

INTERIM GUIDELINES FOR GROWING LONGLEAF SEEDLINGS IN CONTAINERS

James P. Barnett, Mark J. Hains, and George A. Hernandez¹

ABSTRACT—The demand for container longleaf pine (*Pinus palustris* Mill.) planting stock continues to increase each year. A problem facing both producers and users of container seedlings is the lack of target seedling specifications. Outplanting and evaluating performance of seedlings with a range of physiological and morphological characteristics, over a number of years, and on a wide range of sites is needed to have sufficient data to develop optimum seedling criteria. Since resources have been unavailable to conduct this needed research, we have canvassed the producers and users of longleaf container stock for their recommendations on what they consider “preferred” and “not acceptable” planting stock. The compilation of this information has been widely reviewed and all suggested revisions considered. These standards are proposed as guidance until research provides sufficient data to modify and upgrade the specifications.

INTRODUCTION

Interest in the production and planting of longleaf pine (*Pinus palustris* Mill.) has reached an all time high, and demand for seedlings continues to increase. A 10-fold increase in seedling production has occurred in the last few years. In year 2000, growers produced about 75 million longleaf pine seedlings. In the last few years, seedling users are increasingly concerned about the lack of recognized and accepted stock specifications for container longleaf pine seedlings. Establishing seedling standards based on research has been difficult because even substandard container stock will survive in years when rainfall is abundant. Developing seedling grades requires outplanting and performance evaluation of seedlings with a range of physiological and morphological characteristics—testing over a number of years and over a range of site conditions. Lacking the resources to conduct the research to establish standards, The Longleaf Alliance and two USDA Forest Service units—the Cooperative Forestry group in Atlanta and the Southern Research Station silviculture unit in Pineville—decided to seek agreement among producers and users on acceptable seedling criteria. A survey of those who produce and use longleaf pine container stock for their recommendations revealed that available information was insufficient to develop three different seedling grades similar to those for bareroot stock (Wakeley 1954). So, we decided to develop only two, “preferred” and “not acceptable.”

Initially, we mailed an informal interview document to 15 longleaf growers and to the Southern States’ Forest Management Chiefs for their suggested specifications. After compiling these responses, we prepared a preliminary document and circulated it among all growers, to the Forest Service’s Southern Region, and to State silviculturists for comment. We evaluated the additional comments and incorporated them into the proposed standards.

We propose these standards as interim guidance until research provides sufficient data to modify and upgrade the specifications.

THE INTERIM STANDARDS

The interim standards in table 1 are only guidelines. Seedlings that fail to meet the criteria for the preferred category may still survive and grow well under favorable site conditions. However, experience has shown that when seedlings meet the preferred criteria, they will perform well in more stressful situations or less prepared sites. As additional research information becomes available, we will develop more specific criteria and will modify and improve these interim guidelines in the future.

The short discussion of seedling characteristics that follows should help clarify some of the issues related to the criteria listed in the standards.

NEEDLES

Size and condition of the needles are important to future survival and growth. Most seedlings are grown under nutrient regimes that limit excess growth, eliminating the need for clipping needles. To maximize root-collar development, some growers may use heavier fertilizer regimes. Such regimes may result in excessive needle growth and require needle clipping, especially if needles reach 12 to 16 inches. At this length, they tend to fall over and lodge, causing problems in uniformity of irrigation and increasing the likelihood of disease development. If clipping is required, growers should not cut needles shorter than 5 or 6 inches to maintain seedling growth and root-collar development (Barnett and McGilvray 1997).

The presence of needle fascicles indicates a well developed seedling. If needles develop in clusters of two or three, the seedlings will perform well when planted. Generally, needles should be pale to dark green in color. However, seedlings

¹ Barnett, Chief Silviculturist, USDA Forest Service, Southern Research Station, 2500 Shreveport Highway, Pineville, LA 71360, Hains, Research Coordinator, The Longleaf Alliance, Solon Dixon Forestry Education Center, RR 7 Box 131, Andalusia, AL 36420, and Hernandez, USDA Forest Service, State and Private Forestry, 1720 Peachtree Road NW, Atlanta, GA 30309.

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Table 1—Interim specifications for longleaf pine container seedlings

| Characteristics | Preferred | Not acceptable |
|---|--|-----------------------|
| Needles | | |
| Length if not top clipped | 8 to 12 inches | < 4 inches |
| Length if top clipped | 6 to 10 inches | < 4 inches |
| Fascicles | Many present | None present |
| Color | Medium to dark green | Yellow or brown |
| Roots | | |
| Root collar diameter at base of needles | ≥ 0.25 inch | < 3/16 inch |
| Color | Light brown with white tips | Black (diseased) |
| Mycorrhizae | Present (the more the better) | |
| Evidence of disease | None present | Any present |
| Root spiraling | None present | Any noticeable amount |
| Buds | | |
| Present | Present on 90 percent of crop | Absent |
| Color | Green to brown | Yellow or chlorotic |
| Container attributes | | |
| Container size (per plant) | | |
| Diameter | ≥ 1.5 inches | < 1 inch |
| Length | ≥ 4.5 inches | < 3.5 inches |
| Volume | ≥ 6 cubic inches | < 5.5 cubic inches |
| Other important attributes | | |
| Firmness: | Plug stays intact when extracted and during handling; no loss of potting medium. | |
| Moisture: | Root plug is always moist, never dry. | |
| Pests: | No competing weeds or insects are present. | |
| Sonderegger: | Buyer specifies whether to cull Sonderegger seedlings. | |

grown in northern nurseries may have variations in color that result from exposure to cold temperatures. Yellowish needles indicate poor seedling vigor.

ROOTS

Root-collar diameter (RCD) is one of the best indicators of seedling quality. Seedlings with RCDs of 0.25 inch or larger should survive well and invariably reach the 1-inch diameter needed for height growth earlier than smaller seedlings.

Observation of roots requires more attention than observation of tops. Roots with light brown color and numerous white tips indicate vigorous seedlings. Black roots require close scrutiny because they are likely to be diseased, particularly if a large portion of the root system is black. If the cambium is brown when the root is scraped with a fingernail, the root is dead. Waterlogging in the bottom of a container—caused by roots plugging the drainage hole late in the cultural period—often results in root mortality.

The presence of mycorrhizae indicates a healthy root system. Inoculation of seedlings with mycorrhizal spores is usually not needed because air-borne spores of native fungi typically inoculate the roots (Barnett and Brissette 1986).

Most commercially available containers have ribs within the cavities to restrict root spiraling. Longleaf seedlings rapidly develop extensive root systems, so spiraling is a potential problem if the ribs are not effective.

BUDS

The presence and color of buds depend on the developmental stage of the seedlings. If seedlings are outplanted in late October or early November, their buds will be more likely to be green than brown, compared to seedlings planted in late December or January. Although planting should not be delayed to obtain better bud development, it is desirable to have buds that have developed to the point that they become brown. Green-budded seedlings may still perform well, but they lack the maturity that provides hardiness and capability to begin early growth in the field.

CONTAINER SIZE

With appropriate cultural techniques, longleaf pine seedlings can be grown in almost any type of container. However, seedlings develop best when density in containers is no more than 50 plants per square foot and container volume is about 6 cubic inches per cavity (Barnett and Brissette 1986). Because longleaf pine seedlings are shade intolerant, close spacings may result in poorly developed plants (Barnett 1989). Seedlings grown in smaller containers may perform well under many conditions, but performance is enhanced by growing plants in larger containers. Container volume is an important consideration because very small containers may result in root systems that are excessively distorted, requiring considerable time to recover after outplanting. A variety of stock types may be suitable for specific sites. But, if stock is contract grown, choice of container type should be agreed upon by the grower and the buyer.

OTHER IMPORTANT ATTRIBUTES

A number of other attributes should be standard for any container production. First, the seedling plug should stay intact when extracted and handled, with no significant loss of potting medium. Second, the root plug should always be moist. Third, no competing weed or insect problems should be evident. The grower should cull seedlings with any such problems during extracting and packing.

Seedlings that begin height growth during the cultural period are usually Sonderegger pines (*Pinus Xsondereggeri* H.H. Chapm.). Sonderegger pine is a naturally occurring hybrid of longleaf and loblolly (*P. taeda* L.) pines (Little 1979) that have some stem elongation in the nursery. These seedlings produce poorly formed trees that are frequently culled because they are less desirable than longleaf pine. Whether Sonderegger seedlings are to be culled or planted should be agreed upon by the grower and buyer of the stock. Normally a very low percentage of nursery seedlings are Sonderegger pine.

CONCLUSIONS

These interim guidelines are designed for producers and users of longleaf pine container stock. They are not meant to exclude any container product. However, we believe growers should be able to attain the seedling specifications listed in the preferred category. Seedlings that meet these guidelines should yield excellent field survival and early height growth. Responses to our questionnaires to growers and users of container stock generally support the criteria. However, seedlings that do not meet the criteria may still perform well on some sites. Refining and improving these guidelines requires evaluating performance of seedlings with a range of physiological and morphological characteristics, planted over a number of years and on a wide range of sites. As additional research data become available, we will revise these guidelines. Some regional tests that are evaluating seedlings grown in a number of container types are underway. We expect these tests and others to help improve guidelines and provide further benefits to longleaf growers and users.

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