35

A sandy soil such as this simplifies nursery management. It is seldom too wet for the routine operations required to produce pine seedlings; it is less likely to develop poor physical characteristics due to compaction; and the fertility level of the soil can be readily adjusted and maintained to meet seedling requirements. Also, seedlings grown on a sandy soil can be lifted without difficulty and with less root damage than occurs on seedlings grown on heavier textured soil.

Soil Management

With few exceptions, procedures for growing CSP seedlings in the nursery are the same as those for the other major southern pines. The site should be thoroughly prepared in late winter or early spring. Previous cover residue should be com-

pletely decomposed. A week to 10 days prior to sowing the seeds, it is recommended that the soil be fumigated with methyl bromide (68% concentration) at the rate of 600 pounds of total chemical per acre.

If adjustments in nursery soil fertility or pH are considered necessary, these should be made several months before seeds are sown. A soil pH of 5.0 to 5.8 is satisfactory. Powdered sulfur (S) applied at the rate of 600 pounds per acre will reduce the pH of sandy soils about 1.0 pH unit within 2 or 3 months. Phosphorus (P) also should be applied annually at the rate of 450 pounds of Pz05 per acre. Either 0-46-0 or 0-20-0 are satisfactory sources of P. These materials (S and P) should be thoroughly mixed with the soil to the normal nursery tillage depth. Nitrogen (N) and potassium (K) usually need not be applied prior to sowing.

Nurseries which practice rotations should plan to grow an appropriate cover crop. A complete fetilizer along with minor elements as needed usually must be applied to produce the cover crop. Adjustments in soil pH can be made conveniently when the cover crop is being grown.

Seeding

Either treated or untreated seeds have given satisfactory results. If treated seed are sown, the standard Aransan® [1] 42-S treatment with an aluminum flake coating is usually used. CSP seeds germinate in about 14 to 21 days, which is somewhat slower than, for example, Ocala sand pine or slash pine. Stratification decreases the germination period by as much as 7 days and may increase final germination percent slightly. However, CSP seeds usually are not stratified before they are sown in the nursery.

Seeds should be sown at a rate to produce about 30 plantable seedlings per square foot of seed bed. Satisfactory methods of seeding vary from broadcasting by hand to use of mechanical seeders such as the Whitfield® or Stanhay®. CSP seeds need not be covered with soil. Rolling the seedbed to press the seeds into the soil after they have been distributed provides sufficient soil covering. If the nurseryman considers it essential to cover CSP seeds, the seeds should be sown to a uniform depth not to exceed 1/2 inch. Variation in depth of sowing causes variation in the rate of germination which tends to accentuate the variable growth pattern that is somewhat of a problem in CSP seedling production. CSP is normally sown in mid April, which coincides with spring sowing of other conifer species in Florida.

Satisfactory mulching materials include unprocessed pine straw, chopped pine straw, and wood fiber mulch (Hydro Mulch®). Best results with wood-fiber mulch have been obtained when it is applied at the rate of 800 pounds per acre of seedbed. Use of wood-fiber mulch or chopped pine straw saves labor because neither needs to be removed from the seedbed after the seeds have germinated.

Seedling Care and Growth

The 20 to 30 days immediately after the seeds have been sown are perhaps the most critical in CSP seedling production. Because germination is comparatively slow, the seeds can be washed out by rains during this period. Frequent light irrigation is essential during the germination period. The sprinklers should be adjusted to produce fine droplets rather than large, heavy droplets, which tend to wash out or damage newly germinated seedlings, Ants, mole crickets, and other insects that feed on seeds or seedlings can also cause problems. Granular chlordane broadcast at 5- to 10-day intervals at the rate of 1 pound per 1,000 square feet of nursery area adequately controls these pests whenever they become a problem. Insect damage to CSP seed-

[1] Mention of trade names is solely for information. No endorsement by the USDA is implied.

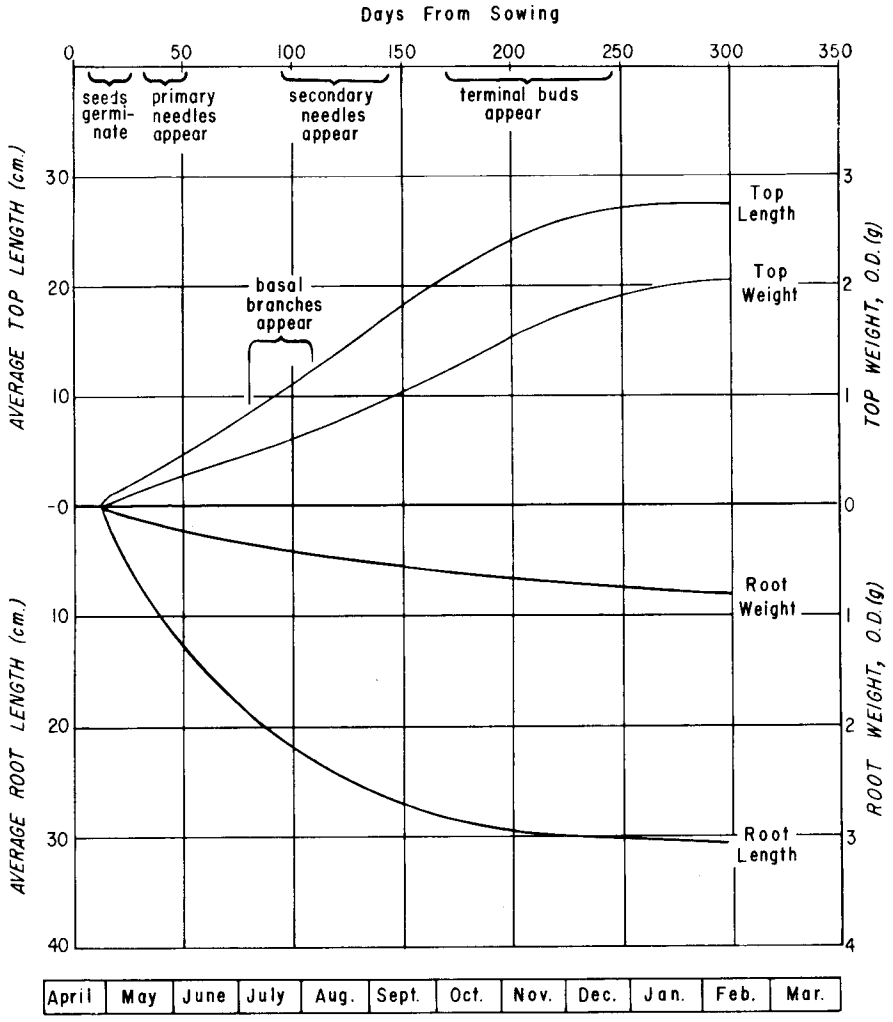

Figure 1. — *Development of CSP seedlings in the Chipola Experimental Forest nursery.*

lings seldom occurs after the seedlings are past the cotyledon stage. Occasional outbreaks of red spider are easily controlled with malathion or Kelathane®.

Fertilization as top-dressings should be started early in June. Light applications of N and K (each at 10 pounds per acre) should be applied at about 10-day intervals during June and July. Amonium nitrate or amonium sulfate and muriate of potash are appropriate sources of N and K.

For convenience, these materials can be blended in proper proportions before being applied. A total of 50 to 60 pounds per acre of both N and K meet the requirements of CSP seedlings. If the June-July schedule is followed, additional amounts of N and K need not be applied after August 10. This fertilization schedule was followed to produce the seedlings with the growth pattern shown in figure 1. By mid-August, CSP seedlings will have attained only about half the total height and the 40 percent of the top weight they will reach by December 1. At this point in the growing season, CSP seedlings will be considerably smaller than those of slash pine (figure 2). Nurserymen unfamiliar with the growth pattern of sand pine have applied as much as 100 pounds per acre of N or N and K in September to stimulate the growth of what they considered to be small seedlings. Such practices have produced unnecessarily large, succulent seedlings that are difficult to lift, handle, and store, and may account for some planting failures.

Naturally, there may be exceptions to these fertilization schedules, especially if the nursery is subjected to unusually heavy rainfall during June and July when N and K are being applied. Large amounts of these water soluble fertilizers may be leached or simply washed away

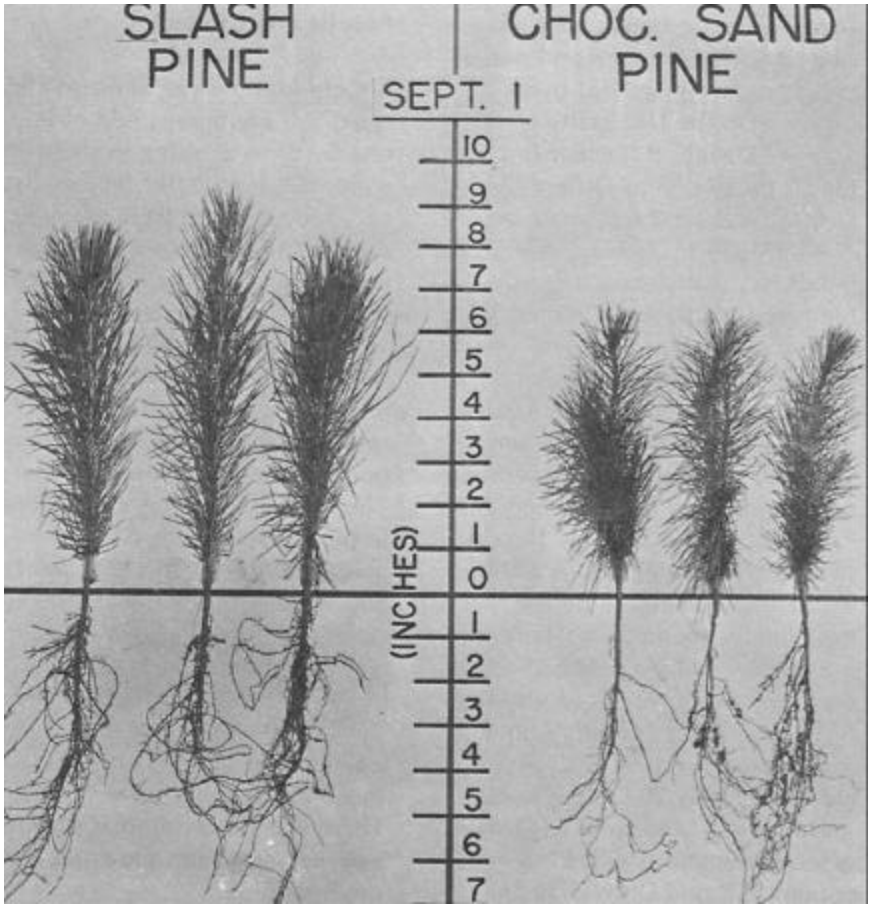

Figure 2. — *Comparative size of slash and CSP seedlings.*

by heavy rainfall. In such situa tions, the nurseryman will have to rely on evaluation of the seedlings and increase the frequency of N and K applications accord ingly. Whenever adjustments are made in the N and K fertilization, it should be kept firmly in mind that late season (after mid-August) fertilization with these materials, especially N, is apt to be more harmful than beneficial.

Soil fumigation normally does not eliminate the need for either hand or chemical seedbed weeding. To reduce or eliminate hand weeding, mineral spirits can be used on sand pine. Spraying should be done as needed, as for slash or loblolly pine, at the rate of 20 gallons of mineral spirits per acre of nursery bed. Mineral spirits cannot be applied to the same nursery beds on consecutive days without having adverse effect on the seedlings.

CSP seedlings with tops 8 to 10 inches in length and with well developed root systems of equal length are not difficult to produce. Seedlings this size have given excellent results when planted on prepared sites. Survival generally is satisfactory even when seedlings such as these are planted directly in the scrub oak rough. The nurseryman need not be overly concerned if the CSP seedlings are shorter than 8 inches when lifted. CSP seedlings 5 to 6 inches tall with well-developed root systems survive and grow as well as larger seedlings.

Seedling Handling and Lifting

Eight months of attention to detail can be undone by a few days of neglect during and after lifting. For several reasons, CSP seedlings must be lifted by hand. Grading is no longer considered necessary. CSP seedlings can be packaged in the conventional Forest Service "jelly-roll" bale. Such bales usually contain about 2,000 seedlings. Boxes of various types and kraft bags are also suitable for packaging these seedlings. Time of lifting and length of time in bale storage have a decided effect on planting success. Burns (*3*) reported greatest success when CSP seedlings wre lifted in January and early February and planted within 1 week.

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