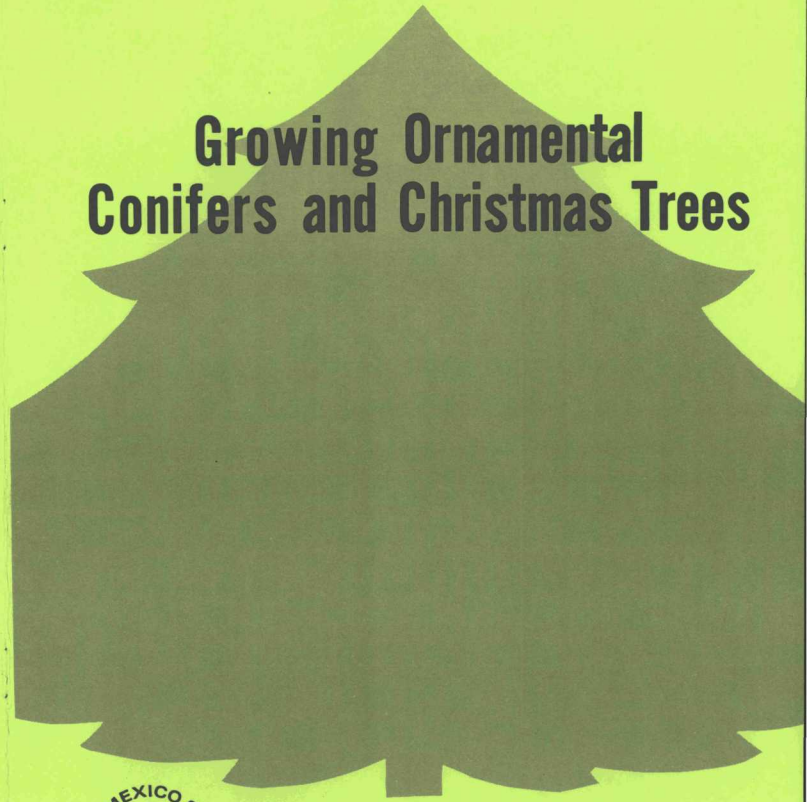
Growing Ornamental Conifers and Christmas Trees



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Growing Ornamental Conifers and Christmas Trees

Production techniques are basically the same for growing nursery stock that is balled and burlapped (B&B) and Christmas trees. In New Mexico, high-quality trees of both kinds are in strong demand. Retail vendors now import them from other states, but they could be grown in this state.

Often, potential tree growers ask what, where, how to plant, and how to care for planted trees. A more important question is, "Do I really enjoy growing trees?". In the long run, success or failure hangs on the answer to that question. Growing trees intensively requires special knowledge and skill, plus many hours of hard work.

The person considering the tree-growing business must be inquisitive and willing to learn principles of genetics, tree physiology, entomology, silviculture, and marketing. Other prerequisites are access to suitable land and a willingness to assume considerable financial risk.

A grower's capital investment may be tied up for six or more years before the first dollar returns. About half of the investment would be labor that an operator could perform himself, if his acreage is not too large. The remainder of the needed investment would be in costs for such items as taxes, planting stock, equipment, tools, and chemicals.

Before launching into production, a prospective tree grower should analyze the market carefully to decide which species have a good market acceptance. For Christmas trees, imported Scotch pine, Douglas fir and blue spruce, 5½ to 6½ feet tall, are popular in New Mexico. The landscape industry requires a variety of native conifers; blue spruce and ponderosa pine are among the most popular.

Characteristics and growth requirements of some species with production promise for New Mexico are as follows:

Fig. 1. Austrian pine.

Austrian pine (*Pinus nigra*) (figure 1) can be grown on most open sites with good soil drainage. This tree should be sold as balled nursery stock, so it should be grown on deep, rock-free soil. The planting area should be level or on a south-facing slope. Austrian pine needles are stiff, sharp, and usually dark green. It is an excellent ornamental and windbreak species. As a Christmas tree, Austrian pine is most attractive when flocked. Growth rate is 8 to 20 inches per year. The species grows best at elevations from 5,000 to 7,000 feet. It needs water at least every other week during the growing season.

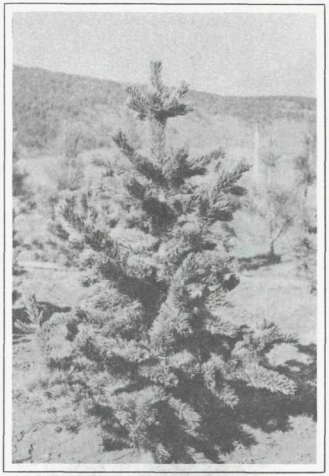


Fig. 2. Bristlecone pine.

Bristlecone pine (*Pinus aristata*) (figure 2) is found growing at higher pine elevations (10,000 feet) mixed with spruce and fir. Growth rate is slow, 4 to 6 inches a year. The species tolerates wide variations in temperature and soil conditions. It is valuable as an ornamental. Resin exudates on the needles give the appearance of a mealy bug infestation. Needles are dark green and remain on the stems for 10 or more years. Bristlecone pine can be grown at elevations of 8,000 to 11,000 feet. The species grows better with good soil drainage, and it needs water at least every other week during the growing season.

Fig. 3. Piñon pine.

Piñon pine (*Pinus edulis*) (figure 3) grows on the lower level of the pine ecotype (4,500 feet) mixed with some desert trees and shrubs, but it can be grown successfully at elevations up to 7,000 feet. Once established, it is extremely drought-tolerant, and it adapts to wide variations in soil conditions. Piñons grow too slowly for commercial production as Christmas trees (2 to 8 inches per year). A better return might be obtained by marketing as balled nursery stock.

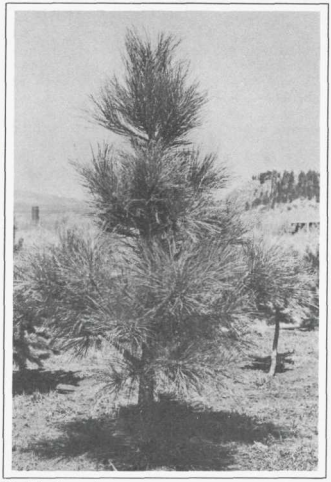


Fig. 4. Ponderosa pine.

Ponderosa pine (*Pinus ponderosa*) (figure 4), once established, can tolerate dry and low-fertility soils, if they have good drainage. Its needles are long, stiff, and sharp, ranging from dark green to off-yellow. Cutting ponderosa pine for Christmas trees at freezing temperatures causes severe needle fall, but needle retention is excellent if the trees are cut at temperatures above freezing. Response to shearing (clipping laterals to increase density) is erratic. Nonetheless, the tree is popular as an ornamental in the Southwest. As a Christmas tree, ponderosa pine is most attractive when flocked. Growth rate is 4 to 15 inches per year. The tree grows well at elevations ranging from 5,000 to 8,500 feet. It should be watered once every two weeks for maximum growth.

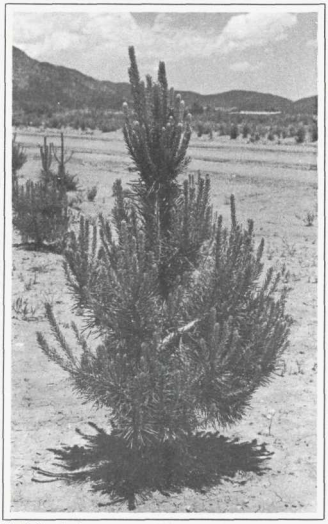


Fig. 5. Scotch pine.

Scotch pine (*Pinus sylvestris*) (figure 5), a European native, is one of the most widely planted pine species for Christmas tree production in the United States. It tolerates extremes in soil type and moisture conditions but is intolerant of shade. Scotch pine grows vigorously and responds to shearing and pruning, which makes it easy to form a dense, conical tree. Because of its wide geographic distribution in Europe, there is great variation in foliage color, needle length, and stem straightness. Spanish and French sources grow 6 to 8 inches per year and do not yellow in the winter; Austrian (Burgenland) sources grow 12 to 18 inches per year but tend to yellow during the winter. During the fall of the harvest year, the trees can be dyed green for consumer acceptance. Scotch pine can be grown at elevations of 4,000 to 7,000 feet.

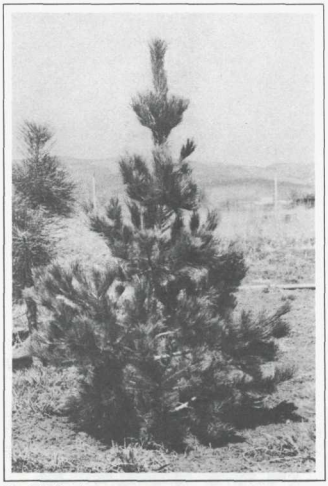


Fig. 6. Limber pine.

Limber pine (*Pinus flexilis*) (figure 6) tolerates extremes of temperature and soil conditions but grows faster on deep, well-drained soils. Needles are soft-textured and silver blue to silver green. Growth rate is 4 to 10 inches per year. The tree grows naturally at elevations of 7,000 to 10,000 feet but, with adequate care, can be grown at 5,500 feet. It should be watered at least once every two weeks.

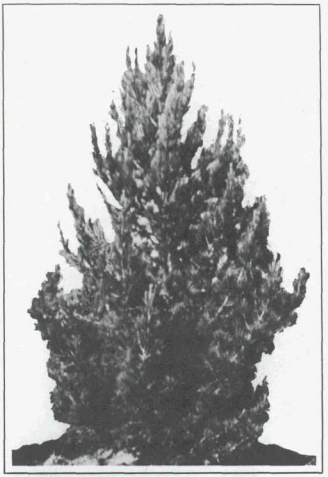


Fig. 7. Afghan pine.

Afghan pine (*Pinus eldarica*) (figure 7), introduced into the United States from Afghanistan and Pakistan, is finding ready acceptance among nurserymen and consumers because of phenomenal growth rate (up to 3 feet per year) under irrigation. This species tolerates variable soil conditions but does best in deep, sandy, alkaline soil. Its needles are long, soft-textured and green to blue green. Planting is recommended at 3,000 to 5,000 feet. The trees have been consistently winter-killed at elevations above 6,000 feet. Afghan pine can be used as a landscape, windbreak, or Christmas tree. Unlike other pines, Afghan pine does not need annual shearing to make it dense and symmetrical. It does need some corrective pruning. In the first year, the trees survive and grow best when they are watered every two weeks. Once established, they can tolerate drought but will not grow as rapidly.

Fig. 8. Douglas fir.

Douglas fir (*Pseudotsuga menziesii*) (figure 8) requires deep, moist soil with good air and water drainage. The species does not tolerate shade. On exposed sites, the prevailing winds tend to deform Douglas fir. Test trials indicate that southern New Mexico strains are superior in growth rate. The needles are short, deep to light green, and attached singly. Douglas fir can be used in a landscape or as a Christmas tree. The trees respond well to annual pruning and shearing. Growth rate is 6 to 18 inches per year. Douglas fir can be grown at elevations of 5,000 to 8,000 feet.

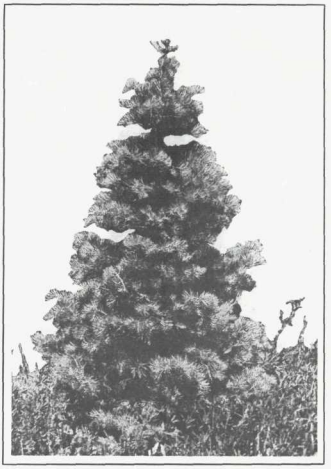


Fig. 9. White fir.

White fir (*Abies concolor*) (figure 9) has the same soil requirements as Douglas fir but is more tolerant of late spring frosts, temperature extremes, and shade. Growth rate is slow during the first four years after planting, which probably makes planting for Christmas trees uneconomical; however, once established, annual growth rate can exceed 14 inches. Needles are silver blue to silver green, making the tree an attractive ornamental. Like the Douglas fir, this species grows at 5,000 to 8,000 foot elevation. It needs water once every two weeks during the growing season.

Fig. 10. Blue spruce.

Blue spruce (*Picea pungens*) (figure 10) requires deep, fertile, moist soils. Its needles are short, stiff, and sharp, ranging from silver blue to green. This ornamental species is extremely popular; demand is especially high for the trees that are blue. Growth rate is 4 to 12 inches per year if water and soil fertility are adequate. It needs 10 to 15 grams of urea per tree, applied before buds swell in the spring. It also needs water once every two weeks during the growing season. Blue spruce can be planted at elevations ranging from 5,000 to 8,000 feet.

SITE SELECTION

Many tree production problems can be avoided by careful selection of the plantation site. With a good site, a grower can work efficiently among the trees, even in difficult weather; insect and brush control is easy; and harvesting in wet or snowy periods presents the least problem. Without a good site, a prospective grower has little chance of success.

Plantation land should be reasonably fertile and produce a moderate growth rate. Gently sloping hillsides, upland benches, or rolling lowland fields make good prospects. Heavy concentrations of large rocks should be avoided, because they impede the operation of cultivating, planting, and mowing equipment and increase equipment costs. Shallow soils over rock should be avoided for the same reasons, together with the fact that such soils tend to dry out quickly and retard tree growth. Good drainage is essential. Therefore, hardpan layers lying close to the surface should be avoided unless a subsoiler is used to break it up to a minimum depth of 12 inches. Gently sloping or nearly level ground is more desirable than steep ground.

Good air drainage implies a slope, hilltop or bench where cold air will not collect and kill newly sprouted buds during the early spring growing period. Freezing air, like water, flows downward into flat areas. Valley bottoms and natural bowls known as "frost pockets" should be avoided.

Good soil drainage implies the free movement of water through the soil profile. Land that holds rainwater on its surface for several days probably has poor drainage and possibly poor soil aeration. Either condition is detrimental to tree growth.

Proper matching of the species to the site is important. Some sites are well suited for growing only one species, while others may offer a choice of two or more species (figure 11). Plantings of only one species are normally easier to maintain and harvest but are more susceptible to serious insect and disease problems than are mixed plantings. Mixed plantings offer greater market versatility and greater security, should consumer demands shift while the trees are growing. To grow several species in one plantation, a grower should subdivide his area into several planting units and match the best adapted species to each unit.

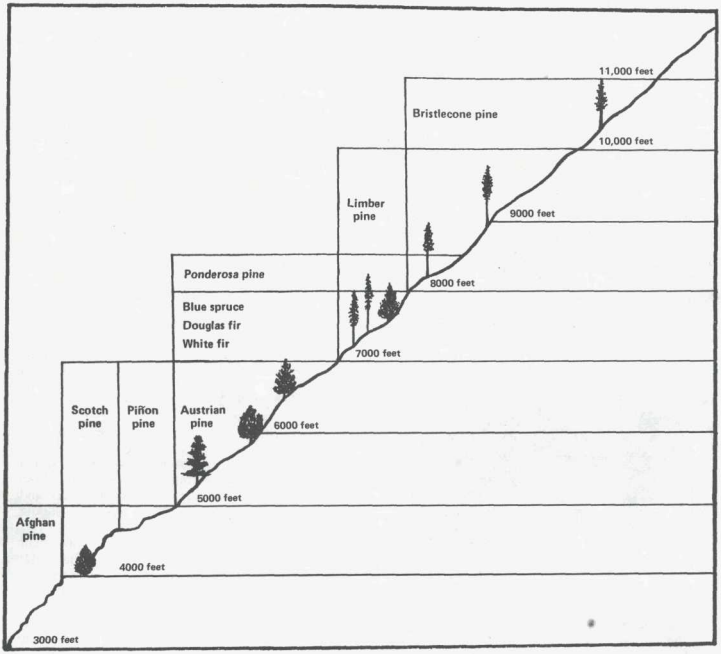


Fig. 11. **DISTRIBUTION OF CONIFER SPECIES, BY ELEVATION**

PLANNING A ROAD SYSTEM

Once the site and the species have been selected, the road system layout should be planned carefully to facilitate cultural and harvesting operations. Roads also act as firebreaks and separate species and different rotation blocks. The road system is a long-term investment that can be charged to many harvests.

Roads should be constructed for year-round use. No part of a producing areas should be more than 200 feet from a road. This helps reduce final harvest costs and speeds up every plantation operation. Main access roads and secondary roads are necessary. Main roads are used by trucks to pick up the trees. These roads should be carefully laid out on grade, with ditches for drainage. Secondary roads are used less frequently, but must be closer together (60 to 100 feet) and run at right angles to the main roads (figure 12). If the operation is very big more secondary roads will be needed. They can be built parallel to the main roads. This road arrangement makes harvesting easier. Provisions must also be made for a central yard and loading area where large trucks can maneuver and load.

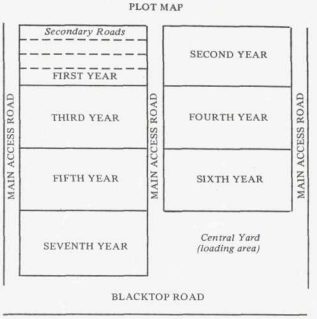
SITE PREPARATION

After the road system is constructed, the land must be prepared for planting. Fairly level land supporting sod or dense weeds must be plowed, disked, and harrowed one year before planting. On steeper slopes (over 7 percent) that may be subject to erosion if disturbed, discriminate weed control in strips four feet wide may be necessary.

PLANNING PLANTATION SIZE

The number of trees to plant each year depends on the number of trees the owner can sell, the available acreage, and available time. A full-time grower planning to do most of his own work may be able to manage an 80-acre plantation. A semi-retired or weekend grower should plan a smaller operation. Growers with extremely small acreage have too little volume to justify labor-saving equipment and may have difficulty in securing steady buyers.

To estimate annual production, a grower needs to know the number of trees per acre and the harvestability factor. Species and size of trees to be produced determine the spacing. A six by six foot spacing (1,210 trees per acre) enables pines to grow to about 7 feet before laterals from adjacent



Rotation cycle = 7 years
The 6 years from planting to harvest (30 to 50 percent of the trees will be ready to be harvested during the sixth year).

Seventh year to finish harvesting. Replanting will be performed the following spring.

Planting area = 35 acres

Annual planting areas = 5 acres

Number of trees per block
6050 in a 6 by 6 foot spacing
7200 in a 5½ by 5½ foot spacing

Examples of mixed plantings:

(a)	(b)
Blue spruce	Scotch pine
White fir	Ponderosa pine
Douglas fir	Limber pine

Fig. 12. Every part of the production area should be within 200 feet of a road. Select species and plan a rotation schedule for several years of production.

trees begin to touch. With a spacing of 5½ feet (1,440 trees per acre), spruces and firs can grow about 6 feet tall before excessive crowding begins. The harvestability factor is the proportion of planted trees that are salable. An average of 20 percent of the trees planted die before harvest. Depending on the grower's tree-growing skills, 10 to 20 percent of the live trees will be culls. This leaves salable about 60 percent of the trees per acre, including roads and access lanes (726 trees per acre in a 6 × 6 foot spacing, or 844 trees per acre in a 5½ by 5½ foot spacing).

A tree grower should regulate annual planting of each species over a rotation period, so that, when harvesting begins, the number of trees ready for market will be fairly constant from year to year. Under this plan, the plantation should be mapped to scale and planting blocks divided equally. Access lanes and roads can serve as boundaries. The procedure for producing a sustained yield is as follows:

1. Determine how much time is needed to grow a certain species, harvest the trees, and prepare the land for replanting.

2. Decide how much acreage will be planted to each species. Get a net figure by subtracting the area occupied by roads, firebreaks, buildings, and wasteland.

3. Divide the total net acres for planting by the rotation cycle in years.

Example: Scotch pine
Rotation cycle – 7 years
Planting area – 35 acres
35 ÷ 7 = 5 acres annual planting area

Genetic differences cause some trees to reach marketable size during the sixth year. The remainder will be harvested during the seventh year. New seedlings will be planted the following spring.

In this example, the grower who wants to have sustained annual harvests of Scotch pine would divide his total acreage into seven blocks, five acres each to be planted yearly (figure 12).

PLANTING THE TREES

Once the land has been prepared, the trees can be ordered from public or commercial tree nurseries. Transplants are more suitable for commercial growing, because they are generally sturdier and have more fibrous roots and a thicker stem than seedlings. These factors help the small trees survive and grow faster during the critical first two years of establishment.

Proper care is essential for planting stock after it is received and before it is planted. Careless procedures at this stage are often the cause of low initial survival.

The roots must be protected from exposure to drying or freezing before the tree is planted. Either condition will ruin planting stock. Growers should request nurseries to ship by the most direct and swiftest transportation available, if possible under refrigeration. Once the trees are received, the root packing materials should be moistened. The bundles or crates should then be placed in a cool humid place. They can be kept there for about a week after delivery.

Some nurseries sell nursery stock in small containers. Container-grown nursery stock can withstand drying better and less shock is encountered, since the small trees do not have to be dug and roots are intact. Care must be taken not to let the root plugs dry out. Container-grown nursery stock costs almost twice as much as bare-root stock but is worth the added cost because first-year survival and growth are greater.

Planting each tree involves digging a hole, preferably with a small auger, slightly deeper than the length of roots. The roots are placed completely vertical in the hole and soil packed back. The soil should be uniformly moist at planting time. Watering immediately after planting is recommended to settle soil around the roots and eliminate damaging air pockets.

CARING FOR THE PLANTATION

After the trees are planted, they must be protected from fire, damaging pests, weeds, and theft. Periodic inspections are necessary. Irrigation during the dry summer months is necessary during the first two years, because of the limited development of the root systems. Lack of adequate moisture during the first year often results in high mortality and slow growth rate for trees. Keeping them alive and healthy is the most important objective during the first two years after planting.

Weed Control

Weeds in tree plantations must be controlled yearly, because they compete with trees for moisture, nutrients and sunlight. They grow rapidly and may choke young trees. Efficient weed control can be achieved by mechanical or chemical means.

Herbicides that kill all types of vegetation, such as Amitrole, Paraquat or Roundup, can be used before trees are planted, to clear fields of undesirable weed species. They can also be used afterwards, as spot treatments to prevent re-invasion.

Extreme caution must be taken to spray only undesirable weeds. Herbicide drift can injure or kill trees and other valuable plants. Drift is controlled by reducing the sprayer pressure (large droplets drift less than small droplets). New types of

applicators, such as the Herbi and the rope-wick type, help avoid injury from drift.

After the trees are planted, weeds can be controlled with a selective herbicide, sprayed over the trees. A herbicide such as simazine or atrazine can be applied in late winter, before weeds emerge (pre-emergence); one such as velpar can be used after weeds emerge (postemergence).

Pre-emergence herbicides are mainly active in the top 2 inches of soil, where they are absorbed by germinating seeds and small weeds. Pre-emergence herbicides should be applied before buds on trees begin to swell in the early spring.

Postemergence herbicides should be applied directly on actively growing weeds when they are about 6 inches tall.

During the growing season, weeds can be mowed between the trees.

The use of herbicides in New Mexico is highly restricted because of the low organic matter content of most soils (less than one percent). Probably the best choice would be a herbicide that breaks down as soon as it reaches the soil. Growers must use caution and common sense for self-protection and to protect the trees, neighbors, and domestic and wild animals. Directions on the pesticide labels must always be followed carefully.

Insect Control

Constant inspection of the tree plantation eliminates the need for most preventative spraying, which may kill beneficial insects. By constant inspection, a grower can see whenever an insect population is building up and spray only those trees that have been attacked. The effectiveness of the application should be checked after 72 hours. If some insects are still alive, the trees should be resprayed with a different insecticide.

On blue spruce, preventive spraying with malathion is needed to control the spruce-gall aphid. Applications should be made over a two- to three-week period.

Preventive spraying with malathion is also needed to protect pines from pine tip moths in late May and early June.

If terminal leaders are destroyed, the next year's growth is reduced and the desired symmetry is more difficult to attain. As an alternative to preventive sprays, systemic insecticides, such as Cygon or Metasystox-R, can be applied before the trees begin to grow. A pesticide applicator's license is needed to apply these chemicals.

Conifer aphids generally feed on new growth by piercing the bark of branches and sucking out great quantities of sap. Aphids expel a sweet and sticky liquid from their bodies. A black mold and ants feed on the exudate, and the presence of either one warrants closer investigation. Aphids can be controlled by one or two applications of malathion or by the systemics mentioned above.

Fertilizing the Trees

If tree growth rate is not adequate or if the trees appear spindly and off-green, fertilization is needed. Most New Mexico soils are deficient in soil nitrogen, and addition of this single element usually is enough to correct a nutrient deficiency.

Fertilization should be started the second year after planting and should be done in the spring before buds begin to swell. Fertilizer rates will depend upon the number of trees per acre. For plantings of 1210 trees or 1440 trees, ammonium nitrate is recommended at a rate of 62 or 73 pounds per acre, respectively, or about two heaping tablespoonfuls per tree. Rates should be adjusted accordingly for nitrogen applications on plantations of other sizes. Care must be taken not to concentrate large amounts of nitrogen near the stem. On sandy soils, the application should be split, with half being applied in early spring and the other half in late June.

Beneficial effects of fertilization are carried into the next season's growth; therefore, applications are necessary only every other year. For the second and third applications (fourth and sixth years, respectively), the application rate is doubled. During July of the harvest year, an application at the double rate (about four heaping tablespoonfuls) improves color and market acceptability.

Pruning and Shearing

Plantation trees are trained with shearing and pruning. Shearing is trimming the current growth of the terminal leader and side branches. Pruning consists of thinning competing terminals and removing protruding side branches and upturning suckers. Training should be started when the trees are not more than two feet tall and continued yearly until the trees are harvested. The objective is to produce conically shaped trees that are dense on all four sides, with well developed basal handles.

Shearing increases bud set on pines and sprouting of lateral buds in firs and spruces (figure 13).

Pines

Pines develop buds only at the tips of current-year branches. For abundant bud production,

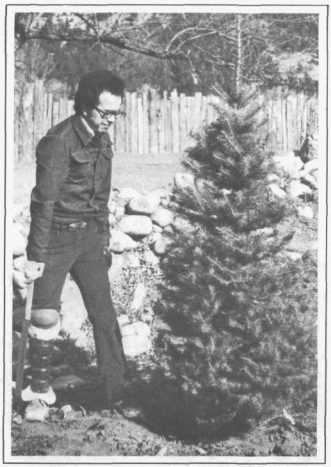


Fig. 13. Shearing knives should be handled carefully for accident-free trimming. A leg guard protects a person from injury should the shears slip.

pines can only be sheared during middle June to middle July. Exact dates cannot be specified because of different weather conditions.

During the first growing season, pines usually do not need shearing. Hand pruners can be used to remove a less desirable double leader or other obvious deformities.

During the second growing season, the first whorl of about five branches, evenly spaced around the trunk, should be formed. Hand pruners should be used to cut the central leader back to one foot, if its growth is greater than that. If growth of the central leader does not exceed 12 inches, it still should be pruned at least one-quarter inch to encourage dense bud formation. Hand pruners should also be used to cut lateral branches on the top whorl to one-third the length of the central leader.

During the third growing season, basal pruning is necessary. Unwanted lower branches are removed between the bottom whorl and the ground. Basal pruning should never remove more than 25 percent of the total branches.

The general pruning guidelines for the second growing season should be followed during the third, fourth, and fifth seasons.

By the sixth growing season, the faster developing trees may be ready for harvest. Such trees should be sheared lightly, with only the longer branch tips cut to form a natural-appearing cone.

The seventh growing season is usually the main harvest season, and trees ready for harvest should be lightly sheared as described for the sixth growing season.

Firs and Spruces

Firs and spruces develop buds on the branch tips as pines do, but unlike pines, they develop lateral buds along current season's growth. Buds are completely formed by middle July. Shearing could start any time after that.

The first three growing seasons should be devoted to maintaining a strong central leader and the formation of a good bottom whorl. Deformities and basal pruning are handled as they are for pines.

By the spring following the fourth growing season, most trees should have made sufficient growth to require shearing. First, the leader should be cut back to a 12-inch length with hand pruners.

For the fifth, sixth, seventh, and eighth growing seasons, use the same technique. Trees should be ready to harvest by the ninth growing season. They should be lightly sheared during July to September.

RECORD KEEPING

Besides tending the growing trees, the producer must follow good business practices. Accurate records must be kept of the cost of each cultural operation so that necessary adjustments can be made. Good records are also needed for income tax purposes. If workers are hired, the grower should be acquainted with the federal minimum wage law and state labor laws.

Good records include a scale map of the plantation with reference points. The map should show topography and surface drainage, location of roads, species and number of trees in each field, and date planted. A continuous inventory of merchantable trees enables a grower to calculate the cost per tree.