



TEXAS A&M FOREST SERVICE

Reforestation: Bareroot and Container Pine Seedlings

Producing and planting pine seedlings came into commercial use in the early 1940's. Between 1985 and 1990, annual South wide production and planting of bareroot pine seedlings ranged from 1.2 billion to 1.5 billion, and loblolly accounted for about 80% of all pine seedlings planted in the southern United States. Genetically improved seed, effective seed collection and storage techniques, intensive production, and advanced methods of seedling care and handling have made it possible to produce seedlings with high survival rates and vigorous early tree development.

The first step in producing pine seedlings is collecting cones. Carefully controlled cone collection, cone and seed processing, and storage can greatly increase the viability of pine seedlings. Once harvested, the cones are stored 3-7 weeks to dry so they will open. After extracting the seed from the cones, they are dewinged, cleaned, sized, and tested for viability. Before the seed can germinate, they have to undergo stratification (pre-chilling) to break the seed from its inherent dormancy. After the seed has been stratified, it is treated with a bird repellent and a chemical fungicide before being sown in nursery beds or container trays in the spring. There are generally two types of pine seedlings grown for commercial, large-scale plantings: bareroot and container.



Bareroot Pine Seedlings:

Bareroot seedlings are sown in seedbeds and are intensively managed during the growing process. They will be watered, weeded, fertilized and pruned. Bareroot seedlings are also conditioned throughout the growing season to improve size, shoot-to-root ratio, and physiological adaptability. In East Texas seedlings are normally lifted from December 15 through February 15 and graded on stem characteristics that indicate seedling quality. The ideal physical characteristics for a seedling include:

- a balanced shoot-to-root ratio (about 2:1),
- stem height 7-12 inches,
- root collar diameter at least 7/32 of an inch,
- fibrous root system about 6-8 inches long,
- winter buds present,
- at least a few secondary needles,
- no disease or injury present

Once graded, seedlings are packaged in heavy cardboard boxes or polyethylene lined kraft bags in quantities of 1000 and stored on racks in large refrigeration units at temperatures from 32 to 360 F. Fully dormant seedlings can be safely stored for 6-8 weeks under proper conditions.

Bareroot seedlings can be planted either by hand or by machine. The art of planting is easily learned, but planting is tedious, and so it is frequently done incorrectly. Incorrect seedling handling and planting can result in poor survival or misshapen root systems. The cost of planting bareroot seedlings is influenced by the intensity of site preparation, size and shape of the regeneration area, site topography, type of planting method, etc. The less vegetation or debris left on a site, the easier (and cheaper!) it is to plant, either by machine or by hand.

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The planting period coincides roughly with the dormant period of the seedlings. This is usually from December 15th to March 15th in East Texas, although local and yearly environmental conditions can alter dormancy. In actual practice, the beginning of and ending of planting season is often governed by the amount of moisture in the ground during late fall and early winter and by spring temperatures above 75 degrees.



Container Pine Seedlings:

Planting container-grown loblolly pines first came into commercial use in the 1970's, but is currently attracting increased interest among southern landowners and foresters as a means of extending the planting season and surviving drought. As many as 20 million containerized seedlings are now planted each year. In addition, longleaf pine lends itself especially well to containerized planting.

Using containerized seedlings has several advantages over using bare root seedlings. A crop of containerized seedlings can be produced at any time of the year. Producing containerized seedlings makes more efficient use of limited numbers of seeds, and seedling growth is increased. Using containerized seedlings extends the planting season, often improves growth on adverse sites, and survival is generally increased.

However, container seedlings also have several disadvantages. It takes more care to grow containerized seedlings than to grow bare root seedlings; the seedlings are often smaller than bare root seedlings; the containers are bulky; and per-seedling production costs are higher for containerized seedlings than for bareroot seedlings.

Containers can be divided into two general categories: containers planted with the seedlings and containers that are removed before out planting. Paper pots, wood fiber containers, and biodegradable plastic containers are outplanted with the seedlings as a unit. Most containers are

sturdy enough to withstand mechanical planting. Wood fiber containers planted with seedlings make direct contact with the soil, so root development is not restricted. Seedlings removed from their containers before outplanting are called "plugs." After roots have developed sufficiently to bind the growing medium into a cohesive unit, the seedling and the growing medium are removed from the container as one unit and planted. When handled properly, newly outplanted plug seedlings have all their roots and growing medium intact, so roots can begin growing into the surrounding soil immediately. It is important to discuss both minimum and preferred seedling standards with the nursery when placing an order. This is especially important for longleaf pine, and specifications are available by contacting a local Texas A&M Forest Service office.

Although containerized seedlings are bulkier than bareroot seedlings, the uniform shape of the containers or plugs makes hand and machine planting relatively easy. Containerized seedlings can be hand-planted with conventional planting tools such as dibbles or mattocks. However, tools specifically designed for planting containerized stock can greatly speed planting, but the effectiveness varies with soil characteristics. These tools force open a space in the soil equal to the size of the container or plug. Most continuous or intermittent machine planters used to plant bareroot seedlings can be easily modified to plant containerized stock. Self-propelled machines capable of automatically planting various kinds of containers have also been developed.

Containerized seedlings can be planted 9-10 months of the year, particularly if summer rains are frequent. In the South, planting typically occurs from mid-September to mid-May. Planting should not be done during droughts or hard freezes. Most container seedlings survive and grow well in any season. However, field performance is affected by type of container and type of growing medium, degree of site preparation prior to outplanting, and site quality.

Cost of Bareroot vs. Container Seedlings:

There is a cost difference between bareroot seedlings and container seedlings. Bareroot pine seedlings typically cost between $\frac{1}{2}$ and $\frac{1}{3}$ the price of container seedlings. Labor costs to plant bareroot seedlings can also be less than containerized seedlings. Some container costs can be offset if landowners plant fewer container seedlings per acre expecting a greater percentage to survive.