

Planning the Planting Operation

Even if you have only a few acres to plant, you can increase your chances for success by knowing what to expect, anticipating problems, and deciding how to handle those problems. It pays to have a plan. Here are some of the questions that your plan should answer:

- ✂ What species and seed source will you plant?
- ✂ Exactly when will the seedlings be planted?
- ✂ Will bareroot seedlings do the job or should container seedlings be used?
- ✂ How many seedlings do you need, and where can you get them?
- ✂ How will the seedlings be packed?
- ✂ How, when, and where will you pick up the seedlings?
- ✂ Do you have a suitable vehicle to haul the seedlings?
- ✂ Can you pick up seedlings daily, or can you store them on the site?
- ✂ Will you be planting longleaf or sand pine, which are extremely perishable?
- ✂ How will planting be supervised to be sure that the work is of the highest quality?

(These questions are printed in the form of a checklist located at the end of this section.)

Species and Seed Source Selection

The first step in the planting process is to obtain the best species and seed source for a given site. For this decision landowners should seek the advice of county foresters,

extension foresters, industry-landowner assistance foresters, consulting foresters, or ASCS/SCS personnel. It is important that the forester providing the advice be familiar with local soils, sites, and timber markets.

Genetically improved seedlings are a good investment because they perform better than unimproved seedlings. However, it is important to be certain that these seedlings are adapted to the planting site under consideration. Seed orchards are designed to produce genetically improved seeds suitable for specific geographic areas or physiographic provinces. They will not necessarily

perform well when planted elsewhere. As with the selection of any plant, it is important to carefully match species and seed source to the planting site. A genetically improved seedling is of no value if it dies or grows poorly because it is not adapted to the site.

When seedlings from a poorly adapted source are planted, the plantation can fail or growth reductions can adversely affect yields throughout the rotation. Poor adaptation in the South causes early mortality from drought, freeze damage, ice (glaze) damage, fusiform rust infection, and slow growth.



Cold weather damage in a Kentucky plantation. Left: Loblolly pine from a south coastal source; right: loblolly pine from a northern Piedmont source.

The Planting Season

The planting season throughout most of the South usually starts in December and ends in March. In Kentucky, Tennessee, and Virginia, planting often continues into April, and on occasion includes early May.

A number of factors influence the start and duration of the planting season:

- ✍ The degree of dormancy of the seedlings determines whether they can be stored and the duration of storage. Bareroot southern pine seedlings seldom become truly dormant like the northern and western conifers. Seedlings in nurseries near the Gulf Coast and the South Atlantic Coast may stop shoot growth but root growth often continues as long as soil temperatures remain favorable.
- ✍ When seedlings cannot be stored, they must be lifted on a daily basis. For this to happen, the soil cannot be frozen, and the air temperature, windspeed, and relative humidity must be within safe limits at the nursery.
- ✍ The weather at the planting site must also be above freezing with the air temperature, windspeed, and relative humidity within safe limits.

✍ During the planting season operations at both the nurseries and the planting sites may have to be suspended due to severe weather.

✍ The end of the planting season is often determined by warm, dry weather in the spring. Under these conditions, seedlings suffer high mortality due to overheating and desiccation. In the nursery when seedlings "flush" (start height growth), they are very fragile and do not store well.

Fall Planting of Bareroot Seedlings—Fall planting has been done successfully when the seedlings are not stored. Some forestry organizations require planting contractors to pick up seedlings daily. In this case the nursery lifts and packs only sufficient seedlings for 1 day of planting. An advantage of early planting is that the seedlings become established during the winter and are ready to start shoot growth early in the spring. A disadvantage is that the seedlings may be actively growing in the nursery and therefore are extremely tender and difficult to handle. Early lifted seedlings also are extremely vulnerable to early frost.

Anyone considering fall planting should be aware of the risks associated with handling these early lifted seedlings.

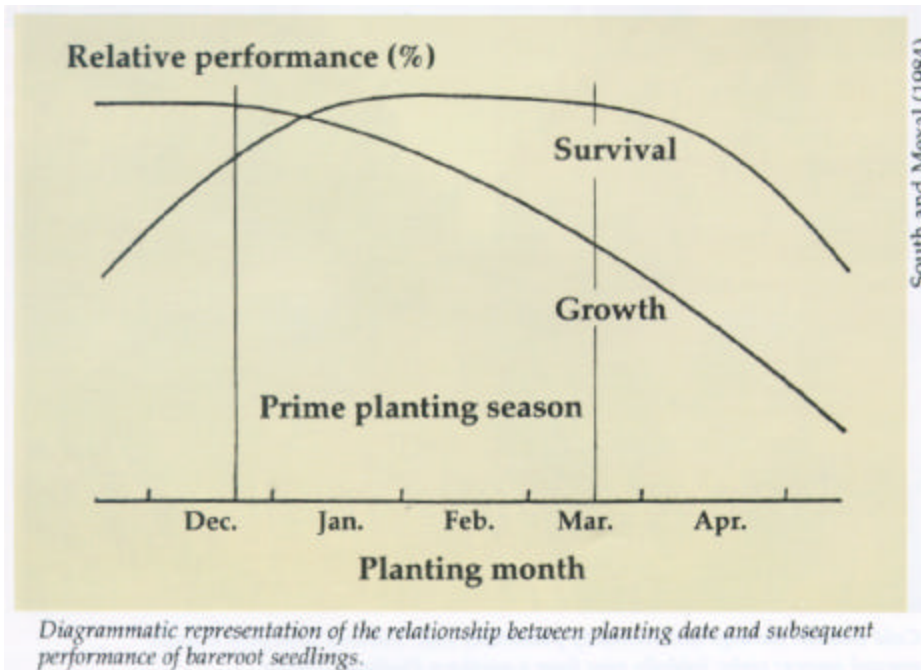


Container seedlings.

Bareroot or Container Seedlings?—Seedlings that are grown, shipped, and stored in individual containers are becoming increasingly available in the South. They were originally developed for reforestation in the Scandinavian countries and Canada. Container stock can be planted either earlier or later in the year than bareroot stock. Early planting in the South can begin in October, allowing seedlings to become established before freezing weather occurs. Planting can extend into late spring and even summer on sites that are too wet to plant during the fall or winter with bareroot seedlings. The root system protection of container seedlings often helps to reduce seedling damage associated with the lifting, storage, and planting of bareroot seedlings. However, container seedlings are usually more expensive than bareroot seedlings. For additional information on container seedlings see the reference section.

REMEMBER

Seedlings must be protected from high temperatures, direct sun, wind, and freezing.



Advantages and disadvantages of southern pine container seedlings

Advantages	Disadvantages
Quickly produced	Require more attention while growing
Extended planting season	May cost more
Improved performance of some species	Bulky to handle
Perform well on adverse sites	May require more intensive site preparation
Efficient use of limited seeds	Smaller size
Uniform seedlings	

Barnett and Brissette 1986.

Seedlings are planted at different spacings to achieve the desired density. A general trend is toward increasing spacing between rows and correspondingly decreasing spacing within rows to improve access for fire control, thinning, and harvesting equipment.

Seedlings per acre by spacing

Spacing (ft)	Number of seedlings	Spacing (ft)	Number of seedlings
6 x 8	907	9 x 9	537
6 x 9	806	9 x 10	484
6 x 10	726	9 x 11	436
6 x 11	660	9 x 12	403
6 x 12	605	10 x 10	435
7 x 7	888	10 x 11	396
7 x 8	777	10 x 12	363
7 x 9	691		
7 x 10	622	12 x 11	330
7 x 11	565	12 x 12	302
7 x 12	518	12 x 15	242
8 x 8	680	15 x 7	414
8 x 9	605	15 x 8	363
8 x 10	544	15 x 9	322
8 x 11	495	15 x 10	290
8 x 12	453	15 x 15	193

Ordering Seedlings

After the species, seed source, and type of seedling have been chosen, it is time to think about ordering your seedlings from a nursery. Plan ahead to allow time for adequate site preparation and to ensure availability of seedlings. Most southern nurseries begin taking seedling orders in midsummer—some begin as early as, April. Place orders early so that you have enough seedlings of the proper species and seed source to meet your planting needs.

Before ordering seedlings . . . you need to know how many are needed and when they should be delivered.

To determine the number of seedlings to order consider the acreage to be planted and the planting spacing.

Determine acreage by actual field measurement, or by estimation from up-to-date maps, aerial photos, or other records.

Spacing of seedlings depends somewhat on your plans and objectives. Most pine plantations in the South are established with 600 to 700 seedlings per acre. A minimum of 600 seedlings per acre is required for participation

in some Federal cost-share programs. In some cases forest industries are planting up to 1,000 seedlings per acre to maximize fiber production in short rotations. Most landowners, however, will get better returns by planting 600 to 700 trees per acre and managing for multiple products such as poles, sawtimber, chip-n-saw logs, and pulpwood.



New Plantation

Calculation of the Number of Seedlings Required – The number of seedlings required for any spacing can be calculated by multiplying the distance between seedlings in rows (in feet) times the distance between rows (in feet) and dividing that product into 43,560 (the number of square feet in an acre).

Example: How many seedlings would be required to plant one acre at a spacing of 6 by 12 feet?

$$6 \text{ by } 12 \text{ feet} = 72 \text{ ft}^2$$

$$\frac{43,560 \text{ ft}^2 \text{ per acre}}{72 \text{ ft}^2 \text{ per seedling}} = 605 \text{ seedlings per acre}$$

Having determined the number of acres to plant and the spacing and trees per acre, consider one more point. Add 10 percent for cull seedlings and shortages in the number of seedlings packed. Cull seedlings are too small, too large, damaged, or otherwise unsatisfactory for planting. (Identifying cull seedlings is covered in detail in the next section on seedling quality.) In effect, you will be ordering 10 percent more seedlings than you have calculated you need for planting. This overage will compensate for any shortage in the number of seedlings actually packed.

Most southern nurseries estimate the number of seedlings in a package by its weight. A bag that is intended to contain 1,000 seedlings may actually contain only 800 seedlings if the seedlings are unusually large and heavy, or possibly 1,200 seedlings if they are small and light. Differences in seedling moisture content or soil adhering to the roots will also disturb the accuracy of weight estimates of seedling numbers.

Example: How many seedlings should you order to plant 35 acres at a 7- by 10-foot spacing and allow for a 10-percent cull factor.

$$7 \text{ by } 10\text{-foot spacing} = 622 \text{ seedlings per acre}$$

$$35 \text{ acres} \times 622 \text{ seedlings per acre} = 21,770 \text{ seedlings}$$

$$10\text{-percent cull factor: } 21,770 \times .10 = 2,177 \text{ seedlings}$$

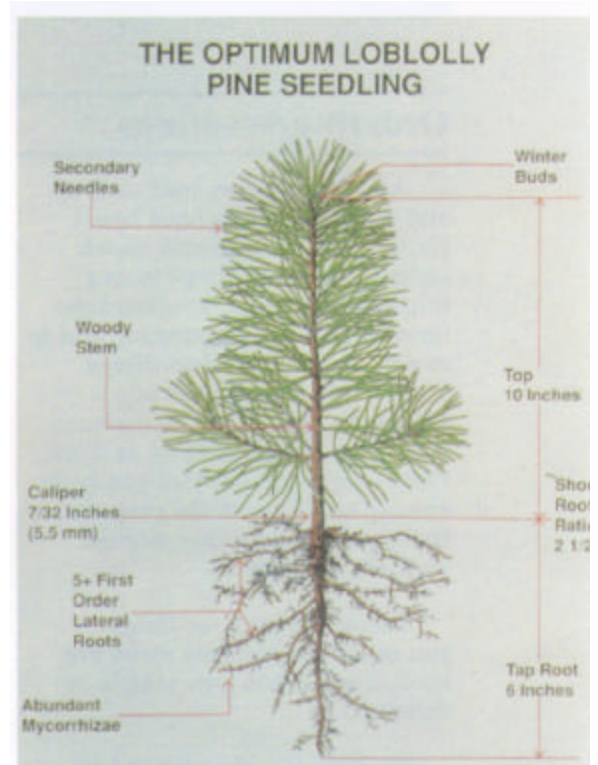
$$21,770 + 2,177 = 23,947 \text{ seedlings required}$$

$$23,947 \text{ rounded to the next highest } 1,000 = 24,000 \text{ seedlings to be ordered.}$$

REMEMBER
*Cull seedlings
 don't
 pay off!*

Seedling Quality

High-quality seedlings are always a good investment. In contrast, investing land and labor in the planting of poor-quality seedlings never pays. Optimum quality seedlings have consistently performed better in both survival and growth than seedlings of lower quality.



The Optimum Loblolly pine seedling.

***High-quality
 seedlings
 are a good
 investment!***

Optimum characteristics of southern pine seedlings

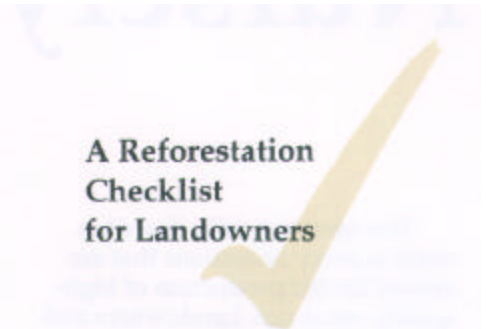
Characteristics	Pine species		
	Longleaf	Loblolly and slash	Shortleaf
Stem length (inches)	—	10	8
Root collar diameter (inches)	9/16	7/32	3/16
Tap root length (inches)	6	6	6
Laterals (number)	← 5+ first order laterals →		
Winter buds	Present	Present	Present
Nature of stem	—	Stiff, woody, with bark	Stiff, woody, with bark
Mycorrhizae	Present	Abundant	Abundant
Shoot/root ratio (volume)	1:1	2 1/2:1	2 1/2:1

Lantz (1985).

Some nurseries cull seedlings to a uniform size before packing. Others attempt to produce a uniform seedling in the nursery bed to eliminate the added expense of hand culling after lifting. Culling before planting removes seedlings that are too large or too small to be planted. It also removes seedlings with broken or crushed stems and roots, stripped needles and missing bark. You should also look carefully for stem swellings indicating fusiform rust.

When seedling packages contain less than 10-percent cull seedlings, it is seldom cost-effective to cull at the planting site. Planters can be instructed to discard any small, weak, or damaged seedlings as they plant.

When packages contain more than 10-percent culls, the seedlings should be culled under careful supervision in a cool, high humidity area protected from sun and wind. As seedlings are removed from their packages, their roots should be dipped in water, clay, or a synthetic gel to reduce drying. Seedlings with roots that have already been coated with clay or gel should not be redipped. After culling, promptly repack seedlings in their original packages. Add more moisture if needed. Seedlings may be carried in buckets or tubs containing water or moist moss around the roots to keep them from drying out while being transported to the field. Do not leave seedling roots in water for more than 1 hour! These roots need air and cannot "breathe" under water.



A Reforestation Checklist for Landowners

- ___ The months of December to March are usually the best time to plant.
- ___ Select the best species and seed source for your site.
- ___ Bareroot or container seedlings?
- ___ Order your seedlings as early as possible.
- ___ Read about seedling quality and nursery conditioning.
- ___ Ask the nursery manager how the seedlings will be packed.
- ___ Decide how, when and where you will pick up the seedlings.
- ___ Do you have a suitable vehicle? (You should be able to keep the seedlings cool and protected from physical damage and/or chemicals, diesel fuel, herbicides, etc.)
- ___ Can you pick up seedlings daily from cold storage? If not, do you have suitable on-site storage?
- ___ Are you planting **extremely perishable** seedlings such as longleaf or sand pine? If so, special precautions are needed.
- ___ Have you arranged for proper supervision of the planting operation?