



# Tree Seedling Availability, Planting, and Initial Care

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## Introduction

This is the second in a series of three publications addressing the topic of forest stand establishment. If one is not sure of what seedlings to plant or of what forest product to produce, it may be beneficial to read the first publication in this series, titled "Tree Planting Objectives and the Seedling Selection Process."

There are four points to consider to identify management objectives. These are listed in brief form below.

1. Identify the growing region where land is located.
2. Identify the soil types and moisture regimes located on the land.
3. Identify those objectives feasible and within the bounds of the above environmental constraints.
4. Identify those tree species that, when managed correctly, will achieve wanted results.

If these four points have been considered, management objectives should be well in mind, and one should be ready to order the seedlings needed to plant. When having difficulty identifying a species of tree to plant or a management objective that feels comfortable, contact the Oklahoma Cooperative Extension Center in the county or local Oklahoma Division of Forestry office.

Assuming one is ready to order seedlings, a number of questions must be answered before planting. For example, do you want to order your seedlings from a state nursery; do you want to use bareroot or containerized seedlings; can you plant this year or do you have to wait until next year; are the seedlings you want to order the best for your objectives and your site; and many others.

It is the objective of this publication to explain the advantages and disadvantages of different types of seedlings, to identify seedling sources (nurseries), to suggest planting alternatives, and to explain the initial care required by the newly planted seedlings. After reading this publication, one should be able to communicate with a professional forester about seedlings and seedling establishment.

## Types of Tree Seedlings

There are many different types of methods used to produce a tree seedling, all with advantages and disadvantages. The method used to produce seedlings will greatly influence survival rate and early growth rate of the seedlings planted.

### Bareroot

Most nurseries that sell seedlings produce some form of bareroot stock. Bareroot seedlings, as the name describes, is a seedling with only the stem and the root supplied to the landowner for planting. The major advantages of bareroot stock are the relative ease of production in the nurseries, the relative low cost to landowner, the relative ease of planting, and the ability to mechanize many of the operations in the seedling production method.

Shortcomings of bareroot seedlings include the vulnerability of the seedling to the uncontrollable nursery environment, exposure of the root system to harsh environmental conditions after lifting, and the requirement of a large, seasonal labor force to plant the seedlings.

### Containerized

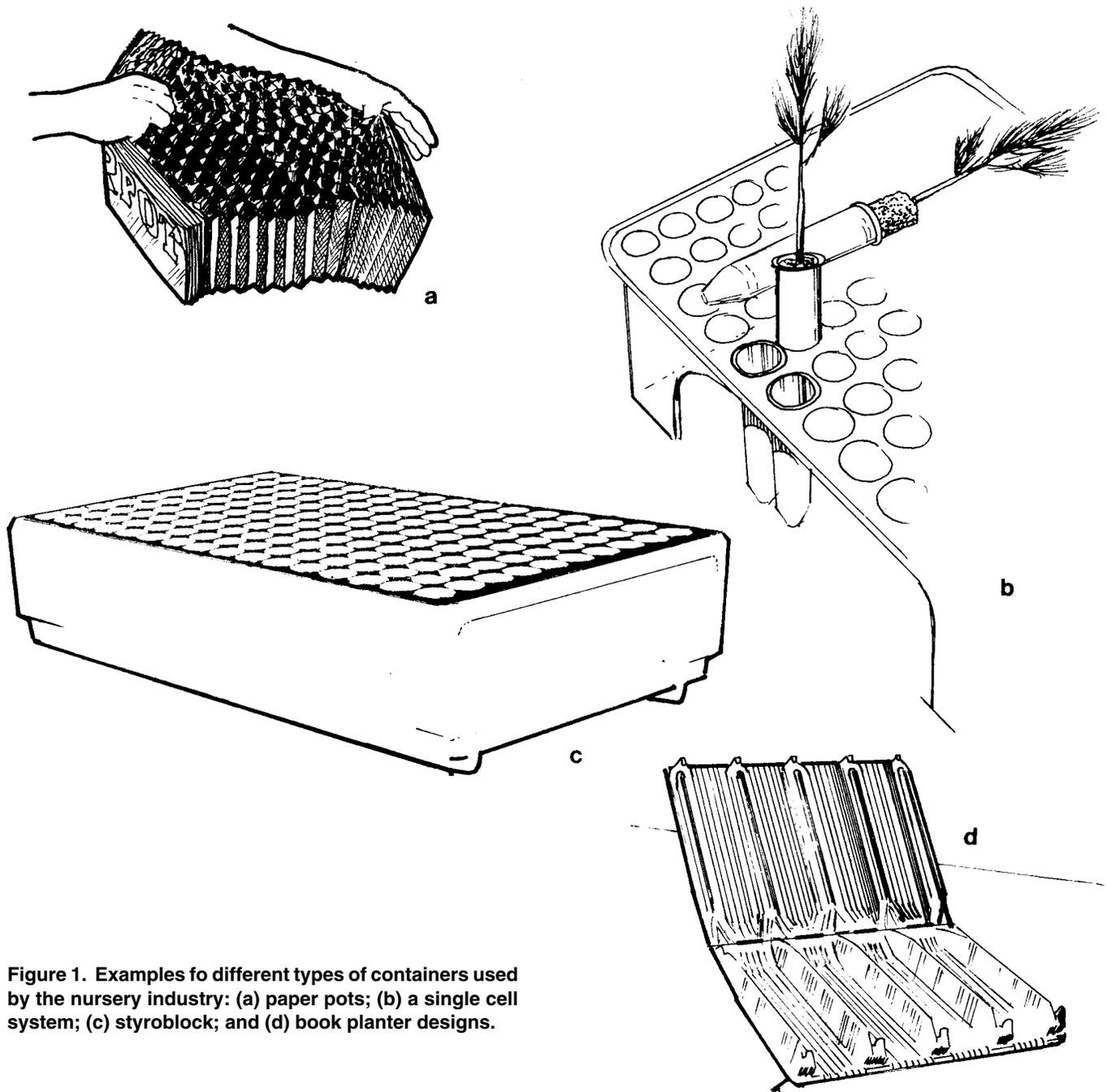
There are many different types of containers used in this process including peat pots, paper pots, "containers," "books," and styroblocks (Figure 1). An advantage of the containerized seedling system includes the ability to control the environment of the developing seedling through the use of green house facilities. As a direct result, the seedlings can be matched for the environment of the area where they will be planted. Other benefits include the protection and control of the root system during production and transplanting processes, and the extension of the planting season.

Some disadvantages of the container method are listed below:

1. The extra expense of producing these species over bareroot seedlings.
2. The need for constant monitoring of the seedling condition because of the relatively small sizes of the containers and the small amount of potting mix.
3. The requirement of a higher level of technical knowledge.
4. The difficulty in the planting process because of the size of the containers due to the transportation of a planting medium.
5. In some cases survival, is not significantly increased, and there is the possibility of root restriction and/or spiraling problems.

### Cuttings

A third option to establish a forest is the use of cuttings. Not all species can use this method of regeneration. Species



**Figure 1. Examples fo different types of containers used by the nursery industry: (a) paper pots; (b) a single cell system; (c) styroblock; and (d) book planter designs.**

common to Oklahoma that could use this procedure include sycamore, cottonwood, poplar, willow, and arborvitae. The advantages of this method include ease of making, storing, shipping, and planting. Disadvantages of this system include the higher level of technical knowledge and the possible need to use root promoting substances. The most important limitations, however, are the timing of the cutting process to the dormant period of the parent tree and the timing of the planting process to high moisture, low evaporation conditions.

## Tree Seedling Sources

### Private Nurseries

The regional situation concerning available seedling sources is unclear. There are several private nurseries that

supply seedlings of various species. However, because the seedling production schedule varies for different nurseries, one may not receive the seedlings until after the Oklahoma planting season. This is especially true for those seedlings ordered from nurseries outside Oklahoma. If one has questions on contacting private nurseries in the Oklahoma region, contact your local Oklahoma Cooperative Extension Center, the American Association of Nurserymen, or the Oklahoma Association of Nurserymen.

### Public Nurseries

Almost all states in the region adjacent to Oklahoma have some form of state nursery producing bareroot seedlings,

containerized seedlings, or both. Normally, the seedlings obtained through the state nurseries are limited in their use. For example in Oklahoma, the seedlings cannot be used to landscape a yard or as a single shade tree. Landowners can use them for establishing windbreaks or shelterbelts, for erosion control, for wildlife habitat, and for Christmas tree or timber plantations.

The Oklahoma State Forest Regeneration Center Produces both bareroot and containerized seedlings. The species produced by the state nursery are numerous and usually serve a variety of functions. The OSU Extension Facts F-5023, "Tree Planting Objectives and the Seedling Selection Process," explains the characteristics of seedlings produced by the Oklahoma State Department of Agriculture—Forest Regeneration Center.

## Tree Planting Procedures

It is very important to match the seedlings to the site and the environmental conditions of the area. If not matched, the species with the proposed site characteristics, it is advantageous to do so.

### Planting Season

One of the most important aspects of tree planting in Oklahoma is the time of the year the seedlings are planted. Often poor seedling survival rates are blamed on poor quality seedlings, when the real problem was planting too early or late in the planting period, or planting immediately prior to a severe freeze.

The planting period for trees in Oklahoma is varied because of the severe climatic differences, and is dependent on when the seedlings can be lifted and the moisture level at the time of planting. If it is too dry, supplemental water may be needed to help seedling establishment.

It is best to plant the seedlings during the seedlings' dormancy period. This is usually from early December through March. In the southeast region of the state, the best planting period is from December through mid- to late February. Seedlings planted in this region after March first will see a severe decrease in survival rate. The recommended planting season for the northeast region of the state is from early December until the end of March, and for the central and western area of the state, the planting season is normally from mid-December until mid-March. However, for those people who plan to plant west of I-35 and who plan to use containerized seedlings, the planting period can be extended into April.

Keep in mind these are estimated times and are subject to a number of environmental characteristics. Frozen ground will prevent planting many times in late December through January. Frequently, the nurseries may not be able to harvest (lift) the seedlings until mid-December because of high moisture levels, or because the ground is frozen. This will delay shipping and planting times.

### Spacing

The number of seedlings ordered will depend on the spacing used when planting the seedlings. There is no best spacing for all species; the growth rate of the tree and management objectives will be major criteria for deciding the spacing requirements.

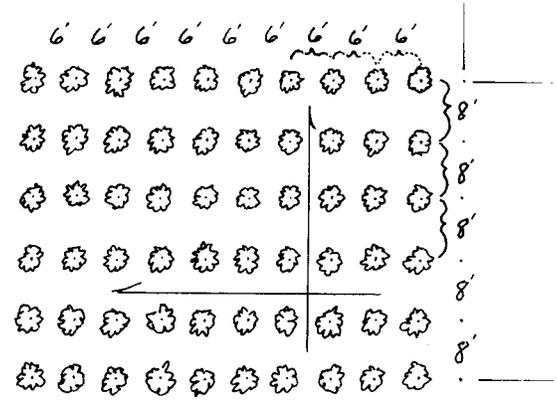


Figure 2. Actual spacing for a pine plantation.

A pine stand managed for timber production and maximizing the utilization of the site will have a minimum spacing of 6x8 with an optimum spacing of 7x9, 7x10, 8x8, or 8x9. This will give approximately 600 to 700 trees per acre (Figure 2).

Spacing for Christmas tree production is different from the above pine plantation. Normally, the objective is not to put on cubic foot volume, but to have a well-shaped tree. Shading from other trees and weed competition should be kept to a minimum. Spacing for Christmas trees should not be less than 5x5. Closer spacing may result in trees being shaded and resulting in reduced tree quality. A wider spacing of 6x6 or 6x8 is recommended.

Spacing for hardwood plantations is dependent on a number of things including the species used and the management objective. For example, wildlife habitat plantings should have trees planted at a fairly close spacing to optimize cover. On the other hand, a black walnut plantation managed for veneer logs will need wider spacing to provide for maximum growth rate. Spacing for a black walnut plantation has been recommended at a minimum of 11x11 feet.

NOTE: Closer spacing in the hardwoods can give some benefits. Adjacent trees will "train" the stems to be straighter with less branching from the main trunk. The end result could be a higher price for your trees due to higher quality logs. The manager must thin the trees more often, however. This procedure tries to optimize crown closure and growth rate.

Spacing is very important for windbreak design. Common spacing within a windbreak is 5x10, 10x10, and 10x15 feet. Spacing between rows often reaches 20 feet to allow for the use of large cultivation equipment. Closer spacing regimes, smaller than the 5x10 feet spacing, have the advantage of quicker crown closure, resulting in shading out of weed competition and the elimination of having to clean between the rows. This advantage is lost, however, if the windbreak is not thinned within approximately five years of planting. The thinning will provide the trees with additional growing space for full development.

### Seedling Care

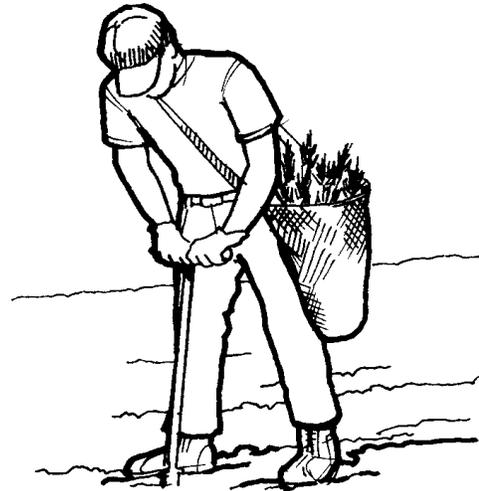
Most bareroot seedlings are packaged in tightly wrapped bundles with their roots in contact with damp peat moss, sawdust, or sphagnum moss. This acts as a means of

protecting the roots from desiccation during the shipping process. Polyethylene bags are increasingly being used to ship the seedlings. This material allows for carbon dioxide (CO<sub>2</sub>) movement and retains the moisture in the bag, eliminating the need for damp root packing material.

Many times the seedlings ordered are delayed in delivery due to problems in the lifting process (bad weather conditions), or they arrive when the manager cannot plant them. In all cases, it is best to plant the seedlings as soon as they are received. If the manager cannot do this, plan to plant the seedlings within a week of receipt, they can water them daily and store in a cool, shady location, preferably a refrigerator. Do not allow the seedlings to freeze. If the seedlings are going to be held for more than a week prior to planting, it is recommended the manager “heel in” the seedlings in a shady location to prevent photosynthetic stress (Figure 3).

The “heeling-in” process protects the root systems, but allows the manager easy access when he or she is ready to plant. Dig a narrow trench slightly deeper than the length of the roots. Remove the seedlings from the packing material and place the roots in the trench. Cover the roots with loose soil, pack firmly with your shoe, and water them well.

When the seedlings are taken into the field to plant, protect the roots as much as possible. The root system is the most fragile part of the seedling. It is very important to protect it from damage or from drying out. The use of planting bags or a pail with the roots in a damp moss or mud slurry is recommended (Figure 4). Do not keep the seedlings in a hand prior to planting. Remove each seedling from the bag or the pail as you plant it. This simple precaution will substantially increase your seedling survival rate.



**Figure 4. A planting bag used to protect the roots of the seedlings during the planting process.**

### Planting Plan

Before going to the field and starting the planting procedure, it is a good idea to have an enlarged map of the area to be planted. A photo of the planting area, obtained from the county Agriculture Stabilization and Conservation Service (ASCS) office, can be used.

On the map, identify how many areas will be planted and what the spacing will be between rows and seedlings. If more than one species will be used, label the areas according to what will be planted in each area (i.e., label one area as Black Walnut for saw log management and label another area as Scotch and Virginia pine for a Christmas tree plantation). Also identify on the map the location of access roads and fire-breaks. By using this plan, you will be able to identify those areas that should be planted first due to moisture or species limitations and increase the protection of the young trees.

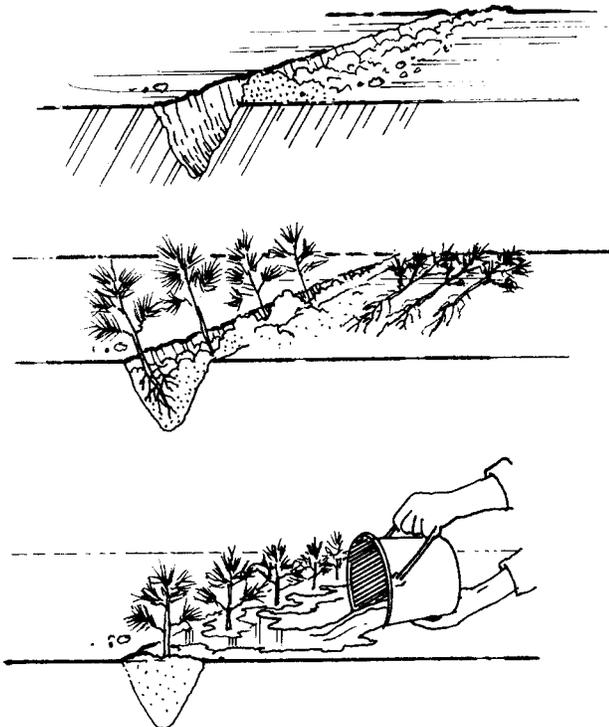
### Planting Alternatives

There are many procedures available for planting all types of seedlings. The mechanical procedure (Figure 5) is probably the most efficient, but it is limited by the terrain and the debris on the site.

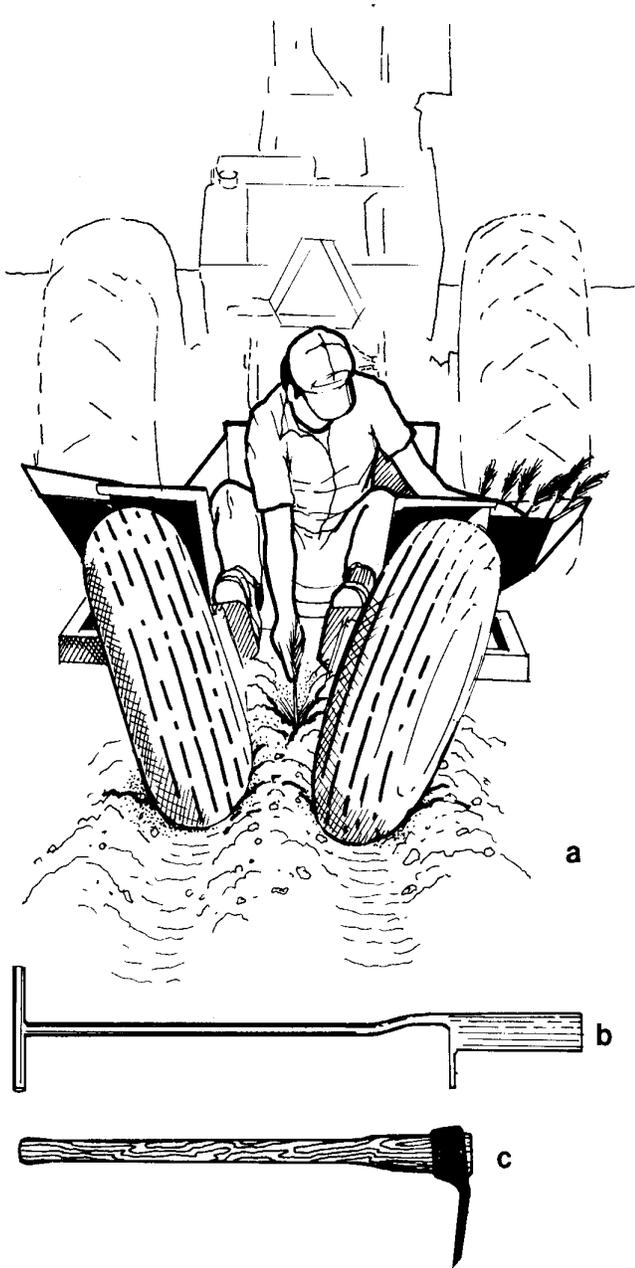
Hand planting is probably the most common tree planting method used in Oklahoma. It includes the use of a planting bar, called a dibble, the mattock or grub hoe (Figure 5), or a shovel. The hand planting method does give better control over spacing, but planting areas should be marked in some manner prior to planting regardless of the method.

For all planting procedures used, the seedlings should be put in the ground to a depth equal to or slightly deeper than the root collar (Figure 6). Push the seedling into the hole well below the desired planting depth, then pull up. For bare root seedlings, this will help spread the root system out and ensure the roots are not balled or turned up.

It is very important to place the seedling in the middle of the hole regardless of planting procedure. This will allow the root of the seedling to have the same growing conditions on



**Figure 3. The “heeling-in” process for seedlings that can not be planted immediately.**



**Figure 5. Examples of planting equipment: (a) a planting machine, (b) a planting bar or dibble bar, and (c) a mattock or grub hoe.**

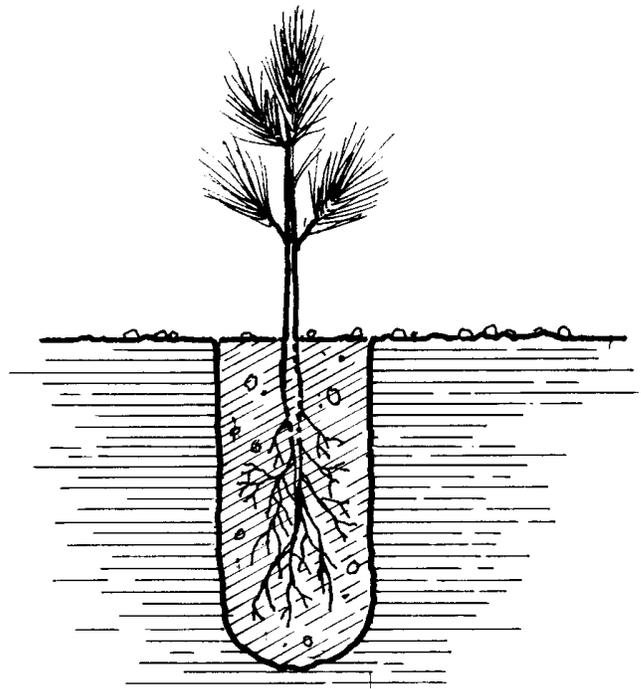
all sides. The root will not be trained or deformed by characteristics of the soil.

Also, it is very important to pack the soil around the root system so no air pockets remain. If the roots are not in contact with the soil, they will dry out when the plant starts to transpire. Death of the seedling is almost guaranteed in this situation. This is especially true of the bareroot stock.

## Initial Care of Planted Seedlings

### Competition Control

Control of surrounding competition is very important for survival of the planted seedlings. Presence of competing



**Figure 6. A correctly planted seedling. Notice root expansion and position of root collar.**

vegetation can decrease the amount of available moisture, nutrients, and light to the seedlings.

The control process should begin prior to planting with some form of site preparation. The site prep does not have to be intensive. To control grasses and annual herbaceous material, treatment of the planting area with pre-emergent herbicides is very effective. Apply the herbicide only to the strips or circles where the seedlings will be planted to reduce the area that must be treated. The size of the treatment area depends on the size of the surrounding competition. The manager should try to have an area of at least two feet or larger in diameter for each seedling to prevent shading.

Control of larger material, such as competing trees or shrubs, may require removal of the material (by mechanical or manual procedures) and treatment of the stumps with herbicides.

Competition control after the seedlings have become established is also very important. If herbicide treatments have been used prior to planting, mowing may be enough to control grass and herbaceous material in Christmas tree plantations and windbreaks. However, to control competition in many of the other plantation and windbreak situations the manager may have to use post-emergent herbicide treatments.

### Points of Concern

If firebreaks and access roads are included in the planting plan, and if they have been constructed, a major step has been taken to protect seedlings from a wildfire. To help increase the control of possible wildfires, the amount of brush and dead material in the immediate vicinity of the planted area should be reduced.

Other precautions to protect newly planted seedlings include the construction of fences or other barriers to keep domesticated animals or wildlife away from the seedlings.

There are incidences of severe destruction to newly established plantings due to browse by deer or rabbit.

There are commercial repellents available to discourage this behavior. However, there is no guarantee of success with these compounds. One may end up building wire cages or other structures for each seedling to prevent browse damage. This can be costly, but it may be worthwhile in windbreaks or Christmas tree plantations.

## **Seedling Replacement**

There is very little chance all seedlings will survive. This will result in dead areas that may need to be replanted. The decision to replant should be based on management objec-

tives. In a wildlife planting, one may not have to replant, but in Christmas tree and black walnut plantations, or in windbreaks he or she may want to replant.

## **Summary**

Much has been presented in this publication including information on available nurseries, different types of seedlings and planting techniques, and actions that should be taken to protect an investment of time and money in the seedlings.

Contact a county Cooperative Extension Center, Oklahoma Division of Forestry, or Soil Conservation Service offices with questions.

If interested in management techniques used during the first years of a stand, read Extension Facts F-5025, "Protection and Care of Planted Seedlings."

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
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