

# RAISING FOREST TREE SEEDLINGS AT HOME



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Cover photo--Home nursery on the farm of Peter Peters, Cowlitz County, Washington. This trial nursery is out in the woodland, a practice sometimes followed in Europe.

### Acknowledgments

This leaflet was planned by a Committee set up by the Clackamas County Farm Forestry Association in the spring of 1957. Members of the Committee were A. L. Parker, farm forester, State Forestry Department; D. H. Baisinger, research forester, Crown Zellerbach Corporation; and Charles R. Ross, farm forestry specialist, Oregon State College, who compiled data from the Committee and from other sources.

Information was obtained from specialists in nursery practice. The help of C. A. Rindt, U. S. Forest Service Regional Office, and Vern E. McDaniel, Superintendent of the Oregon Forest Nursery, was invaluable. Others consulted included personnel of the OSC School of Forestry and the Extension foresters of Idaho and Washington. Considerable help came from Extension publications of other states and from "Recommended Reforestation Practices and Techniques," a report prepared by the Western Forestry and Conservation Association in 1953.

## RAISING FOREST TREE SEEDLINGS AT HOME

### Should I Grow My Own?

Growing seedlings in a home nursery is something like growing garden plants for transplanting. With a 3- by 10-foot seedbed you can grow 2,000 Douglas-fir seedlings to 1-year size or about 1,500 seedlings to 2-year size. It is not likely that you can raise seedlings cheaper than you can buy them. Your seedlings probably will be cheaper if bought from a state-federal nursery where they are sold at cost of production. Cost of 2-year seedlings generally ranged from \$6 to \$10 per thousand during the 1955-58 period. Transplants cost about twice as much. It takes 2 years or more to grow your own.

Raising coniferous trees from seed is an exacting job not recommended for the amateur. It requires special knowledge and is greatly assisted by special equipment beyond reach of the small home nursery. The small producer can be successful, however, if he follows the procedures explained in this leaflet.

Growing seedlings at home offers a way to obtain seedlings when planting stock is scarce. By growing your own, you can raise species not commonly offered for sale. Also, you can use your homegrown trees for any purpose desired, whereas state laws in general forbid the use of state-federal nursery seedlings for anything but reforestation, Christmas trees, windbreak, and other conservation purposes. State-federal seedlings cannot be planted within incorporated city limits, cannot be resold with roots attached, nor can they be used for ornamental purposes.

### Order Seed in November; Plant in Early Spring

The recommended sowing time is spring, as soon as the ground can be worked and frost danger is past. Most seed will germinate within 60 days if sown in the spring. Some will begin pushing through the soil in about two weeks.

It is best to order seed in the fall to avoid the rush at planting time. A Seed Dealers' List is issued periodically by the U. S. Forest Service and copies are sent to County Extension Agents and farm foresters. This list can be obtained from them. Cost of seed varies considerably from year to year. Seed dealers will send price lists upon request.

Information on the collection of cones also is available from County Extension Agents and farm foresters.

### Seed Source is Important

More and more stress is being placed on the sources of tree seed. The difference between two seed sources could mean a difference of 50% in production of wood. Christmas tree growers think a great deal about their seed sources. At present limited choices may prevail, but seed source deserves continued attention. Forest



managers, at least, try to get seed from approximately the same elevation or higher (but within 1,000 feet), as that of the area to be forested, and if possible from nearby locations.

### Bed Location and Preparation

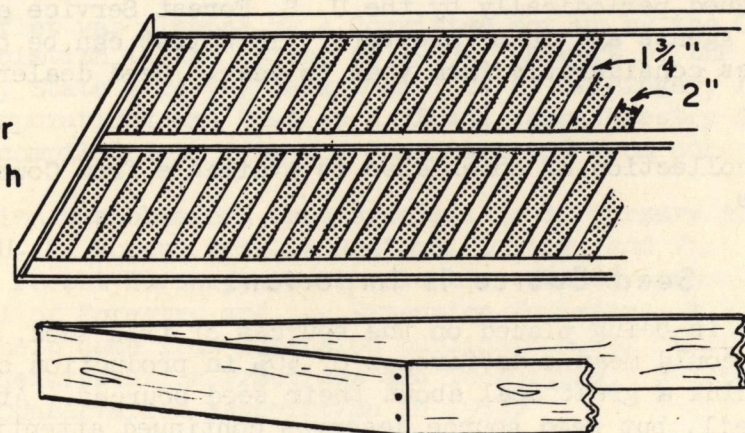
Assuming you have good seed or can get it either by collecting it yourself or by buying it from the many seed companies, site preparation is the first step.

1. Select an area where the soil is deep, loose, and of the sandy-loam type. You can't work with a soil that becomes sticky in wet weather or hard and caked when dry.
2. Heavy soils should be loosened by adding enough sand, peat moss, or possibly rotted sawdust to a depth of at least 10 or 12 inches. Any such materials should be mixed in with a rototiller or spading fork.
3. Loosen soil to spade depth and remove all foreign material, such as rocks, sticks, and hard lumps.
4. After soil is well worked, level it to provide uniform drainage to the sides.
5. Finally, rake smooth and press down gently with a board to provide a uniform surface for sowing.

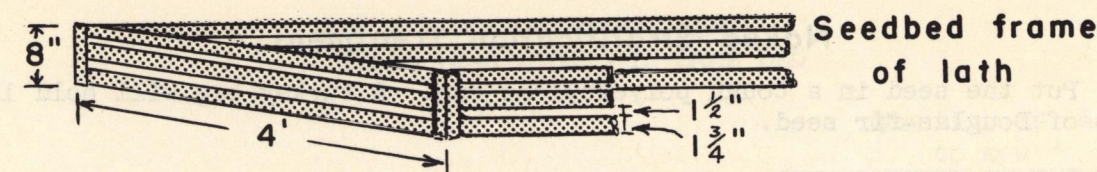
How big should the actual bedframe be where the seeds will be sown, and how is the bed constructed? By using 1- by 6-inch boards, the bedframe can be made 3 by 10 feet, 4 by 12 feet, or almost any other convenient size. Commercial nurseries leave the side frames off and use other means to protect the seedlings from sun, birds, and rodents, but side frames are necessary to the home nursery. In addition to boards frames have been made of cinder blocks, 1/2-inch wire, or lath. The bed should be made narrow enough so it can be worked easily during weeding or root pruning. If rodents are a problem, a piece of small-mesh screen should be used for covering. In addition, a lath or some other suitable cover should provide partial shade during the warm summer months. It is ideal to get about 50% shade. Snow fence has been used, as well as war surplus camouflage netting over a pole framework.

A lath cover over the seedbed provides partial shade and protection from birds. The seedbed frame can be made from lath, cinder block, or solid boards.

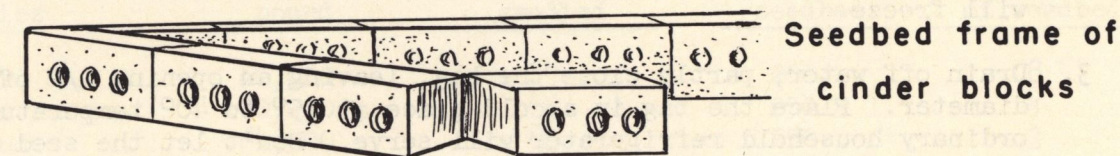
Shade cover  
made of lath



Seedbed frame made  
from solid boards



Seedbed frame  
of lath



Seedbed frame of  
cinder blocks

### Problems to be Overcome

Application of a soil fungicide like pano-drench, semasan, ferbam or others is recommended to destroy fungi like damping-off and root rots. Apply well before sowing and follow directions carefully. Damping-off fungi are capable of killing a large bed of seedlings overnight if conditions are favorable. The fungi are most active in the top 6 inches of most agricultural soils and thrive in warm, moist soil. Prevention is the best control. Allowing the surface soil to dry occasionally is suggested to help in checking it. Keeping soil surface dry at night (cease watering by early afternoon) is also suggested for tender seedlings during first month after germination.

A soil on the acid side, in the pH range of 5.4 to 5.7, usually is desired. Acidity can be determined by simple litmus paper test. More complete and accurate soil tests can be had through County Extension Agent offices for a small fee. Soil deficiencies can be discovered and corrected.

Insects such as cutworms, symphylids, and strawberry root weevils may or may not become problems. Controls are the same as for garden or field. Protection against birds and rodents already has been stressed.

The hot sun is likely to be the greatest killer of first-year seedlings, and also may kill second-year seedlings. Commercial nurseries are able to use light overhead sprinklings for "shading" on days which have killing temperatures. Home nurseries must have shade frames for the first growing season. Align rows north and south so the trees will shade each other.

### Seed Preparation and Treatment

Forest tree seed usually are treated to break dormancy before sowing. This is done by the process of stratification, or placing the seed in cool, moist storage for one to two months. This brings about certain biochemical changes, principally absorption of water and getting the food reserves into a readily usable form for germination and growth. Leading Oregon and Washington nurserymen use the naked stratification method outlined here. It has had ample testing with Douglas-fir and true firs, and is considered a method generally suitable for other coniferous seed including pines, redwood, and cedar. Certain species, however, may need a special treatment, juniper being one.



### Naked Stratification Treatment

1. Put the seed in a tough polyethylene bag. A turkey bag will hold 10 lbs. of Douglas-fir seed.
2. Put enough clean tap water in the bag to cover your seed. Close the bag and let soak 30 to 40 hours. Keep the bag in a cool place but not where it will freeze.
3. Drain off water, partly close the bag, leaving an opening 1/2 of an inch in diameter. Place the bag in a cold place at 35° to 40° temperature. The ordinary household refrigerator will serve. Don't let the seed freeze. Keep the seed in this cool storage 3 to 4 weeks, or longer.
4. When ready to sow take the seed out and dry it, doing this either indoors or outdoors, but avoiding a warm sun. Dry the outer surface of the seeds so they won't stick together, but don't allow complete drying. Dust with Ortho 75, Spergon, or another recommended fungicide and the seed is ready to sow.

If necessary the seed can be kept in this half-dry state. Put it back in cool storage, but avoid mildewing.

### Water Soaking Treatment

When time will not allow stratification, soaking the seed in water often is used as an alternate method, and results are good.

1. Put the seed in a small cloth sack with a weight to hold it under the water surface, fill a bucket with tap water, drop the sack in the bucket.
2. Place the bucket in a cool place but not where it will freeze, and leave the seed under water for about a week.
3. Take the seed out, dry the same as described in the preceding method, and the seed is ready to sow.

### Number of Seed to Sow

Generally, coniferous seedlings can be grown with 35 to 100 seedlings per square foot, depending on the species and rate of growth. Fast growing species need more room. Table 1 can serve as a guide. The seeding rates suggested are higher than those used by commercial nurseries, since the home nursery may have poorer seed and survival. If too many seedlings grow, the weaker ones should be thinned out.

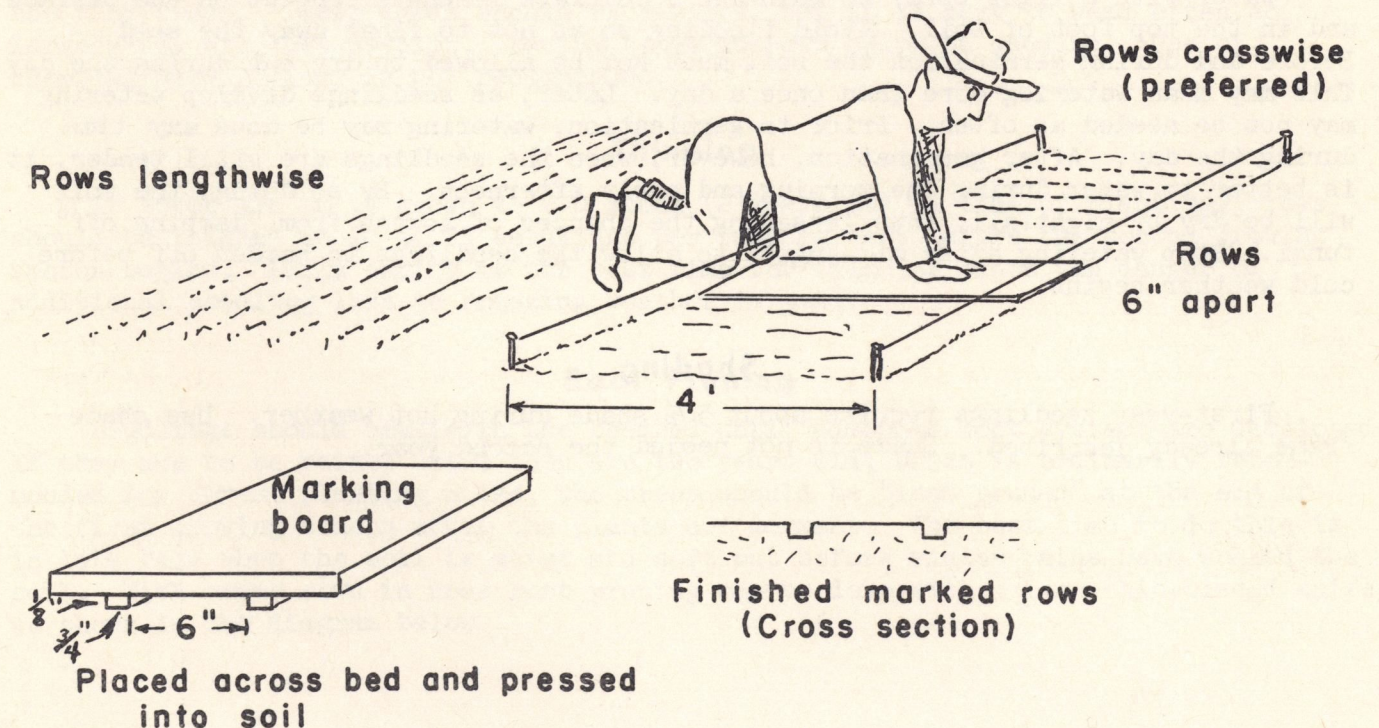
If seedlings are to be left in seedbeds more than two years, more room will be required for each seedling. If the seedlings are to be grown in the seedbed for only one year, the seeding rate may be increased.

DATA FOR GROWING SEEDLINGS  
2 YEARS (2-0 STOCK) IN SAME BED

Species	No. seed per pound	No. seedlings per sq. ft. seedbed	Quantity of seed to sow	
			No. seeds per sq. ft. seedbed	Ounces of seed per 100 sq. ft. of seedbed
Douglas-fir	40,000	65	200	8
Blue spruce	100,000	65	250	4
Norway spruce	64,000	65	250	3
Western redcedar	400,000	75	1000	4
Port-Orford-cedar	210,000	75	500	4
Scotch pine	80,000	50	200	4
Austrian pine	25,000	50	200	13
Ponderosa pine	12,000	50	180	24
White fir	15,000	65	220	24
Grand fir	15,000	65	300	32
Noble fir	16,000	65	350	35
Bigtree redwood	90,000	75	675	12
Rocky Mountain juniper	28,000	65	250	13

### Sowing in Rows

Beds ordinarily are easier to take care of if the seed is sown in rows rather than broadcast. Make very shallow trenches, a little deeper than the seed measures in diameter, 6 inches apart, using a stick about 3/4 of an inch wide. The seed can be sown in the trench by hand. If you have many rows a marking board as illustrated can be used to make the trenches.





Sow the number of seed per square foot of bed that the Table indicates, with 2 feet of trench per square foot of bed. If the seeding rate for Douglas-fir is 200 seed per square foot, sow 100 seed per linear foot of trench or drill. Cover the seed twice its diameter. If necessary, a bed covering other than the basic nursery soil can be used, such as a thin layer of sand, peat moss, or sawdust. Clean sawdust makes an excellent covering.

The usual method of covering the seed is to press it into the soil and then use a sieve to sift the covering soil over the bed. If the soil or sand does not need sifting or if sawdust is used it may be scattered by hand and smoothed as uniformly as possible with a short board or trowel.

### Sowing Broadcast

As a general practice nurserymen sow in rows, and this is probably the best method for home nurseries because weeding, root pruning, and lifting are easier. Occasionally there may be a reason for sowing broadcast. Therefore, suggestions on this method also are included.

As previously explained, the soil is worked well, and leveled to provide uniform drainage to the sides. It then is raked smooth and pressed down gently with a board to provide a uniform surface on which to sow the seed.

Three-fourths of the seed is scattered evenly over the surface of the seedbed. The remainder of the seed is used to fill in the sparse places. The seed should be lightly pressed into the soil with a board, then covered in the manner described under "Sowing in Rows."

### Watering

Water with a light spray to maintain a moderate moisture content on the surface and in the top foot of soil. Avoid flooding so as not to float away the seed. Before and during germination the soil must not be allowed to dry out during the day. This may mean watering more than once a day. Later, as seedlings develop watering may not be needed as often. Prior to germination, watering may be done any time during the day. After germination, however, when the seedlings are still tender, it is better to water during the morning and early afternoon. By so doing, the soil will be dry by nightfall, thus lessening the chances of losses from "damping off" fungi. Stop watering after mid-August to allow the seedlings to harden off before cold weather begins.

### Shading

First-year seedlings require about 50% shade during hot weather. Use shade frame already described. Shade is not needed the second year.



H. W. Chappell, Linn County, Oregon, grows Shasta and red firs for planting on his own lands. When in use, the roll-up shade frames are supported by the slim pole nailed to stakes.

### Weeding

Weeds will smother the trees if not removed promptly. Also, if the weeds get as much as 1 inch tall, it is hard to pull them without injuring the root systems of the tiny trees. Large weeds should be cut off, but it is best to weed often so large weeds will not develop. Having trees in rows helps in weeding. Use of chemical weed killers is not recommended.

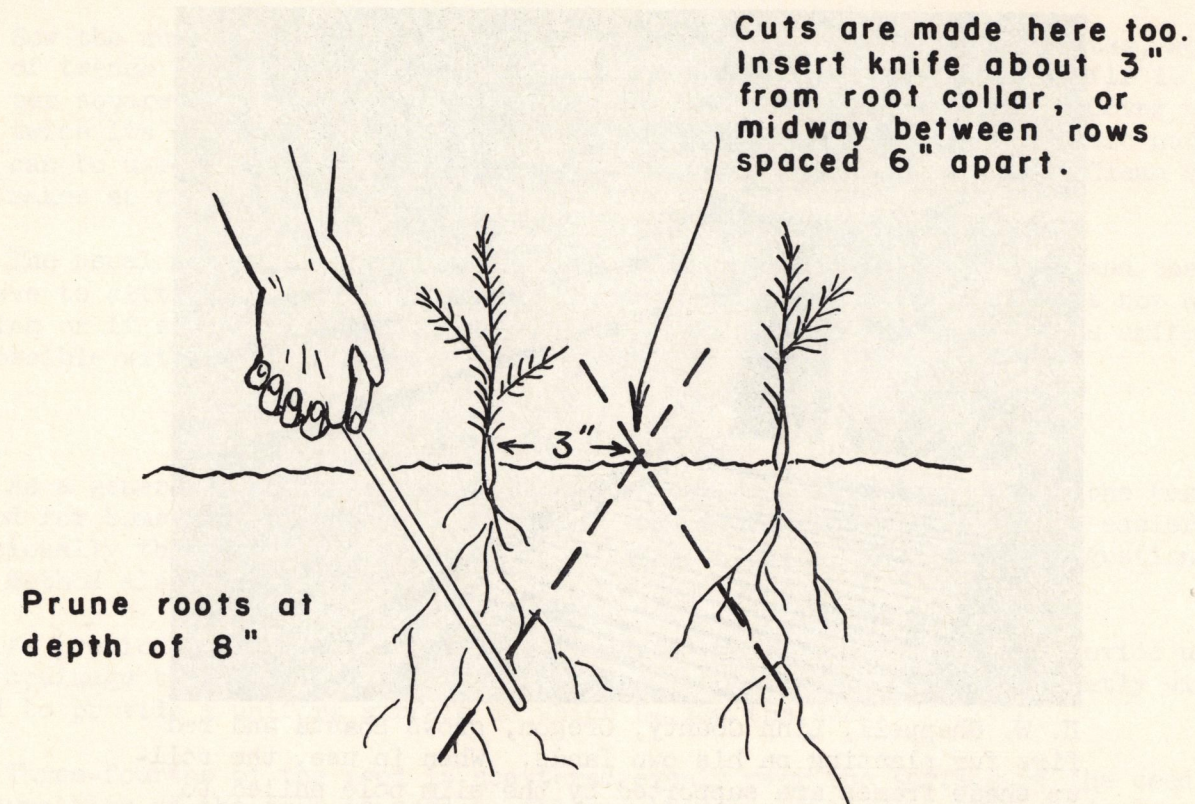
### Thinning

If trees are to be grown to 2-0 stock (2 years old at time of planting), rows should be thinned to 20 to 25 seedlings per running foot before the second growing season begins. Early spring is the best time for thinning since the danger of additional seedling loss to freezing weather is past.

### Root Pruning

Seedlings should remain in the seedbed until adequate root systems are developed. If they are to be raised until they are two years old, which is ordinarily recommended for forest planting sites, the trees should be "root pruned" at the end of the first growing season after the plants are dormant. The best time to do this is in late fall when the soil is moist and soft but before winter rains have soaked the soil. With trees sown in rows root pruning can be done with a long thin-bladed knife as shown in the diagram below.





Root pruning can be done with long thin-bladed butcher knife if seedlings are in rows and the soil is soft. The job can be done with a sharp spade. Purpose is to develop compact root system for better transplanting.

Place the blade in the soil midway between the rows at an angle so the roots are pruned off about 8 or 9 inches below the ground line. This should be done on both sides of each row. The object of this procedure is to develop a spreading fibrous root system rather than a long spindly root which will be longer than the planting hole the tree is to be placed in later. During root pruning try not to loosen the soil around the tree roots any more than necessary. If the soil is loosened very much it would be well to tamp it down along each side of the row when through.

If seedlings are to be transplanted to other beds, root pruning is done as part of that operation after the seedlings are lifted. Use a heavy knife on a board. Trim the roots of conifers to leave a root system only 4 or 5 inches long. Keep roots moist at all times.

### Mulching

During the first winter it may be well to protect the young trees with a 3- or 4-inch layer of straw mulch free of weed seeds, to prevent frost-heaving and damage. The straw should be removed as soon as the frost period is passed. The Oregon Forest Nursery prefers 1/2 of an inch of sawdust. It can be spread by hand and the fine sawdust brushed off the seedlings. If sawdust is used for mulch it does not have to be removed as is necessary with straw. The rodent protective screens should remain on the beds.

### Fertilizing

At the beginning of the second growing season, about April 1, apply a top-dressing of one-fourth of an ounce of 4-8-12 fertilizer per square foot. Repeat by applying another one-fourth of an ounce about June 15. **DON'T BURN THE TREES.** To avoid burning them with fertilizer, apply on a dry day when seedlings are dry. After putting on the fertilizer, immediately sprinkle them with water to get all of the fertilizer off the tree leaves.

Remember you are applying one-half ounce of fertilizer to one square foot to be divided into two applications of one-fourth ounce each. Apply about April 1 and June 15.

### Care the Second Year

During the second growing season the beds again should be kept free of weeds but should not be watered except during extremely dry periods. During the first part of the second growing season, however, the soil should not be allowed to dry out to a depth of greater than 3 or 4 inches. Shade should not be used during the second growing season.

### Lifting and Handling

Coniferous trees generally are lifted for planting at the end of the second growing season. Lift only after they become dormant, usually in late October or early November. The trees can be lifted with an ordinary spade, taking care not to break the roots. If desired, bunch the trees for tying in bundles of 25 or 50. The nursery soil must be damp. Shake excess soil gently from the roots and pack the trees in a suitable container such as a bucket or long, narrow box with a wet material like peat moss or shingletow around the roots. Trees can be held in this manner for a short time, several hours or overnight. Roots should never be exposed or allowed to dry. Always allow free air circulation around tops, and don't expose trees to sun or drying winds. Much handling between nursery and planting site will decrease survival.

### Transplanting

Transplanting of nursery stock to other beds slows down top growth and stimulates root development. It is done sometimes when it is desired to produce larger, sturdier trees with heavy root systems and tougher stems for planting on adverse sites. It is costly and the trend is away from it except where there are special needs.

Transplanting is done in the dormant season, usually in fall or early spring. Beds are prepared the same as for seedbeds. Trees usually are spaced with a transplanting board. Douglas-fir often is spaced at 2-inch intervals in rows. Home nursery operators using transplanting beds should get further information from forestry texts or forestry agencies.



## Field Planting Suggestions

More trees will be grown if care is given planting stock. Follow these precautions for a successful tree planting:

1. Do not break roots when lifting young trees from seedbed or transplant bed. Cut the tops of broadleaf seedlings back to about 9 inches and trim the roots back to about 10 inches for field planting. Trim off the roots on conifers to match the length of the blade of the hoe or other tool that will be used for planting but not shorter than 8 inches.

2. Keep the roots moist all the time.

3. Make the hole or slit on the ground large enough for the roots to take a natural spread position. The ground line on the planted tree should be at the same place on the stem as it was in the nursery bed.

4. Place only moist soil next to the roots and press it down firmly.

If you are planting an area you cannot plow and work down, scalp a spot 18 by 24 inches for each tree. Plant trees in the centers of these scalped places. This cuts down competition from weeds and grass. The young trees will stand a better chance of survival if placed on the north sides of stumps and down logs. Do not plant close to large brush clumps or trees.

## Additional Information

One of the most complete manuals presently available is the 1957 Agriculture Handbook No. 110 "Forest Nursery Practice in the Lake States." It can be ordered from the U.S. Government Printing Office, Washington, 25, D.C. for \$2. While it was written primarily for nursery practice in the Lake States it contains much information that applies to tree nurseries anywhere. It has a comprehensive reference to other publications on the subject.

Reports of the Pacific Northwest Seeding and Planting Committee of the Western Forestry and Conservation Association have been printed under the title "Recommended Reforestation Practices and Techniques." It is available from the Association, 712 U.S. National Bank Building, Portland 4, Oregon, for \$1.75.