

forestry & natural resources

WOODLAND MANAGEMENT

Growing Christmas Trees

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This publication will acquaint the prospective grower with the basics of growing Christmas trees and help him avoid management errors that could cost years of lost profits or complete plantation failure.

It has been said over and over again, "There is no such thing as a free lunch." Truer words were never spoken when applied to Christmas tree production. Every year hundreds of optimists plant tree seedlings expecting to come back in seven to ten years and make a killing on the Christmas tree market.

Grim reality usually rears its ugly head early as weeds and rodents seem to flourish at the expense of newly planted seedlings. Shearing and insect problems seem endless.

Even after all the hard work, well-managed plantations may only yield 50 to 80 percent salable trees. The rest can be lost to mortality, poor quality, or some other malady. So before you purchase the new seedlings, consider all of the above. Are you really sure you want to commit a significant amount of time to manage a successful Christmas tree operation? Can you find temporary labor to complete the seasonal cultural operations? Can you market your trees to yield a satisfactory return on your investment? If the answers are yes, read on for a few suggestions to help you get off on the right foot.

Site Selection

"All Life is Rooted in the Soil." Before planting any crop, the soil and site characteristics must be examined. While the pines will grow on a variety of soil types, more careful site selec-

tion is needed for the spruces, firs, and Douglas-fir. Soils vary in their texture, depth to root restrictions, stoniness, fertility, and soil moisture-holding capacity. The slope steepness, slope direction (north facing, etc.), and vegetative cover also influence soil characteristics and, ultimately, the survival and growth rates you can expect from tree seedlings.

As a rule, trees grow best on north or east facing, level to moderately sloping, deep well-drained soils with adequate fertility. Unfortunately, weed competition on these sites is more severe. Growing spruces, firs, and Douglas-fir should be confined only to these better sites in Indiana.

While it is true that Scotch pine will grow well on steep, eroded, or infertile land, the increased rotation length, equipment, and maintenance costs make these sites less desirable. Therefore, the investment in intensive management required to produce high-quality trees is best spent on gently sloping, accessible sites that will produce a saleable 6-foot tree in six to eight years. Avoid poorly drained sites as growth rates and survival will be low, and equipment operation impossible.

Refer to FNR-36, *Planting Forest Trees and Shrubs in Indiana*, for a list of the site requirements for Christmas tree species. To determine the soil characteristics of your proposed plantation, obtain a copy of your county soil survey, available from the Soil Conservation Service.

Site Preparation

Control of competing vegetation prior to planting, called site preparation, is a critical first

step in plantation establishment. There are several methods that can be used: (1) bulldozer with root rake, (2) mowing, (3) herbicides, (4) plowing or disking, and (5) a combination of these methods.

Hard-to-kill perennial vines and hardwood sprouts should be controlled prior to planting. After planting, these weeds are difficult to control without damage to Christmas tree seedlings. Use of the proper herbicides as a site preparation treatment will prevent resprouting of weeds resulting in season-long weed control. In addition, removal of stumps and smoothing rough spots and ditches will make subsequent mowing and other equipment operation more efficient.

If weed competition is not expected to be severe, such as in eroded, old field sites, a banded application of a soil (pre-emergent) and foliage (post-emergent) active herbicide tank mix will give lasting control around the seedlings. Seedling survival and first year growth will increase, and subsequent mowing will be easier. The remaining strips of vegetation between rows will help prevent erosion. On non-erosive soils a broadcast application may be desirable.

Herbicides can be applied with a variety of hand or tractor drawn equipment. Small growers may find the backpack hand sprayer a useful tool for all pesticide application. Rope wicks, paint rollers, or other wiping devices may also be useful for some weed problems. For information on calibration of hand equipment and specific herbicide recommendations, see *Use of Herbicides for Establishing Woody Plants*.

Planting Stock

Scotch pine and eastern white pine are the most common Christmas tree species grown in Indiana. They are best adapted to the Indiana soils and climate. Spruces, firs, and Douglas-fir are also grown but require ideal soil conditions and a longer harvesting rotation.

Many genetic varieties of Scotch pine are available from local nurseries. It is difficult to prescribe to a grower which variety will perform best under his growing conditions, management practices, and in local markets. Each variety has its own unique growth rate, needle length, winter needle color, needle retention, butt diameter, stem straightness, branch angle, and overall form. Visit with experienced growers, nurserymen, or foresters to select a variety to match your soil and market condition. Initially,

you should plant two or three varieties. Observe the characteristics of these varieties through a rotation to determine which performs better for you.

Eastern white pine is gaining popularity as a Christmas tree in Indiana. Rotation length and management practices are similar to Scotch pine, only white pine has a slightly higher market value. White pine grows well on most Indiana soils with the exception of dry, severely eroded and wet sites. If site quality is adequate, a small percentage of your first planting should be white pine.

Seedling Size

The planting stock size and vigor is critical to survival and establishment. Examine seedlings carefully upon shipment from the nursery. Roots should be moist and free of mold or fungus, and seedling foliage should have good color and not be dehydrated.

Plant the seedlings as soon as possible or store in a cooler at 34° to 38°F. Do not allow seedlings to freeze. If a cooler is not available, keep the seedlings in a shaded, cool place such as a basement. Seedlings held for more than five days without a cooler should be "heeled in." That is, spread the seedlings roots along shaded trench and cover with moist soil. Keep the soil moist until planting.

Most seedlings are grown from seed in nursery beds and are called bareroot seedlings. Some nurseries offer containerized seedlings that are greenhouse grown. These container-grown seedlings usually have a more fibrous root system but cost significantly more.

Bareroot seedlings may be grown for one to three years in a high-density seedbed. They are then sold or transplanted at lower densities for one to two more years. Seedlings are advertised and priced by age and species. The seedling age may be listed as 2-0. The first number indicates years in a high-density seedbed. The second number indicates years in a low-density transplant bed. If the second number is 0 (e.g., 2-0), the tree is a two-year-old seedling. If the second number is 1 (e.g., 2-1), the tree is a three-year-old transplant.

Two-year-old seedlings are usually 4 to 12 inches tall with a small stem diameter. Seedlings smaller than 8 to 12 inches are easily overgrown by weed competition and are an easy target for mice and other rodents. Order more seedlings than you need, then plant only the largest and healthiest. If severe weed competition or rodent

problems are anticipated order 2-1 transplants. The larger seedling will yield better survival and first-year growth, ultimately reducing rotation length. The cost of transplants will be higher but may be necessary for successful plantation establishment.

Planting Design

Spacing between trees and overall plantation design depends on terrain, species planted, and type of machinery used for maintenance. If you own mowing equipment select a between-row spacing at least 2 feet wider than the mower. This will facilitate mowing in later years since a 6-foot-tall tree with 67 percent taper will be 4 feet wide at the base. Rarely should spacing of trees be less than 5 feet. Tighter spacing increases competition among trees and causes difficulty in shearing, spraying, and other management practices (Table 1).

Planting seedlings on a grid pattern (e.g., 6 feet x 6 feet) facilitates mowing in both directions. This is highly desirable from the standpoint of weed control but may increase the planting costs. Straight rows are essential to prevent damage to seedlings during cultural operations. Rows should be laid out prior to planting, using permanent stakes or wire flags.

When planting several species, separate each species into a management unit (Figure 1).

Table 1. Number of Christmas trees per acre for different spacings.

Spacing (feet)	No. trees /acre	Spacing (feet)	No. trees /acre
5 x 5	1742	6 x 7	1037
5 x 6	1452	6 x 8	908
5 x 7	1245	7 x 7	889
5 x 8	1089	7 x 8	778
6 x 6	1210	7 x 8	681

This facilitates application of selective herbicides, spraying for specific insect or disease problems, and other cultural practices unique to that species. The rows of the management unit should be longer than wide to reduce equipment turnaround time. The type of spray equipment you plan to use may dictate the width of the management unit. The management units are separated by lanes large enough to be used in harvesting, spraying, and turning equipment around. The plantation should be accessible by an all-weather road since harvesting and other cultural operations occur year-round.

Planting

Spring planting is preferred in Indiana, eliminating the problem of frost heaving that is com-

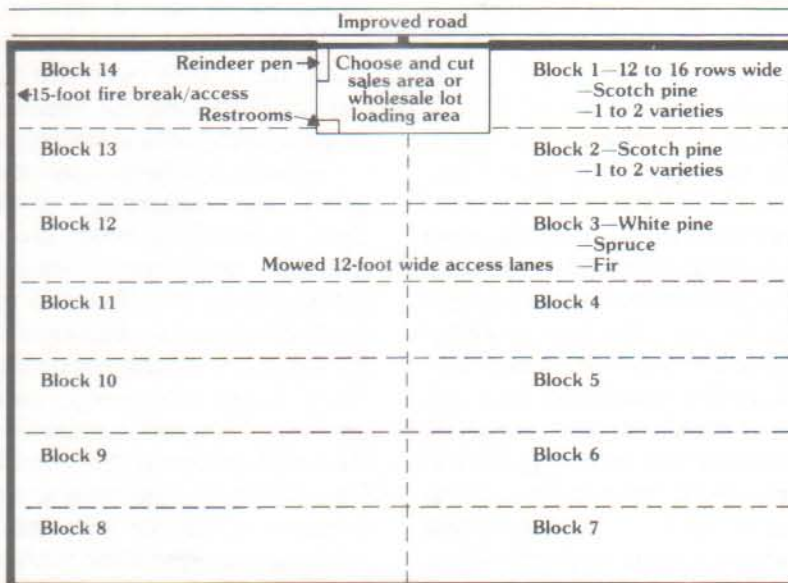


Figure 1. Sample layout of a 14-acre plantation. To maintain sustained production of trees, plant 2 or 3 blocks each year, depending on rotation length. Keep species separate because of different maintenance requirements and growth rates.

mon to fall-planted seedlings. Planting should begin as early as possible. However, do not plant in frozen soil or under saturated soil conditions.

Christmas trees may be planted using a variety of hand tools or a machine planter. New growers should start with a small number of trees (1,000 to 2,000) which can be easily planted by hand. Additional management units can be planted annually to produce a sustained yield of harvest size trees.

The most productive hand planting tools are planting bars, hoes, and shovels. Production with these tools will range from 300 to 800 trees per day depending on the skill of the planter, stock size, and site conditions. Round pointed shovels, spades, and mattocks can be used but production is slower.

Machine planting production may vary from 2,000 to 5,000 trees per day, depending on terrain, stock size, soil moisture, and rock content. A skilled machine planting crew can do a high-quality planting job within the limits of slope steepness, rockiness, and stock size.

Some mortality can be expected even with the best planting job. Survival of 90 to 95 percent is excellent. Always plan to replant first-year mortality and unhealthy seedlings to avoid underutilization of the planting site.

See FNR-36 *Planting Forest Trees and Shrubs in Indiana* for a description of hand planting techniques and other information on plantation establishment.

Weed Control

The best weed control technique for newly planted seedlings is preplant (at least two weeks) site preparation. If tillage, mulching, herbicides, or a combination of these methods was used, weeds will be controlled for at least one to three months. This is sufficient to bring the delicate new seedlings through the first growing season (Figure 2). A late-season mowing may be necessary to clean up the plantation.

If herbicides are not used for site preparation, subsequent cultivation or mowing will be necessary to prevent weeds from overtopping the trees. Cultivation should be shallow (less than 2 inches) to prevent tree root damage. Mulching gives excellent weed control and preserves soil moisture but may not be practical for large plantations. Mowing-only weed control does not remove the competing vegetation close to the seedling where weeds are most



Figure 2. Good weed control is especially important in newly established plantations.

harmful. Repeated mowings (two to seven) may be necessary to keep weeds down.

Foliage-active herbicides can be applied in spots around newly planted seedlings. Take care to shield the trees with a device such as stovepipe or use a directed spray to prevent herbicide from contacting the seedlings. Do not apply herbicides over the top of actively growing seedlings without carefully reading the label or consulting with a herbicide specialist.

Weed control in later years can be achieved using any combination of the above methods. Spot, banded, or broadcast applications of soil-active in combination with foliage-active herbicides can be made in the fall prior to the first frost or in spring before the weeds germinate. Spring applications should be completed before trees break dormancy, as evidenced by bud swelling. Directed sprays or sprayer shields can be used to keep the herbicide off the trees. Depending on the tree species, age, and product, trees may or may not be tolerant of an over-the-top application. Again, read the label. It will specify how the product can be applied to the trees without damage.

Many growers prefer the fall herbicide application. Adequate weed control can be obtained well into the next growing season. Spring prob-

lems of rainy weather, wind, saturated soil conditions, and planting conflicts are avoided.

The weed control technique you use depends on a lot of factors: specific weed problem, equipment and labor available, grower's philosophy on chemical use, site conditions, and more. Experiment with different techniques until you find the method you are most successful with.

Fertilization

Fertilization is not usually recommended for newly planted seedlings. However, applications to establish plantations on infertile sites may be beneficial. Fertilization must be combined with good weed control. Using slow-release fertilizers without applying a herbicide can stimulate severe weed problems. Removal of competing vegetation alone increases the availability of moisture and nutrients, essentially fertilizing the trees.

Scotch pine normally does not need fertilization; however, it may benefit from fertilizer application on very dry, infertile sites. The spruces, firs, and Douglas-fir may benefit from fertilization on marginal sites. If low fertility is a problem, fertilize with a balanced slow-release fertilizer such as 12-12-12. Apply in spots or bands along the rows of seedlings. As with herbicide application, calibrate your fertilizer equipment. Rates of 150 to 225 pounds per acre of actual nitrogen should be adequate.

Shearing

Shearing is the most important cultural activity involved in producing a high quality Christmas tree. Shearing probably gives the greatest dollar return for labor invested. Consult with experienced growers to develop your shearing expertise. Some pruning to remove double leaders, dying branches, or wild growth may be necessary in year two. Heavy shearing should not begin until year three or four and continues until harvest.

The practice of shearing Christmas trees is to control the height and width of the tree and to produce a conical shaped tree with uniform taper. Besides shaping, the shearing process stimulates more buds to form near the newly cut branch end. More branchlets are formed the next year, increasing tree density. Insect and disease damage can be removed at shearing time, and this is an important step in controlling infestations.

Taper of a Christmas tree is defined as the relationship of tree height to tree width at the base (Figure 3). The ideal taper for a Scotch pine Christmas tree is about two-thirds as wide as it is high, or 67 percent taper. A tree 6 feet tall and 4 feet wide at the base would have a 67 percent taper.

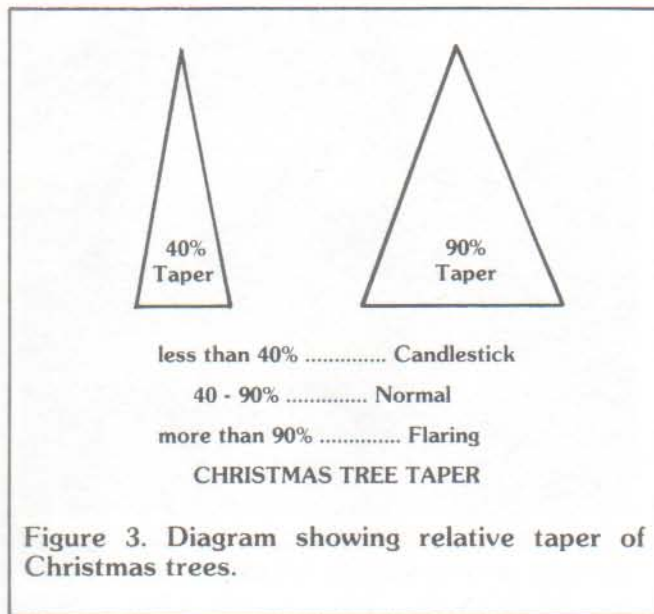


Figure 3. Diagram showing relative taper of Christmas trees.

The U.S. Department of Agriculture has developed the "United States Standards for Grades of Christmas Trees." The standards designate four quality classes of trees: (1) Premium, (2) Choice or No. 1, (3) Standard or No. 2, and (4) Cull. These categories are based on foliage characteristics, tree density, taper, and defect-free faces on the tree. New growers should review these standards before beginning to shear their trees.

The pines must be sheared immediately after height growth stops and buds are set. This generally occurs in early or mid-June. Shearing should be completed by early July, or budset may be reduced causing poor growth the following year.

Timing is not as critical with the spruces, firs, and Douglas-fir. They can be sheared anytime after height growth ceases and before bud-break in spring. Most growers shear these species after the pines or when other work slacks off.

Shearing tool selection depends on grower preference, tree species, and time constraints. Lightweight knives with 14- to 16-inch blades are preferred over hedge shears by many growers. Production rates are higher for knives, but special safety precautions must be

taken. Leg protection and a reinforced glove should be worn at all times. In addition, hand pruners are needed to remove double leaders and dead branches (Figure 4).



Figure 4. Removal of double leaders during shearing creates straight, single-stemmed trees.

Regardless of the tool used it is essential they be kept sharp and free of pitch buildup. Kerosene, fuel oil, or mineral spirits may be used to clean tools. Dull tools cause jagged or incomplete cuts on the tree and slow production. Some stripping of bark may also occur, reducing budset on that branch. Tree vigor may

be reduced, predisposing it to insect or disease attack.

Growers must supervise the shearing operation very closely. New shearers should be trained slowly and carefully. Use them to clean trees or assist in tool maintenance until they are thoroughly familiar with the shearing operation.

Shearing is the most critical step in the Christmas tree operation after establishment. A poor shearing job may ruin the marketability of a good tree. New growers should visit experienced growers during shearing season or seek other assistance before beginning their first shearing operation.

Plantation Protection

A number of insects, animals, or other pests may attack your plantation. New growers must familiarize themselves with the life cycles of insects and diseases that affect Christmas trees and plan surveillance to detect signs of these pests. Insect feeding habits vary, requiring that you visit your plantation weekly during the spring and summer (Figure 5). Insect and disease problems must be detected early so that control measures can be taken. See E-32 *How to Combat Insect Pests of Pine Trees* for more information.

Good weed control practices will help protect new plantations from mice and rabbit damage. Removal of the tall vegetation eliminates cover and subjects the rodents to other preda-



Figure 5. Frequent visits are necessary to monitor insect, disease, and weed problems in the spring and summer.

tors. In plantations where mouse girdling becomes severe, use of rodenticides may be necessary.

A deer browse problem is more difficult to control. Locating plantations in remote areas may invite costly browse of small tree buds and debarking on larger trees. Deer repellents, physical barriers on trees (e.g., plastic netting), or fencing techniques may reduce the problem but are expensive.

Livestock are not compatible with Christmas tree production. They cause significant damage by feeding, trampling, or rubbing on the trees. The less obvious damage, soil compaction, is reason enough to keep livestock out of the plantation. Livestock hooves compact the soil in the upper 4 to 6 inches of the soil profile. This is the zone of maximum moisture and nutrient uptake and oxygen exchange by the tree roots. Compaction damages fine feeder roots in this zone, and reduces infiltration of rainfall, causing increased runoff and erosion. The result is reduced vigor of the trees, making them more susceptible to insect and disease problems.

Fire is devastating in a Christmas tree plantation. The planting design should allow for a buffer strip around the plantation to serve as a firebreak. As pine trees near harvest age, a heavy build-up of dead needles beneath and spread throughout the tree make Christmas trees highly flammable. Close mowing or plowing a 10-foot strip usually provides a sufficient firebreak.

Harvesting and Marketing

The method of marketing your Christmas trees depends on the proximity of your plantation to population centers, accessibility of the plantation, and the effort you want to devote to selling.

A wholesale operation requires a large input of labor just prior to the Christmas season to cut, clean, and bale trees for shipment. Reputable buyers must be located well in advance

(the previous year is best) to assure a market for all financially mature trees. Holding trees beyond the optimum market size (5½ to 7 feet) may reduce the rate of return. A specialty market for large trees would be an exception.

Normally, growers try to harvest all trees in a management unit within a three-year period. Ideally harvested units should lie fallow for one year to help check insect and disease problems such as pine root collar weevil and *Lophoderium* needle cast. Weed and brush problems may be easily controlled during the fallow period, using the proper herbicides. If you do not let a management unit lie fallow, treat all stumps with an insecticide to prevent reinfestation of the newly planted trees by insects.

Selling trees retail is another outlet. Using this method, you must bear the cost of transportation and lot rental. Others prefer the choose and cut method of sales. Families can select and perhaps cut their own tree from the plantation. A family tradition of coming to the same farm every year is often developed.

Choose and cut growers often diversify their sales by offering an assortment of other Christmas products at the plantation. Music, hot apple cider, and reindeer all add to the customer's experience and keep families coming back year after year. Use your imagination to make your operation a unique and successful business. Sell Christmas, not just a tree!

Summary

Growing Christmas trees can be a profitable and satisfying business. However, it requires significant inputs of seasonal labor and expertise in diagnosing insect, disease, and other problems. Consult experienced growers for help in avoiding early problems. Other sources of assistance are the Indiana Christmas Tree Growers' Association, consulting foresters, Indiana Division of Forestry, Purdue Department of Forestry and Natural Resources, the Cooperative Extension Service, or Soil Conservation Service.

Helpful Publications

Ohio Christmas Tree Producers Manual. Bulletin 670. Cooperative Extension Service, 2120 Fyfe Road, Ohio State University, Columbus, Ohio 43210. Price: \$3.75.

Christmas Trees—A Management Guide. EC-76-1741. Dept. of Ag. Communications, University of Nebraska, Lincoln, Nebraska 68583. Price: \$1.25.

Use of Herbicides in Establishing Woody Plants. Dept. of Natural Resources, Division of Fish and Wildlife, 607 State Office Building, Indianapolis, Indiana 46204.

U.S. Standards for Grades of Christmas Trees. 1989. U.S. Dept. of Agriculture, Agricultural Marketing Service, Washington, D.C. 20402.

Christmas Tree Pest Manual. Stock #001-001-00641-6. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price: \$14.00.

Also available from Publications Mailing Room, 301 South Second Street, Lafayette, IN 47905-1092:

FNR-36 Planting Forest Trees and Shrubs in Indiana

E-41 Recommendations for Managing Insects on Shade Trees and Shrubs \$3.00

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