

Plantation Products and Practices

Objectives

Terms for Understanding

Seedlings

Cuttings

Nursery Stock

Career Profile

Christmas Trees

Biomass

Cultural Practices

Looking Back

Questions for Discussion and Review

Learning Activities

A **plantation forest** is created when trees are established in an area by planting seeds or seedlings. In most instances, the trees planted in a plantation are of a single variety. A population of trees consisting of a single variety is called a **monoculture**. A monoculture is not restricted to plantation forests. A monoculture can also occur naturally in a

forest when a single species of trees such as Douglas-fir or lodgepole pine becomes dominant. Plantation forests have become widely established because it is possible to reduce the rotation age and to increase total forest production using intensive silviculture practices that favor monoculture forest populations.

OBJECTIVES

After completing this chapter, you should be able to

- define monoculture as it is related to forestry
- explain the cultural practices involved in the production of containerized seedlings
- describe how cuttings are used to produce trees for transplanting
- list some silviculture practices used in the management of a Christmas tree plantation
- distinguish between bare-root stock and containerized seedlings
- explain the beneficial effects of pruning on lumber quality
- evaluate the production of biomass as a plantation crop in contrast with biomass production in most forest environments.

TERMS FOR UNDERSTANDING

containerized seedlings cuttings

monoculture nursery stock

plantation forest

SEEDLINGS

Management of a forest plantation is very much like the cultivation of crops on a farm. Silviculture has been defined as the cultivation of trees, and the management of a plantation forest is often referred to as tree farming. It should be noted that there are many different types of tree plantations. Some of these produce a tree crop every year in the form of seedlings. Some tree plantations raise trees for ornamental purposes in landscapes for homes and businesses. In these instances, a crop may require several years to mature.

A Christmas tree plantation produces trees that require several years to mature and produce the crop. Biomass is produced on plantations, often requiring 12-20 years to attain maximum economic yields. Pulpwood plantations may require 20-40 years to produce a single crop, and timber plantations often have rotations that require 50-70 years to mature. All of these tree crops are products of tree and forest plantations.

Seedlings are young trees generated from seeds. They are raised under controlled conditions to assure high survival and growth rates. Some are produced in beds located in field nurseries. Seeds are planted directly into the soil in narrow rows with close spacing of the seeds in each row. This method of planting helps to control weeds, and it makes it possible to produce a large number of seedlings in a very small area.

Containerized seedlings are produced in greenhouses in small containers of soil. The roots and soil are left intact when transplanted in forest locations. Seedlings produced under these conditions are more expensive than those raised from seed in nursery plantings. This is due to the cost of containers, soil medium, buildings and labor. Seedlings vary in the length of time required from germination to transplanting. Some species of trees take much longer than others to reach a seedling size that can be successfully transplanted. The use of seedlings over direct seeding has advantages such as uniformity in the spacing

of trees and in the age of the stand. Less seed is needed for seedling production than for direct seeding of a forest site. This is due to the high seed losses that occur due to birds and rodents when seed is broadcast on soil surfaces.

A very large industry has developed in North America for the production of tree seedlings. Many new hybrid varieties of trees with specific characteristics have been

developed, and these are actively marketed for commercial tree production on plantations and for ornamental purposes in parks, city streets and homes. Seedling sales are promoted in trade journals and industry trade shows. Large numbers of seedlings are produced each year by government forest agencies and by private forest industry facilities. They are used to replant thousands of acres of harvested forest lands each year.

CUTTINGS

Some types of trees can be regenerated from cuttings. This is a type of asexual reproduction. Fresh branches or twigs are cut from trees during the dormant season and buried in the debris on the forest floor to accomplish reforestation. An adaptation of this method is to generate new tree growth by rooting the tips of branches in soil medium in a greenhouse or cold frame. These vegetative tree parts are called **cuttings**, and large numbers of trees are generated from these materials.

Some types of trees such as poplars can be generated under damp climatic conditions from vegetative cuttings pushed down into the moist soil. Other trees, such as some of the conifers, are generated in large numbers from small cuttings from the tips of the branches. Under greenhouse conditions, these plant materials can be rooted in large numbers. Once the cuttings have rooted, they can be transplanted to plantation sites in the same manner as seedlings for the purpose of growing the trees to larger sizes or to populate the plantation for tree crop production.

NURSERY STOCK

Approximately 1.6 billion forest tree seedlings are produced in the United State each year. A significant number of these are produced in field nurseries by federal and state forestry agencies and by the private sector of the forest industry. Many of these seedlings are used to regenerate public and private forest lands, and some are used to produce trees used for decorative purposes in public parks or for landscaping purposes. Although these types of plantings do not conform to the traditional image of forestry, they contribute to the urban forestry movement sweeping through the cities and towns of North America.

Commercial nurseries produce trees of many different sizes ranging from seedlings to mature trees. All these plants are considered to be **nursery stock**, and most of these plants are exposed to intensive management practices. Among these practices are weed control, pruning, fertilization, insect control, irrigation, and transplanting. Commercial nurseries produce many hybrid tree varieties. Many of these hybrids have been developed to express resistance to specific problems or to exhibit aesthetic qualities that make them desirable for decorative purposes.

CAREER PROFILE: SILVICULTURIST

A career as a silviculturist requires an understanding of the science and culture of trees. A person engaged in this career should have a college education plan that includes the study of natural sciences along with a strong component in business, forestry and soil science. He or she will need to be knowledgeable in farming methods including

the use of machinery for preparing seedbeds, planting, fertilizing and harvesting. It will be important to study the latest research and to seek information about improved tree varieties. A thorough understanding of forest needs, from seedlings to mature trees, will contribute to success in this occupation.

CHRISTMAS TREES

The production of Christmas trees on plantations has replaced many trees that were harvested as young stands of trees in evergreen forests were thinned. Most fresh Christmas trees sold each year are raised in Christmas tree plantations because the plantation trees are generally higher in quality than wild trees. A number of evergreen varieties are acceptable for Christmas trees, but the Scotch pine variety has become quite popular for this purpose.

Quality in Christmas trees is measured by color of the needles, density of the branches, and fullness of the foliage. These characteristics can all be controlled by using silviculture practices. Needle color can be affected by applying fertilizers to the soil in

proper amounts. The density of branches is increased by cutting back the central leader of the tree. This causes the tree to produce additional branches from the stem. Pruning off the ends of the branches with a shearing knife increases the production of foliage, causing the tree to have a full appearance.

Christmas tree plantations located near urban centers sometimes sell their trees to customers who come to the farms to select them. Trees are also cut and shipped from tree farms to retailers in cities and towns a few weeks before Christmas. Christmas tree plantation managers usually produce only as many trees as they think they can sell each year, and they plant a new crop each year to replace the trees harvested.

BIOMASS

Biomass production was discussed as a specialty crop. It will be discussed in this unit as a tree crop well adapted for high yield plantation farming. In recent years, it has been demonstrated that biomass production can be increased dramatically by producing biomass crops under intense management systems on plantations. Some hybrid varieties of trees, such as hybrid poplars, grow at extremely rapid rates. It is evident that plantings with high populations of high yielding trees are capable of yielding massive amounts of biomass material over relatively short periods of time. The fact that biomass has found a market niche in the production of electricity has contributed to its success as a crop.

Perhaps the most significant aspect of biomass production is its potential to replace fossil fuels as an energy source in the production of electricity. Whole-tree chipping converts entire trees to useful fuel that can be used to replace coal, diesel and natural gas in the production of large amounts of electricity. Efficient production of biomass is having the effect of reducing our dependency on non-renewable fuels. The production of many different types of fuels from biomass is now possible, and research is continuing to refine and enhance these processes. Biomass may very well be our most important energy source of the future.

CULTURAL PRACTICES

Cultural practices used to manage plantation forests include all of the practices discussed in other units. A review of the silviculture practices discussed would be appropriate as part of this discussion on plantation management practices. In addition to those already mentioned, some additional practices are common in plantation forests that are too expensive to be profitable in most commercial forests.

Transplanting

Most trees transplanted to plantations or forests are in the seedling stage of development. If they have been raised in nurseries under field conditions, they are prepared for transplanting by removing them from the soil. Bareroot stock is often removed from the nursery in the late fall and stored in cellars or refrigerated storage areas until the seedlings are planted in the spring.

Seedlings must be transplanted with great care to increase their chances of survival. Before planting, trees should be stored at cool temperatures, but they must not be allowed to freeze. The optimal storage temperature range is 32-35°F. The storage temperature can be increased to 45°F during the last two or three days preceding transplanting. During the planting process, the roots must be protected from exposure to the wind or the sun to prevent the fine roots from drying out. Serious damage is sustained by seedlings when the roots become too dry.

Soil condition is important when seedlings are transplanted to permanent sites. The soil should consist of fine, moist particles that can be packed firmly around the seedling roots. Seedbed preparation is important if seedlings are to survive. Seedlings should be planted slightly deeper than they were growing in the nursery. The roots must retain their conical shape during transplanting, avoiding any twisting, bending, bunching or shortening of the root system. Roots must be placed in the hole pointing downward, and they should not contact the hard edge of the hole. Fine, moist soil should be packed firmly, but not too tightly, on all sides of the roots.

Seedlings planted in plantations often benefit from supplemental water and weed control. Many seedlings transplanted to plantation locations are planted by mechanical planters in prepared seedbeds. Workers riding on the planter place the seedlings in the furrow opened by the machine, and packing wheels compress the soil on either side of the seedling to assure good contact between the soil and the roots. Spacing of the seedlings depends on the tree variety and the intended use of the trees. Biomass plantations provide the highest yields when row spacings and seedling placements within the rows are close together resulting in a high density stand of trees. A lower density stand is desirable for pulpwood production, and trees cultivated for lumber production must be thinned extensively to provide proper spacing.

Seedlings planted in forest locations must depend on rain for moisture, but some steps can be taken to improve their access to the

moisture available. Planting the seedling in the bottom of a scrape or gouged area allows moisture from the surrounding area to flow to the bottom of the scrape where the seedling is located. Site preparation of this kind is fairly common in forest plantings. Seedling survival rates of 75-80% are considered to be normal for seedlings properly transplanted. It may be necessary, however, to replant the following year when seedling mortality is high or where large areas have experienced heavy seedling losses.

Pruning

Removing unwanted branches to change the shape or growth pattern of a tree is called **pruning**. This is done to improve the quality of a tree for a specific purpose. For example, pruning the lower branches from the stem of a tree increases the quality of the lumber because fewer knots are evident in the wood. On the other hand, a Christmas tree will generate many more branches if the central leader of the tree is cut each year. The shape of the tree is modified by trimming the ends of the branches with a sharp shearing knife.

Trees managed under plantation conditions are pruned during the early stages of growth to control the growth patterns of individual trees. Removing the lower branches at the sapling stage of growth will often add significantly to the value of trees when they are mature. Pruning is a valuable cultural practice for trees raised on plantations, but this practice should be restricted to dominant trees of those species used for finishing work and cabinets. One such species is white pine. Pruning enables the tree to produce a knot-free shell of clear wood high in value.

Pruning is expensive, and it is seldom economical to prune to greater heights than 16 feet. The first pruning should not occur until the tree can be pruned to the height of the first 8 foot log. This pruning will result in a uniform shell of clear wood up to the length of a standard cut of lumber. Pruning should be restricted to the dominant trees that can be expected to remain in the stand after it is thinned for the last time.

LOOKING BACK

Plantation forests usually consists of monocultures established for a specific purpose. Plantations are established for the commercial production of seedlings, Christmas trees, biomass, wood pulp, and lumber. Some of these purposes overlap, and two or even more of these products are sometimes obtained as a crop matures. Other products, such as Christmas trees and seedlings, are fairly restrictive in their uses. Plantation populations of seedlings are usually established from seeds, but a few varieties reproduce from vegetative plant parts. Both

containerized seedlings and bareroot stock require proper care at transplanting to assure that viable populations are established. Some plantation crops benefit from pruning, shearing or other silviculture practices, and plantation trees are usually subjected to much more intense management practices than wild trees. One of the most promising plantation tree crops is biomass. Biomass research is establishing this product as an important energy source for both the present and the future.

QUESTIONS FOR DISCUSSION AND REVIEW

Essay Questions

1. Explain why plantation forest plantings tend to be monocultures.
2. What steps are involved in the production of containerized seedlings?
3. How are cuttings used to produce young trees for transplanting?
4. What are two silviculture practices used in the production of Christmas trees to cause the branches and foliage of the tree to increase in density.
5. Explain how pruning the lower branches from the stem of a tree usually results in improved lumber quality.
6. Distinguish between containerized seedlings and bareroot stock.
7. How is a biomass planting under plantation conditions superior to biomass production in a natural forest environment?

Multiple Choice Questions

1. A forest planting consisting of a single variety of tree is called a:
 - a. plantation
 - b. monoculture
 - c. nursery
 - d. silviculture
2. A young tree generated from seed in a container filled with soil is a:
 - a. sapling
 - b. cutting
 - c. containerized seedling
 - d. twig
3. A young tree generated by vegetative reproduction is called a:
 - a. sapling
 - b. cutting
 - c. containerized seedling
 - d. twig
4. The shape and density of the branches and foliage of a Christmas tree is improved by which of the following practices?
 - a. shearing
 - b. cutting
 - c. flocking
 - d. culturing
5. Lumber quality can be improved by eliminating knots from the main stem of a growing tree using a cultural practice called:
 - a. cutting
 - b. culturing
 - c. shearing
 - d. pruning
6. A young tree that has had its roots removed from the soil in preparation for planting is known as:
 - a. a cutting
 - b. bareroot stock
 - c. a sapling
 - d. a containerized seedling
7. A dense plantation planting of fast-growing trees for energy production is called:
 - a. biomass
 - b. prune production
 - c. pulpwood
 - d. jungle
8. Nursery stock consists of:
 - a. young cattle or sheep grazed in nurseries to control weeds
 - b. trees maintained in nurseries from which rootstock is obtained for grafting
 - c. a product obtained from tree sap used as a soup base for human consumption
 - d. all of the trees and other plant materials maintained for sale by nurseries

Learning Activities

1. Obtain some nursery supplies and select some seeds for trees that are adapted to your area. Instruct the students on the proper planting procedures, and have the students plant a small tray of seeds. Have the students identify their trays, and make each student responsible for caring for his or her own plants as they sprout and grow. Keep the plantings damp, and maintain them in a warm place as they germinate. Once they have emerged, place the plantings in a greenhouse or near a window to allow exposure to light. Allow the students to take their seedlings home, or find a planting location near the school when the trees are big enough to be transplanted outside.
2. Take a field trip or assign students to visit a local nursery. Make a list of the trees available in landscape and shade tree varieties. Ask the customer service representative to explain how these trees should be transplanted for best results.