Growing Christmas Trees in New Mexico
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Most Christmas trees produced in New Mexico prior to the mid-1970s were harvested from natural stands on private lands, allowing landowners to supplement their incomes. Only a few of these operations undertook stand treatments to improve and sustain the production of wilding Christmas trees.

An increasing demand for trees and poor natural stand management led to the depletion of naturally grown New Mexico Christmas trees. Two solutions became apparent: New Mexico could become a net importer of Christmas trees to meet the demand of its increasing population, or New Mexico landowners could become plantation Christmas tree producers.

New Mexico has never been a large exporter of Christmas trees. In 1965, 34.5 million real (live or cut) Christmas trees were sold in the U.S. Of these, approximately 1.1 percent, or 366,500 trees, were produced in New Mexico. Approximately 39 percent of this harvest was exported out of state.

Initially, the greatest limitation for Christmas tree operations in New Mexico was the lack of knowledge necessary to start and maintain such an operation. For instance, in 1965 only two Christmas tree plantation operations existed in New Mexico; both of these businesses subsequently went out of business because of plantation failures. Another major problem, which persists today, is the relatively slow return on investment. Currently, competition from producers in other states is also a great obstacle to Christmas tree plantations in New Mexico.

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The Mora Research Center, established in 1972 as part of NMSU's Agricultural Experiment Station, has conducted numerous research projects on Christmas tree production. Since the Center's inception, projects have been conducted on the genetics, propagation, culture, and economics of Christmas tree farming in New Mexico. The advances made at this facility and elsewhere have improved New Mexico's ability to produce plantation-grown Christmas trees.

New Mexico's environment is quite conducive to producing a wide range of Christmas tree species. New Mexico is part of the native range of many important Christmas tree species including white fir (*Abies concolor*), alpine fir (*Abies lasiocarpa*), Douglas fir (*Pseudotsuga menziesii*), and blue spruce (*Picea pungens*). New Mexico's environment is also conducive to the production of other non-native Christmas trees including scots pine (*Pinus sylvestris*) and eldarica pine (*Pinus eldarica*).

With a few exceptions, producing high-quality plantation Christmas trees is similar to producing any other agronomic or horticultural crop. The first, and probably most important, difference is that the return on investment for Christmas trees is much slower. Depending on the species being grown and the plantation site, it can take up to seven or eight years to produce a marketable tree. Another difference from other crops is that Christmas trees are less labor- and energy-intensive; however, they cannot be planted and harvested in seven years with no input from the grower.

Producing Christmas trees requires the same basic cultural practices as any other agronomic or horticultural crop, including irrigation, fertilization, and weed and pest control. Most of these must be performed every growing season from the time the seedlings are planted until they are harvested. Another necessary step is shaping or shearing the trees, which can influence the quality of the trees and increase their overall value dramatically. Shearing increases the fullness of a Christmas tree and can be used to eliminate defects. While spruces, true firs, and douglas fir can be sheared at almost any time, pines must be sheared at critical times,

because of differences in the way the branches on these trees develop and grow.

Sites for Growing Christmas Trees in New Mexico

The first factor to consider when producing Christmas trees is the plantation site. Important site factors include the soil, growing season length, cold hardiness zone, and irrigation.

Soil properties can affect the type of tree that be can produced (cut or live), irrigation type and frequency, and fertilizer needs. Essential soil properties to consider include soil depth, texture, water-holding capacity, rockiness, and soil reaction—factors that influence the cost and ease of establishing, producing, and harvesting the trees.

Site preparation is probably the most significant operation influenced by soil properties. It is simply the process of preparing the soil for planting Christmas trees. Based in part on research conducted by the NMSU Mora Agricultural Science Center, guidelines have been established for site preparation in most of New Mexico. These guidelines take into account soil properties, irrigation needs, type of crop being harvested, and cost.

A second plantation site factor to consider is climate. Climatic features that influence the success and cost of producing Christmas trees include growing season length, precipitation, hardiness zone, and frequency of late and early frosts.

Most Christmas tree species are native to high-elevation (above 6,000 ft) mountain climates, which usually differ from climates at plantation sites. Species such as white fir, douglas fir, and blue spruce are native to elevations above 7,000 ft. When these species are grown at lower elevations, growing seasons are longer, warmer, and drier. Unlike other agronomic crops, a longer growing season does not necessarily correlate to more growth.

All native New Mexico pines, firs, and spruces have a fixed growth pattern and will grow only fixed amounts each year. Annual growth potential is determined by the previous year's growing season. The cells for the following year's growth are laid down in a bud at the end of a growing season. If the tree is under stress

at this time, it may only lay down a fraction of the cells that would be laid down under good conditions. Actual annual growth is also a function of the current years growing conditions. If the tree is not under any stress when the tree begins to grow in the spring, it will allow all the cells laid down the previous year to expand fully.

Eldarica pine is an exception to this fixed growth pattern. It can set and flesh out bud up to six times in a growing season, making it the fastest-growing Christmas tree in North America. Trees use genetically determined environmental cues to determine when to grow. Daylength or photoperiod is one of these cues. When trees are grown outside their native environments, usually at lower elevations or further south, these mechanisms are inadequate for perceiving changes in the new environment and trees can become susceptible to early or late frosts.

A second environmental factor perceived by trees is cold exposure during the fall and winter, commonly called chilling unit accumulation. Trees must be exposed to specific minimum amounts of cold in order for growth to occur in the spring. Again, this is an internal mechanism of the tree to prevent growth from beginning too soon and making the tree susceptible to late spring frosts.

Precipitation is another important climatic factor to consider. The overall amount, frequency, and timing can dramatically affect irrigation costs and the total profit of a Christmas tree plantation. Some areas may receive sufficient moisture to produce a tree, but if the precipitation all comes at once or during the wrong season it will essentially be unavailable to the plant.

Species Research

Once a site has been chosen, the second factor to consider is what species of tree to raise. As with any other crop, some species are more suitable to one area than another and some species are more valuable than others. Two primary criteria, growing site and market demand, are used when determining species. Specific guidelines have been established for site suitability of most of the important Christmas tree species in New Mexico. In some in-

stances, proper species selection can strongly affect the return on investment and total profit of a plantation operation. For example, a recent survey of Michigan Christmas tree growers showed the 1991 average wholesale prices for Christmas trees were $7.95 for scots pine; $14.32 for blue spruce; and $23.78 for Fraiser fir.

White fir, alpine fir, blue spruce, Douglas-fir, scots pine, southwestern white pine (Pinus strobiformis), piñon pine (Pinus edulis), and eldarica pine are the primary Christmas tree species under plantation culture in New Mexico. All these species have a tremendous amount of interspecific variation in important Christmas tree traits such as growth rate under plantation culture, response to shearing, foliage color, foliage density, and needle length—all influenced, in part, by genetics.

Growth rate under plantation culture is often the most important genetically influenced trait. A difference in 1–2 years in production can result in a 14–28 percent time delay on return on investment on a 7-to-9-year crop schedule. A study of white fir source areas in northern New Mexico identified several New Mexico species with superior growth rates. Similar studies have been made for blue spruce, southwestern white pine, and douglas fir. A Douglas fir study with sources from throughout the Rocky Mountains identified several fast-growing Douglas fir Christmas tree sources. Several scots pine and eldarica pine seed sources have also been identified for superior growth rates under Christmas tree plantation culture. Using superior seed sources for these species can shorten rotation age to 6–7 years for the northern species (white fir, Douglas-fir, scots pine, and blue spruce) and 3 years for eldarica pine in southern New Mexico.

An important foliage color trait in Christmas trees is blue color. Bluish foliage, caused by waxy depositions on needle surfaces, is common among most of the Christmas tree species in New Mexico. Wide ranges in foliage color occur in most of these species; however, market preference for color will strongly influence sale price. In white fir, for example, foliage color can range from yellow green to dark green to a light blue. In the previously mentioned provenance trial, several provenances had very uniform

color, while others were quite variable. Similar trends have been found in blue spruce.

The other important foliage color trait controlled, in part, by genetics is the stability of the green color during the winter, as some varieties of Christmas trees, specifically scots and eldarica pine, appear to reduce their chlorophyll content during the winter. This apparently is a mechanism to reduce winter injury. This process, however, results in some trees changing from a green foliage to a yellow-green foliage in the winter, reducing the value of these trees as Christmas trees. In a 30-source progeny test, several sources that maintain a green or blue green foliage through winter have been identified.

Even within a provenance, some individuals have been identified that posses superior Christmas tree traits. Through asexual propagation, the genetic superiority of these individuals, which could potentially be lost through the sexual process, can be captured. Research projects on these species have addressed many internal and external factors that affect the success of asexual propagation of these species. Internal factors include age, branch position, and cutting length. External factors include host plant nutrition, chilling hour accumulation, exogenous hormone application, and rooting environment variables. As this research progresses, New Mexico Christmas tree growers will be able to raise only high-quality, fast-growing, and higher-value Christmas trees.

Research on Pests in New Mexico Christmas Trees

Diseases and pest can be potential problems in Christmas tree plantations. New Mexico's dry environment is responsible, in part, for the low incidence of Christmas tree diseases; however, some insects and rodents have caused significant damage. Nantucket pine tip-moth has been the most devastating, causing much damage in eldarica pine Christmas trees, but developments in the control of this pest have reduced its damage to manageable levels.

New Mexico's Christmas Tree Industry Today

The cultural problems attributed to initial Christmas tree plantations failures (poor survival and growth) in the mid 1960s are no longer the main cause of plantation failures today. Progress made over the previous two decades has resulted in improved survival, shortened rotation ages, and more cost-efficient production. Cultivation factors, including planting stock, fertilization, stand density, irrigation, and harvesting, have been refined for New Mexico Christmas tree growers. However, economic difficulties, primarily associated with marketing, still have caused the failure of many New Mexico Christmas tree plantations.

Nationally, Christmas tree producers are facing two main trends that influence sales. The first is the disposal of cut Christmas trees. It has been predicted that by the year 2000, 9,000 communities in the U.S. will ban cut Christmas trees from their landfills, prompting many Christmas growers and retailers to initiate tree recycling programs. The second major trend is the rise in the use of artificial Christmas trees. In the past four years, most U.S. households had an artificial Christmas tree (Fig. 1). In 1992, the use of artificial and real Christmas trees declined, but the reduction in real trees was much greater.

For the past three years, homeowners in the western U.S. still showed a preference for real trees (Fig. 2). All other regions of the country used more artificial trees, leading many Christmas tree producers to target western states as a market for their products.

The New Mexico Christmas tree industry has more plantation operations than it did a decade ago; however, it is not possible to determine the exact number of growers. Many of the new producers are in the southern part of the state, primarily raising eldarica pine. The rapid expansion of the eldarica pine Christmas tree industry is due, in part, to the species' rapid growth rate and its ability to thrive in locations in southern New Mexico.

The wilding Christmas tree industry is still active in the state, however, overall production of this type of Christmas tree is reduced. Using records of New Mexico State Forestry Department
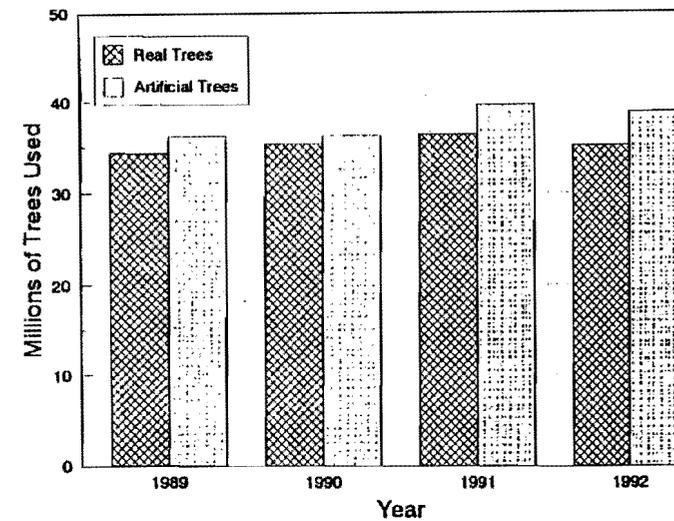
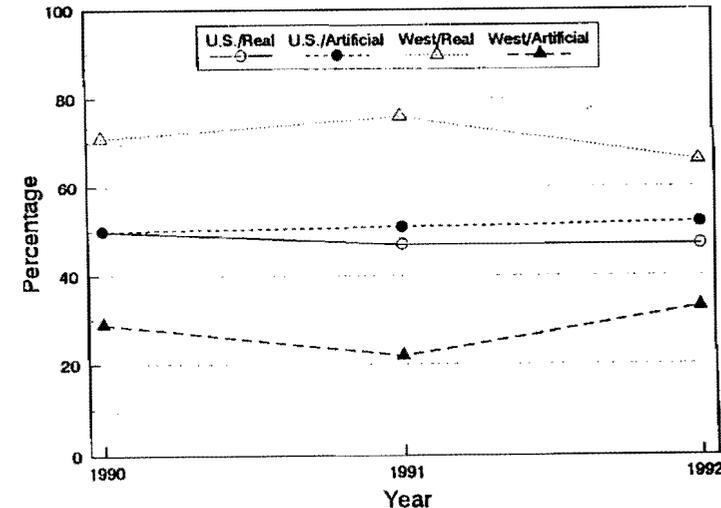Fig. 1. Christmas tree usage in the U.S. from 1989 through 1992 (NCTA 1993).

Fig. 2. Percentage of Christmas trees used in homes having a Christmas tree in the U.S. and western U.S. by tree type from 1990 through 1992 (NCTA 1993).

tree tag sales, a rough estimate can be generated regarding New Mexico's Christmas tree harvest. In 1991, a total of 172,851 tags were issued. Of these, 88,868 (51 percent) were for Christmas trees imported from out of state. In 1992, a total of 199,275 tags were issued, of which 95,986 (48 percent) were for imported trees. In New Mexico all conifer trees are required to have one of these tags, so these values include all types of real Christmas trees as well as landscape trees. To provide an estimate of the value of these crops lets assume all were cut Christmas trees with a value of $10.00. Thus, the value of the in-state crop for 1991 would be $839,830.00; $1,032,890.00 for 1992.