NURSERY CULTURE OF LONGLEAF PINE

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Abstract--Several factors are important in producing high quality longleaf pine seedlings. Seedlings should grow to a minimum root caliper of 0.4 inches before lifting. Fall sowing and low seedbed densities have a positive influence seedling size. Care should be taken in lifting and outplanting to minimize mechanical damage and seedling shock. Benomyl root treatment of seedlings will improve seedling survival and growth. Length of seedling storage time should be minimized.

Comments on Bareroot Longleaf Production

The USDA Forest Service has made a committment to restablishing longleaf pine on those sites where it once naturally occured. This often requires the use of artifical regeneration with seedlings, especially on sites that are occupied by other species. Sucessful regeneration of longleaf like any other species requires that some key practices be followed both at the nursery and by the forest manager. The nursery manager is responsible for producing seedlings that will survive and grow if properly handled and planted by the forest manager. There are a few key principles in nursery culture of bareroot longleaf. Because of differences in nursery sites and operations, it is impossible to "cook book" exact procedures for sucessful production of longleaf pine. This paper will present a few of the key priciples that have brought repeated success in the Forest Service's longleaf regeneration program, and some detail on exact procedures used at Ashe Nursery. Here follows a summation of those principles.

I. 90% OF SEEDLINGS MUST HAVE AT LEAST 0.4 INCH ROOT CALIPER.

A. This eliminates the need for culling, which reduces critical root exposure time. Forest may change planting rates to compensate for culls.

B. Research and operations over the years have shown that seedlings below 0.4 inch root caliper will not consistently survive on most sites.

C. Cultural Practices at nursery to obtain proper root caliper include:

1. Sow in fall between September 15 and October 31. Fall sowing extends the growing season longer than spring sowing resulting in larger seedlings. Sowing in the fall drought period may result in better germination since heavy rains reduce germination and mess up seed spacing.

2. Sow for a density of 8 - 12 seedlings per square foot. Use a vacuum seeder or other precision type seeder to control both density

and spacing. Seed are presently sown in 15 drills on 3 inch centers with approximately 3 inches between seed within the drills. When using a vacuum seeder it may be remembered that skips do not cause culls, and that doubles may often result in culls.

3. Mulch seed with a bark type mulch that can withstand winter rains and will protect young seedlings from sand splash and associated disease entry.

4. Fertilize and water as necessary until seedlings obtain desired caliper. Though it can not be controlled, rainfall also helps increase growth. In months with heavy rainfall, seedlings may grow 0.1 inch or more. In months with little or no rainfall, seedlings may not grow any.

5. Protect seedlings from brown spot. Benlate (benomyl) may be applied monthly at a rate of 1/2 pound ai/acre. Seedlings may also be top pruned to a needle length of 6-7 inches as needed. This allows good penetration of sprayed materials.

6. Apply protection for any other disease or insect problems as needed.

II. TIMING OF LIFTING

A. Longleaf pine does not show color changes to indicate dormancy, although bud set in winter occurs. Root Growth Capacity and survival data for different lifting dates may be used to determine best dates for lifting longleaf. Early winter hard freezes between December 20 and January 1 have historically lowered surivial and caused failures. With the additional stress which longleaf undergoes in lifting and outplanting, outplanted longleaf is not apt to recover from a freeze that browns the needles. The end of the lifting window proably comes no later than budbreak. Usually bud break of longleaf precedes bud break of slash pine by one to two weeks. In most years budbreak has occured between Febuary 10 and Febuary 25.

III. MINIMIZE STRESS IN LIFTING AND PACKING

A. Longleaf pine is much more susceptible to damage in lifting and packing than most other pine species. Normal practices for handeling loblolly and slash pine might result in mortality if applied to longleaf pine.

B. Nursery Practices to minimize stress in lifting and packing.

1. Undercut seedling tap roots to desired length 6 weeks prior to lifting. This gives seedlings time to heal up, but not time to grow. When seedlings are lifted, run the lifting blade at a depth below the pruning depth so that the tap roots are not damaged by pruning at the time of lifting.

2. Handlift seedlings or use a lifter that will not damage the soft succulent tap root. Significant mechanical damage will show up about 2 weeks after lifting as gray blotches inside the white cortex area.

Unfortunately damage will not usually show up before seedlings are planted if they are planted within 10 days of lifting.

3. Lift during proper weather conditions. Do not lift when the air or soil temperature is below freezing. Do not lift when relative humidity, temperature and wind are marginal. Irrigate prior to lifting if the ground is dry.

4. Limit root exposure to air. Field pack, allow no more than one minute from the time a seedling is lifted until it is packaged with a water slurry on its roots. If culling is done, seedlings should be culled by the person who lifts them from the bed so that root exposure times may be held to one minute. Never allow roots to dry out.

5. Placed packaged bags in a shaded transport until they are taken to cold storage. Allow no more than one hour from field packing until seedlings are placed in cold storage.

IV. BENLATE ROOT TREATMENT

A. Apply benlate (benomyl) root treatment to seedlings according to the label rate during packing.

V. SEEDLING STORAGE AND TRANSPORTATION

A. Longleaf seedlings should be planted within 10 days of lifting. Lift on demand. Destroy seedlings that can't be planted within the 10 day limit. Once seedlings begin to break bud, seedlings should be lifted and outplanted in the tightest time frames possible. When significant quantities of seedlings break bud, outplanting is not recommended. Also, refrigerated storage of seedlings until outplanting is needed in all cases.

B. Coordinate shipping with forest manager to prevent over supply of seedlings at the forest and/or nursery. Ship all seedlings in refrigerated trucks. Seedlings are best shipped on pallets to prevent crushing while in transit. If seedlings are not shipped on pallets, they should be precooled to 35 degrees before shipment. Onsite storage of seedlings in refrigerated trailers prevents extra handeling of seedlings.

Concluding Comments

If all of the above steps are taken at the nursery (and others that might be specific for a different nursery), failures will occur when the forest manager does not properly store, plant, site prep, etc. All that is really required to cause a longleaf failure is a one good dose of loblolly pine mentality, either at the nursery or at the forest. I am convinced that both nurseries and forest managers have accepted cull seedlings and overstressed longleaf to the point that many failures have occured. The flexiblity for bending the rules that loblolly affords is simply not there for longleaf. Longleaf is a species that requires that we do all that we know to do if we are going to be sucessful. Sucessful outplanting of longleaf pine plantations is the best measure of good nursery operations.