NC STATE EXTENSION

hristmas Trees

Establishing a Christmas Tree Plantation

Establishing a Christmas tree plantation begins with selection of species and site and includes site preparation and planting. Successful harvest of Christmas trees from any plantation is largely determined by the decisions made during this establishment phase. Suitability of the site for the species to be grown is of critical importance. Selection of an optimum site can minimize the risk of a number of production problems. Careful planning and layout of fields and farm roads can reduce pest management and harvesting costs. Proper site preparation can cut a year or two from the production cycle by providing an optimum environment for young trees. By planting only the highest quality planting stock, the health and quality of a plantation can be enhanced. A grower should proceed with establishment thoughtfully — mistakes made at this point have a tendency to grow and multiply.

Species Selection

The choice of Christmas tree species to be grown is largely governed by geographic region and climate. Some species require the mountain climate. Other species have traditionally been grown and marketed only in the coastal plain and Piedmont of North Carolina.

While species such as Fraser fir are primarily marketed through national or regional wholesale markets, other species, such as Virginia pine, are primarily marketed through local choose-and-cut markets. A potential Christmas tree grower must

carefully weigh the growing requirements and business aspects of each species. Some of the questions to be answered before deciding which species to grow are:

- Will there be a market for these trees when they are ready to harvest?
- Can this species be grown on the land available, or am I willing to relocate to a more appropriate area to grow the species I want to grow?
- What special problems are involved growing this species?

The final choice of species depends on the availability of suitable land. Planting in areas not recommended usually leads to poor survival and growth, and subsequent reduced financial income.

Site Selection

Determination of site suitability for the selected species is one of the most important decisions. A potential Christmas tree producer should focus on finding land with the best possible characteristics. A landowner cannot simply choose a species based on local selling price for that crop. It would be better to succeed in a less profitable enterprise than to fail at Christmas tree production because the site was unsuitable.

Site suitability is governed largely by soil characteristics. A grower should inspect the soil conditions on potential sites. Is the topsoil more than 6 inches deep? Is the subsoil a heavy clay or a clay loam? Is there a hardpan? How deep do weed or existing tree roots grow? Is the soil compacted? Is there ever standing water on the site after a rain? Are there weeds on the site that indicate periodic water saturation, such as swamp grass or rushes? Any of these factors could indicate a problem. County soil survey maps can help determine soil type and suitability. A preliminary soil sample is also needed to evaluate the fertility of the soil.

The elevation and aspect of a site should be considered. Both of these factors influence microclimate and, to a large extent, the characteristics of the soil at a given location. Sites that face south and southwest and sites at lower elevations typically have warmer, drier soils in contrast to north and east aspects or higher elevations, which are cooler and more moist. In the mountains, elevations above 3,000 feet and north-facing slopes usually have more soil organic matter, while clay content tends to increase at lower elevations or on south-facing slopes.

The microclimate of a site determines the risk of freeze damage to buds or new growth. Trees may tend to break bud as much as 2 weeks earlier in the spring on

growth. Trees may tend to break bud as much as 2 weeks earlier in the spring on warmer south- or southwest-facing slopes, as compared to cooler north-facing slopes. When there are risks of late hard freezes in an area, early budbreak is a liability that can cost a year's growth. The extent of frost damage can be compounded by other site factors that create a frost pocket. Any factor that reduces air drainage can keep cold air on site. Cold air drains poorly from flat land. Hills or ridges above the planted area can trap cold air, as can a wall of trees along a property line.

The pattern of water flow and drainage in a site should be considered in site evaluation. Obviously, creeks and intermittent streams should be noted, as well as drainage ditches or culverts above the area. Surface evaluation not only indicates potential flood areas but also where soil may be saturated for extended periods. Flat or concave areas are particularly subject to slow water drainage. Moisture retention can also be evaluated in terms of aspect. Soils on south-facing slopes will be drier than those on adjacent north- or east-facing slopes. Such conditions can effect survival after planting, or tree growth during seasons in which a drought or flood occurs.

There are several other factors that might reduce the effective production area without eliminating the site altogether. Are there areas that are too rocky, wet, or steep to plant? Such areas might serve as staging areas for harvesting or road turn-arounds, even if they are lost to production. The prevailing slope may be severe enough to impede cultural management. Trees generally cost less to manage, and achieve market size faster on gentler slopes. Topography may restrict the use of mechanization. Are there "edge effects" from a tree line along a property border? Unless shade can be removed, such areas are almost certain to produce inferior-quality trees.

Site access should also be evaluated during the selection process. Harvesting must be accomplished in a variety of weather conditions. Good access becomes critical, both to the site on state-maintained roads and on the site with well-planned farm roads. With the short market distribution period, trees must be removed on schedule. However, easy access can also encourage theft. Plantations along public roads and those with multiple access points invite these kinds of problems. For security, the best location is at the end of a dead-end road with no other access. Occupied dwellings with a good view of the plantation can reduce the potential for theft. However, security can be augmented at easy-access sites and generally should not be a primary factor in rejecting a site.

Plantation Layout

Careful layout of tree fields, roads, and work areas before the plantation is established can result in cost savings in both management and harvesting. Roads through and around the field should be marked off, necessary drainage culverts installed, and grading accomplished prior to planting. Professional advice is recommended for road construction. Poorly constructed roads require extra maintenance, and still can fail. Improperly constructed roads can also create drainage problems that can lead to root diseases and erosion problems in tree fields.

As a general rule, no place in a plantation should be more than 100 feet from a road. Some growers space roads as close as 65 feet apart or about every 12 to 13 rows. Placement of field roads every 16 to 20 rows apart is quite common. This spacing facilitates spray applications from the road. It also minimizes the distance trees have to be carried during harvest. "Edge-effect" areas make excellent roads and equipment turn-arounds. Fifteen feet between rows should be left for secondary roads, with more width for main roads. As tree crowns develop, the usable width will be reduced to 10 feet or less (about the minimum to accommodate operation of trucks, tractors, and other machines without damage to the trees).

All-weather roads to a plantation should be graveled. Roads within the plantation that are used less frequently should be seeded to grass to produce heavy sod. Steep or wet roads may require installation of filter cloth and gravel to hold up to normal usage. Regular road maintenance and sod renewal pay off when roads must be used during unfavorable weather.

Some growers like to leave wider areas in the roads at strategic locations for work centers and collection points in harvesting. Designation of work areas, however, is not critical, and many growers operate without them.

Site Preparation

Once a suitable site is selected, it must be prepared for planting. The degree of site preparation will depend on the current condition of the land and the requirements of the intended planting technique. Forests, abandoned fields, and pastures each need different operations to be readied for planting. Machine planting requires a more prepared surface than does planting by hand. Site preparation might involve pushing stumps and rocks, raking roots, and smoothing the ground with a bulldozer. It might also involve disking, chisel plowing, strip-tilling, or subsoiling to provide favorable soil conditions for tree establishment.

Where soil erosion or compaction is probable or when capital is limited, growers may choose less intensive site preparation practices. However, cost savings during

may choose less intensive site preparation practices. However, cost savings during site preparation are often countered by increased costs during planting and early production. Regardless of the economics, potential impacts of site preparation, especially on marginal soils, must be carefully considered before heavy equipment is used.

Initial land clearing must be both cost effective and favorable to future production. Little or no clearing is necessary for existing croplands or pasture, while forestland or abandoned land may require extensive work. Extreme care should be taken to not work on the land when the soil is too wet. Heavy equipment, including skidders, bulldozers, and farm tractors, can compact wet soils to depths in excess of 16 inches. Compaction becomes worse with each additional pass of heavy equipment, particularly under the wrong soil conditions.

Traditional intensive land clearing involves bulldozing debris into windrows. Intermediate techniques involve the use of dynamite or a backhoe to lift stumps from the ground without scraping topsoil away. The slash can then be piled with minimal soil disturbance. Many growers are choosing to leave the largest tree stumps and sacrifice space for a handful of trees per acre to avoid soil disturbance and compaction caused by moving stumps. The lowest intensity land clearing techniques involve cutting and piling the debris by hand with the help of available farm equipment. Farm size frequently dictates the techniques that a grower selects, but with any land clearing, preservation of topsoil must be a primary goal.

Future management must be considered in relation to the degree of land-smoothing conducted. Where growers plan to rely on manual fertilization and herbicide application, the field can be much rougher with occasional rocks or stumps. If a grower plans to mow regularly with a tractor or walk-behind mower, smooth land is a necessity. Achieving a perfectly smooth field can have a cost in soil compaction. Mowing is also more expensive than most herbicide applications. Thus, many growers are settling for less manicured fields.

Often, initial land clearing is completed the year before planting to allow time for site preparation. Herbicide control of re-sprouted or emerged woody and perennial weeds in late summer or early fall of the same year can control weed problems. Hardwood sprouts, vines, and briars are easier to control without the complication of newly planted trees.

If the soil was not tested during site selection, samples should be collected before site preparation is completed. This could be the only good opportunity to work

site preparation is completed. This could be the only good opportunity to work certain nutrients into the soil as the presence of trees limits some fertilization practices. Phosphorus and lime do not move readily in the soil and may not be available in the root-zone for a considerable time following application to the soil surface. These same chemicals also do not readily leach, so once incorporated into the soil, they remain available to the trees. One of the important functions of phosphorus fertilization is to lessen transplant shock. This can occur only if the phosphorus is immediately available to the newly-planted tree. If these materials are needed, they should be applied before tilling in the amount that will meet requirements for at least the beginning of the production cycle. Other nutrients can be applied before planting, but may be more likely to leach over time.

Depending on the condition of the land, several techniques may be used between clearing and planting to improve the tilth, drainage of the soil, or both. Generally, tillage techniques are only used when there are fertility, drainage, compaction, or some combination of these problems on site. On former pasture land, which is often severely compacted, use of these techniques can be especially important. To minimize erosion problems, tillage should be done along contours.

Where true hardpans exist in coarse-textured, sandy soils, subsoiling is an approved practice to improve internal drainage. Growers have used chisel plows, large disks, and various types of cultivators to till the soil. Subsoilers may be used in both directions on a planting grid to provide four channels for root growth. However, in silt or clay soils, subsoiling has little long-term benefit to drainage because the channels quickly fill up with fine soil particles. On finely-textured soils, tillage can be of great benefit, particularly where surface compaction exists. Although long-term drainage may not be enhanced, tilth is improved for the tree establishment period. Tillage should be completed in the fall or early enough in the spring to allow soil to settle prior to planting.

On sloping land, some growers are reluctant to tear up established weeds or sod for fear of accelerated erosion. If heavy rains occur before new groundcover becomes established, severe site damage and loss of valuable topsoil may result. When tilling is done in the fall, rye or some other cover crop is sown over the area to minimize surface runoff. Some growers establish sown groundcovers between their trees, because it can be managed more uniformly and easily with less

Links to:

https://www.ces.ncsu.edu/wp-content/uploads/2014/05/fig5.jpg

herbicide than the native weed growth.

Using large equipment for site preparation is efficient but is not suitable for all areas.

Finally, it is not enough to know that the site selected is suitable in elevation, soil type, and location for the species to be grown. There must be adequate expenditure of time, labor, and materials in developing the layout of the area and preparing the site. Proper attention to these items can spell the difference between the success or failure of the entire venture.

Selecting the Planting Stock

Regardless of species, choosing the right size, age, and quality of planting stock is very important. If healthy, vigorous nursery stock is used, harvesting in a field may begin a year or two earlier. A buyer should examine the seedlings closely. Signs of seedling health include light-colored roots (tan, red, or light brown) with no stripped root tips, and uniformly green foliage. A number of private nurseries grow and sell seedlings or transplants (also called liners) suitable for Christmas trees. Conifer seedlings are also available from the North Carolina Division of Forest Resources and other state nurseries on an as-available basis.

Growing Your Own Planting Stock

It is possible to grow your own seedlings and transplants or even to develop seedling transplant production into a full-scale enterprise. Production of these initially small and tender seedlings is not suited to the management goals of every Christmas tree grower. Some species of Christmas tree take only 1 year to achieve a seedling large enough to plant in the field. For others, 4 to 5 years are necessary. In purchasing seed for seedling production, be sure to deal with a reputable firm that guarantees seed source origin. An alternative is to personally collect the seed from native stands. In either event, the seed should be tested for germination and treated with a fungicide before sowing.

The site for a nursery bed should be level, fertile, well-drained and stone-free, with a deep, sandy loam topsoil. The site should be free of perennial vegetation, controlled either by herbicides or tillage. The soil should be tested for nutrient deficiencies before seed sowing. If soil analysis shows a need for phosphorus or lime, the material(s) should be applied and tilled into the soil before planting. Soil fumigation will control both weed seeds and many soil-borne diseases and should be done

either the fall or spring before the beds are sown. Seedbeds can be prepared in the fall or spring. Many producers till, fertilize, and fumigate their fields in the fall but wait until spring to build raised beds. Soils are often dryer and easier to work in the fall and there is more time to allow for potential delays.

Most seedbeds are built 4 feet wide with 2-foot aisles between the beds. Beds should be designed to fit the wheel width of the tractor to be used. Beds are usually elevated 6 to 8 inches above the aisles. The surface of the bed is finely tilled and then smoothed prior to sowing seeds. Use the equation below to calculate the sowing rate:

```
Pounds of seed required = Area in sq. ft. × Seedling density per sq. ft. Germina
```

More seed should be sown than indicated by the calculated sowing rate to cover losses by insects, diseases, birds, and rodents. Seedling density varies with the species. Firs and spruces should not exceed 40 to 50 plants per square foot. Pines and redcedar should have a density of not more than 35 plants per square foot. Immediately after sowing the seed, the surface of the bed should be rolled or pressed to ensure firm contact of the seed with the soil.

Seedbeds should be covered with ¼ to 1 inch of pine straw, composted sawdust, hardwood bark, peat moss, or other organic material. Fresh sawdust should not be used. Mulch conserves moisture and protects tender plants during germination and early establishment.

Seedbeds should be fertilized according to the specific needs of the species grown and recommendations from the soil test. Nitrogen and potash fertilizer should be used sparingly the first year. In the second year, seedbeds should be top-dressed with nitrogen usually split into three applications in April, May, and June. A late summer application of potassium, not exceeding soil test recommendations, will speed the process of seedling dormancy in some species. If seedlings lack vigor, good color, or both, additional soil samples should be analyzed.

Links to: https://www.ces.ncsu.edu/wp-content/uploads/2014/05/fig6.jpg

Quality seedlings and transplants are important aspects of plantation establishment.

Irrigation water of suitable quality should be available with a full irrigation system installed

available with a full irrigation system installed. Water must be applied to the beds as needed each day following sowing. When seedlings are emerging, more than one application per day may be necessary. During rainless periods, water should be applied at the rate of approximately 1 inch per week after germination and throughout the first growing season.

Fraser fir and spruce seedlings develop better if grown under partial shade during the growing season. Above elevations of 3,000 feet, the seedlings do best under 30 percent shade the first year and no shade the second year. At lower elevations, Fraser fir may need 50 percent shade the first year and 30 percent the second year.

Pines and redcedar usually grow enough for field planting directly from the seedbed. However, after 2 or 3 years in a seedbed, firs and spruces need to be transplanted to a line-out bed for 2 years. This disturbance stimulates the root system and produces a more balanced plant. Transplant beds require well-drained soils and raised-bed construction similar to seedbeds. Transplant beds should have irrigation water available and, as with seedbeds, should be fumigated in the spring for fall prior to planting. Seedlings are spaced 6 to 8 inches apart in the transplant beds. If transplanting by hand, a transplant board and a trenching tool will speed the effort. For large quantities of seedlings, the cost of renting or purchasing a mechanical transplanter may be justified. Seedlings should be transplanted with the roots fully extended downward and the stems upright. Properly handled transplants will be straighter and easier to outplant.

Outplanting the Trees

Success of outplanting largely depends on the care given plants before and during planting. Planting should be done during the dormant season, with planting dates varying with geographic area. While fall planting can be successful, most Christmas trees are planted in early spring (Table 1). Soils are cooler and retain more water and there is usually more rainfall in the spring to support young trees.

Table 1. Suggested times for planting Christmas trees in the spring

Location	Time of Planting
Coastal Plains	January through March
Piedmont	February through April
Mountains	March through mid-May

Mountains	March through mid-May

Planting should be delayed if adverse conditions are likely to reduce either the quality of planting or later survival. No planting should be attempted when surface soils are too dry, too wet, or frozen. Unless the soil is in tillable condition, seedling roots can not be properly packed. Roots die if exposed to air in poorly packed planting holes. Under wet soil conditions, soil is likely to be compacted during planting, aggravating soil drainage problems.

If dormant seedlings are to be field-planted within 4 weeks after they are received, they can generally be stored in the shipping package. From the time trees arrive until they are set out, they should be stored in a cool, dark place, preferably under 50 degrees F. Roots must not be allowed to dry out. Failure to keep the roots moist has contributed to many unsuccessful plantings.

Planting time is an excellent opportunity to remove cull trees. Many growers grade their planting stock before going to the field. They evaluate stem diameter (or caliper), height, vigor of the root system, and presence of a dominant terminal bud or single top. Cull trees are likely to remain a poor investment, but some growers reset them in a transplant bed in an attempt to grow them up to grade. For a majority of low-grade trees, however, a cull remains a cull. They can cost years in reduced efficiency and increased costs.

While grading seedlings, many growers root-prune their planting stock. Root-pruning can reduce the incidence of "J-rooting" or "U-rooting" that occurs when planting too large a seedling into too small a hole. Root-pruning should target only the excessively long roots, as severe root-pruning can reduce plant survival. Ideally, planting stock should have as much volume in the roots as in the top and never exceed a two-to-one ratio of top to roots. It would be better to dig a deeper hole than to cut off too many roots. Root-pruning can also spread root diseases. Periodic sterilization of the knife or hatchet with a disinfectant is recommended to minimize this risk.

Even during planting, care should be taken to keep the roots moist. Many growers root-dip their transplants in a water-retaining planting gel. Trees should be protected from direct sunlight at all times. Loosely stored trees or seedling packages should be kept in the shade, not under tarps, which can trap heat. Trees should be carried

from package to planting site in a bucket, planting bag, or tray with damp moss covering the roots. When hand planting, trees should be removed from the

container one at a time as each hole is dug.

Several planting methods have been used successfully, depending on the planting site. Across North Carolina, tractor-pulled tree-planting machines are used on open land where larger numbers of trees are being set. Most hand planting is done with planting bars or spades. Some growers use hand-held power post hole diggers to provide a tilled planting hole for transplants. However, using post hole diggers in clay soils can be difficult, and can result in a sealed hole, which results in trees becoming "pot-bound." For very rough, steep, or erodible land, hand planting may be the only practical choice. If the planting site is suitable and properly prepared, machine planting is more efficient. Machine-planted trees may require some hand straightening and packing in, but survival often exceeds that of hand planting.

Links to: https://www.ces.ncsu.edu/wp-content/uploads/2014/05/fig7.jpg

Machine planting of trees is often preferred to planting by hand.

Precise spacing is advantageous for Christmas tree production, because each tree has more uniform growing conditions, and cultural practices become easier to complete. Christmas trees must be planted "in-line" in either straight rows or in rows on the contour. "Off-set" trees may be damaged or destroyed by machinery used for cultural practices, especially mowing. To keep trees in-line and uniformly spaced, many growers stretch a string to mark off each row as it is being planted. The string may have the in-row intervals marked on it as well. Other growers carry a measuring stick to mark off tree spacing both within and across rows. Some tree planting equipment is designed to precisely space trees, resulting in equal distances between trees within rows.

Spacing trees the proper distance is very important to growing quality trees. Correct spacing varies by species, intended tree size, and amount of mechanization. As can be seen in Table 2, even a small change in spacing can make a large change in the number of trees per acre. It is important to note that as the trees grow together in a tight spacing, they shade bottom branches of adjacent trees, reducing quality.

Table 2. Common tree spacings and the corresponding number of trees per acre

corresponding number of trees per acre

In-row x Across-row (feet)	**Number of trees / acre**
4 x 4	2,720
4 x 4½	2,420
5 x 5	1,740
5 x 6	1,450
6 x 6	1,210
7 x 7	890

Depending on the existing groundcover, the marked rows may need to be banded with a pre-emergent herbicide several weeks before planting. In other situations, trees and emerged weeds can be oversprayed with a post-emergent herbicide after planting. Generally, tall weed growth is allowed in row middles during the first year to provide partial shade as long as there is no immediate competition around the tree. The fields should be periodically scouted to check for problem weeds, such as vines, that can quickly escape control.

Even with ideal conditions, most growers expect to lose 1 or 2 percent of their trees the first year. If establishment stress is compounded by insects, disease, poor weather conditions, or by poor planting technique, much higher losses can occur. Planting success should be evaluated during the first year. Unless losses can be attributed to a soil-borne disease, any gaps may be reset the following planting season, depending on species. If a root rot disease is the cause of death, replants of the same species are as likely to die as the initial planting.

PAGE LAST UPDATED: 5 YEARS AGO

YOU MIGHT ALSO LIKE

- How Pesticides Can Actually Increase Mosquito Numbers
- Developing Wildlife-Friendly Pine Plantations
- Chapter 5 – Early Days: the 1960s
- 19. Landscape Design — North Carolina Extension Gardener Handbook
- Fall Is the Best Time to Plant Trees and Shrubs
- How to Make Your Centipede Lawn Look Better than Your Neighbor's!