

# PLANTING TREES FOR FARMSTEAD SHELTER

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### **A Good Farmstead Shelterbelt Will .....**

- Reduce the effects of cold, piercing winter winds on humans and animals.
- Moderate the effects of hot, dry, searing summer winds.
- Beautify the home and farmstead, making them attractive places to live, work, and for recreation.
- Help to attract songbirds and game birds.
- Reduce the annoyance of noise and dust from adjacent roadways.
- Prevent snow from drifting around buildings, roads, and walks.
- Save tractor fuel and labor—less snow plowing and shoveling.
- Save fuel—up to 30 percent in many homes.
- Cut down feed costs. Cattle protected against winter winds use feed for weight gain and not merely to keep warm.
- Protect feedlots, gardens, and orchards.
- Aid in establishing lawn and landscape plantings.

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Marvin Smith and Harold Scholten



**Figure 1. Shelterbelt too close to feedlot.** This is a young shelterbelt—there are two rows of spruce under the snowdrift. When the spruce grow larger and provide dense protection, snow will dump into the feedlot.

A good shelterbelt or windbreak adds to the comfort and enjoyment of your farm home and farmstead. It also adds thousands of dollars to the value of your farm. A barren, exposed farmstead offers little for comfortable living and family pride. A well-planned shelterbelt, however, offers family comfort, protects livestock, provides good conditions for successful orchards and gardens, and provides wind protection for landscaping.

This bulletin tells what to consider when establishing a new shelterbelt or renovating an old belt. It discusses how to plan, plant, and establish this valuable asset on your farm. Information is based on experience in establishing shelterbelts in Agricultural Extension Service work since 1926 and on research in Minnesota and other states.

## Shelterbelt Location

### BASIC LAYOUT

Establish the shelterbelt on the west and north sides of your farmstead to afford protection from the prevailing winds that blow from those directions. It's seldom necessary nor is it advisable to plant trees on more than two sides because air movement for summertime comfort will be obstructed.

The shelterbelt should:

- Not be closer than 100 feet from the house, barn, and feedlot (figure 1). Trees any closer can cause snow to pile up around buildings and drives (figure 2) and



Figure 2. Shelterbelt too close to the farm buildings. Snow dumps into the farmstead area. Energy in the form of tractor fuel and hand labor is required in snowplowing and shoveling to clear work area for performing daily chores.

obstruct air circulation during hot summer months. An interval of 100 feet or more allows room for gardens, orchards, and picnic areas. (figure 3).

- Extend south and east at least 50 feet—preferably 100 feet—past the last main building. This distance avoids snowdrifts which form around the ends of a tree belt and interfere with farmwork (figure 1).

- Contain eight rows of trees.

- Contain one or two rows of shrubs or small trees to the south and east of the farmstead if there is a need to control wind and snow blowing from these directions.

Never surround your farmstead with trees on all four sides, as a "dead air pocket" is created in the center.

This "dead air pocket" tends to suck the snow blowing over the trees down into the farmyard.

Trees on all four sides can also make hot summer days unbearable by slowing down air movement.

A windbreak gives reduced wind speed for a distance of approximately 20 times the height of the tallest trees. So most of the farmstead lying within 300 to 400 feet of the shelterbelt is protected.

Highways or other obstacles may prevent following this suggested standard plan. You may have to eliminate some tree rows or make adjustments.

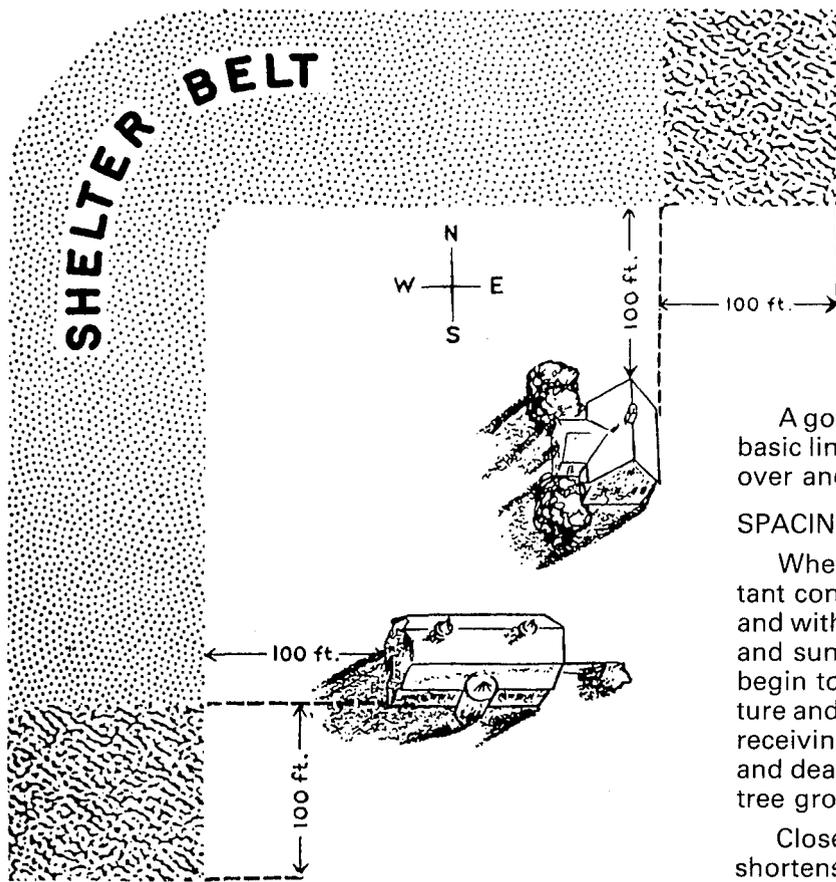
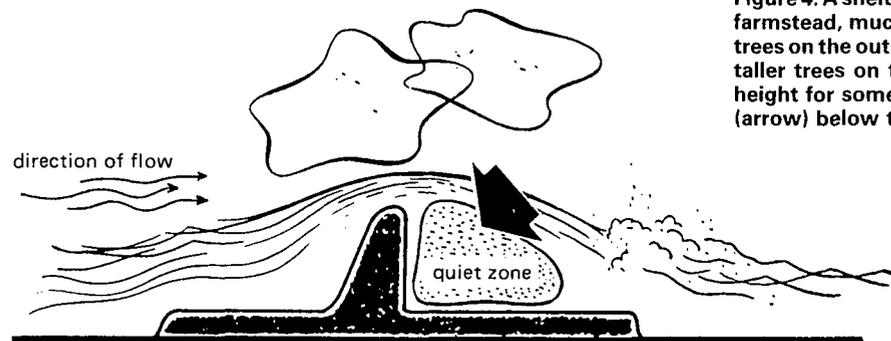


Figure 3. Basic layout of the shelterbelt as it shields the farmstead on the north and west, the direction of most Minnesota stormwinds. The inner row of trees should be at least 100 feet from all buildings. Plantings should extend 100 feet beyond the limits of the buildings for protection against winds whipping around ends of the shelterbelt (see darker areas).

Blowing wind or flowing water travel across the land in about the same manner. You can alter the direction of either by making changes in topography or creating obstructions that deflect the flow. Dams built to slow, retain, or retard water are designed with a long concrete apron leading up to the peak or the water height desired. The pressure behind the dam causes water to spill over in a wide arch.



A good shelterbelt plan is designed along the same basic lines to deflect the wind upward and "spill" it far over and beyond the farmstead (figure 4).

### SPACING

When planning a shelterbelt one of the most important considerations is spacing of trees between rows and within rows. Trees require adequate soil moisture and sunlight to produce healthy crowns. When trees begin to crowd they compete for available soil moisture and their lower branches die because they are not receiving enough light. Competition for soil moisture and dead branches result in considerable reduction in tree growth.

Close spacing: (1) provides protection earlier, (2) shortens the period required for cultivation, and (3) allows planting more rows on a limited area. However, these advantages are more than offset by the fact that wide spacing: (1) eliminates the necessity for thinning, (2) enables trees to retain lower branches much longer, and (3) most important, allows use of farm equipment for cultivation.

So provide an interval between tree rows which is at least 4 or 5 feet greater than the width of your cultivating equipment. If, for example, your field cultivator is 10 feet wide, space rows 14 to 15 feet apart. One exception to this rule is the interval between a row of conifers and an adjacent row of deciduous trees. To keep the faster growing deciduous trees from overtopping the slower growing conifers, it is recommended that adjacent rows of deciduous trees and conifers be separated by at least 18 to 20 feet.

Figure 4. A shelterbelt is designed to "spill" storm winds far over the farmstead, much as a dam deflects waterflow. Shorter shrubs and trees on the outside force the main wind current upward to clear the taller trees on the inside (figure 5). Since winds continue at that height for some distance, the farmstead lies in the sheltered area (arrow) below the "dam."

## Land Preparation

No single factor assures better survival or faster growth in a new windbreak than proper preparation of the planting area during the summer before actual spring planting. Fallowing or keeping the land in a cultivated crop, such as beans or potatoes, the year before planting assures a loose, clean, pulverized soil. The soil then holds moisture well and is relatively free of competing weeds. Fallowing a full summer before planting is best.

On well-prepared land, deciduous trees grow amazingly fast and begin to give protection benefits in 5 or 6 years. By then the conifers will be growing about 8 to 12 inches per year.

### SOD GROUND

Do not plant trees on sod ground or in an alfalfa field without first plowing well and working the soil for 1 or 2 years before setting out trees. This process is especially necessary on fine-textured soils with insufficient moisture during the growing season.

Plow just deeply enough to turn the sod; then disk thoroughly to cut it into small pieces. During the summer, plow deeper. Fallow with a disk and spring-tooth harrow to keep down grass and weeds. Finally, let the area lie rough over the winter to catch snow and hold moisture for spring.

In the spring, disk and harrow the area again. The soil is now mellow, retains water well, and can be easily planted.

### SANDY GROUND

A thick sod layer or rank growth of competing vegetation is rarely a problem on light, sandy soils typical of east-central Minnesota. If you prepare sandy soils in the same manner as sod-covered ground, you can expect serious wind erosion and difficulties in planting. For favorable planting conditions, plow soils in the fall and plant the following spring without working the ground further.

### OTHER PREPARATION

Before planting, build or repair fences as necessary to keep livestock away from the trees. Cattle, sheep, and horses will browse on the foliage and break lower branches. Horses will chew on the bark and often strip off the bark. If the bark is stripped off completely around the tree, the tree will die. Hogs will "root" the soil causing damage to young feeder roots. Chickens peck off new growth and needles and scoop out holes at the base of trees. When trees are taller, chickens roost in them, plastering stems and branches with droppings that can kill the trees.

The high nitrogen content of livestock droppings, especially from sheep and poultry, can be harmful to trees—conifers are particularly susceptible to damage from high nitrogen concentrations. All forms of livestock cause soil compaction by trampling. The heavier

the soil the more serious the compaction. Compacted soil reduces the amount of rain water infiltrating the soil. Reduced soil water reduces tree growth and serious compaction may even kill the trees.

When fencing, allow about the same distance between the fence and trees as between tree rows. This distance allows space to cultivate and prevents grazing animals from reaching through to nibble on the trees. It also protects trees from grass fires.

## Sources of Stock

Planting stock for shelterbelt, reforestation, and wildlife purposes is available from nurseries operated by the Minnesota Department of Natural Resources (DNR). This state agency provides forest planting stock in lots of 500 or more seedlings and transplants for general forestry purposes, including shelterbelts and field windbreaks. Planting stock is also available from the Soil and Water Conservation Districts (SWCD).

Many commercial nurseries also can supply excellent windbreak planting stock and quantities of trees and shrubs in the size and grade best suited to this purpose.

Purchase trees from reliable sources—as close to your home as possible because stock is better acclimated, more suited to your soil, can be delivered quicker early in the spring, and costs less to ship than trees from a distance.

Order enough—at least 10 percent more than required for your planting program. You can then cull out poor, scrawny, or damaged trees. Any surplus can be planted and cared for in the garden and used later as replacements for losses in the original planting.

Order early—in the fall or early winter—before December to assure early spring delivery.

## The Standard Plan

Farmstead shelterbelts require an area approximately 116 feet wide (figure 5) to provide room for eight rows of trees composed of a variety of species. Plant fast growers for quick results, long-lived trees for permanency, and conifers for year-round protection. Such mixed plantings also give variety to the farmstead and beautify the landscape.

Many combinations of trees and shrubs are possible in the design. Research has demonstrated that any combination should incorporate the following features:

1. A low-growing shrub in the windward row.
2. A tall shrub or medium-height tree inside and adjacent to the shrub row.
3. Four rows of tall trees including both fast-growing and long-lived species. All may be deciduous trees or a combination of two rows of deciduous—and two rows of conifer trees (figure 6).
4. Two rows of conifer trees nearest the farmstead.
5. Trees should be staggered as shown in figure 7.

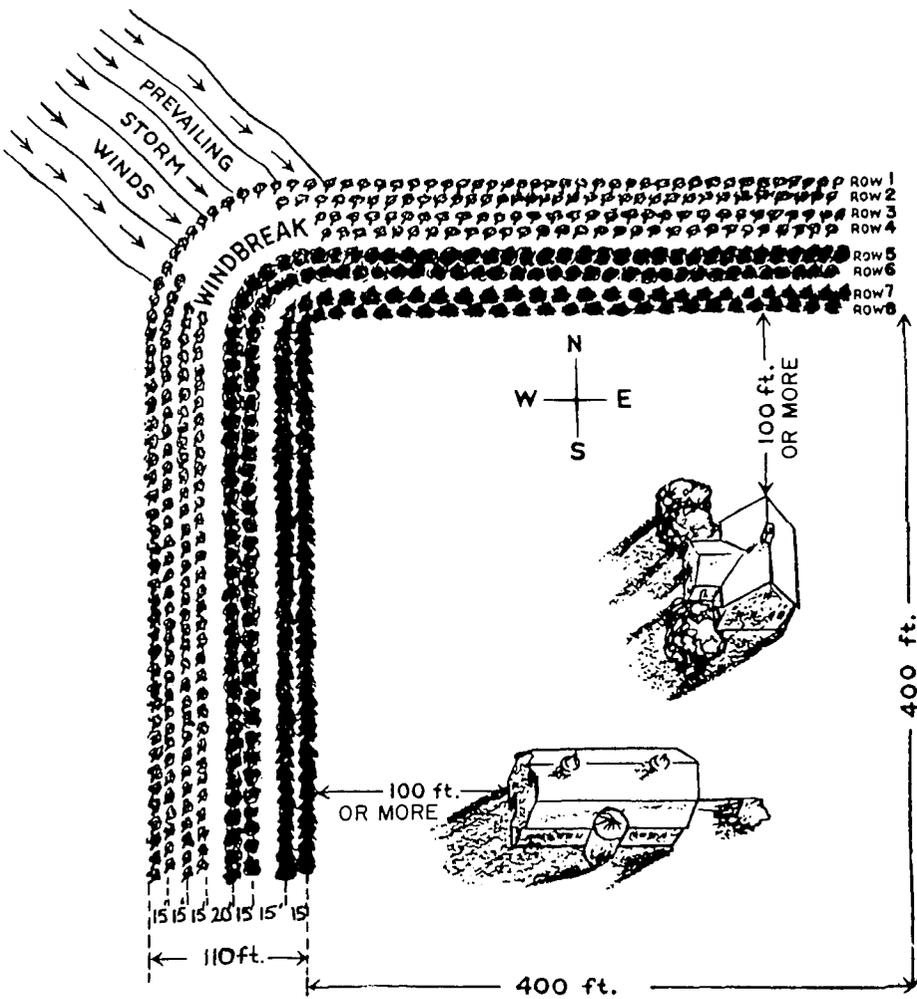


Figure 5. Standard plan. The indicated spacing between rows is only a guide and shows minimum spacings. Make spacing at least 4 to 5 feet wider than the width of your cultivating equipment.

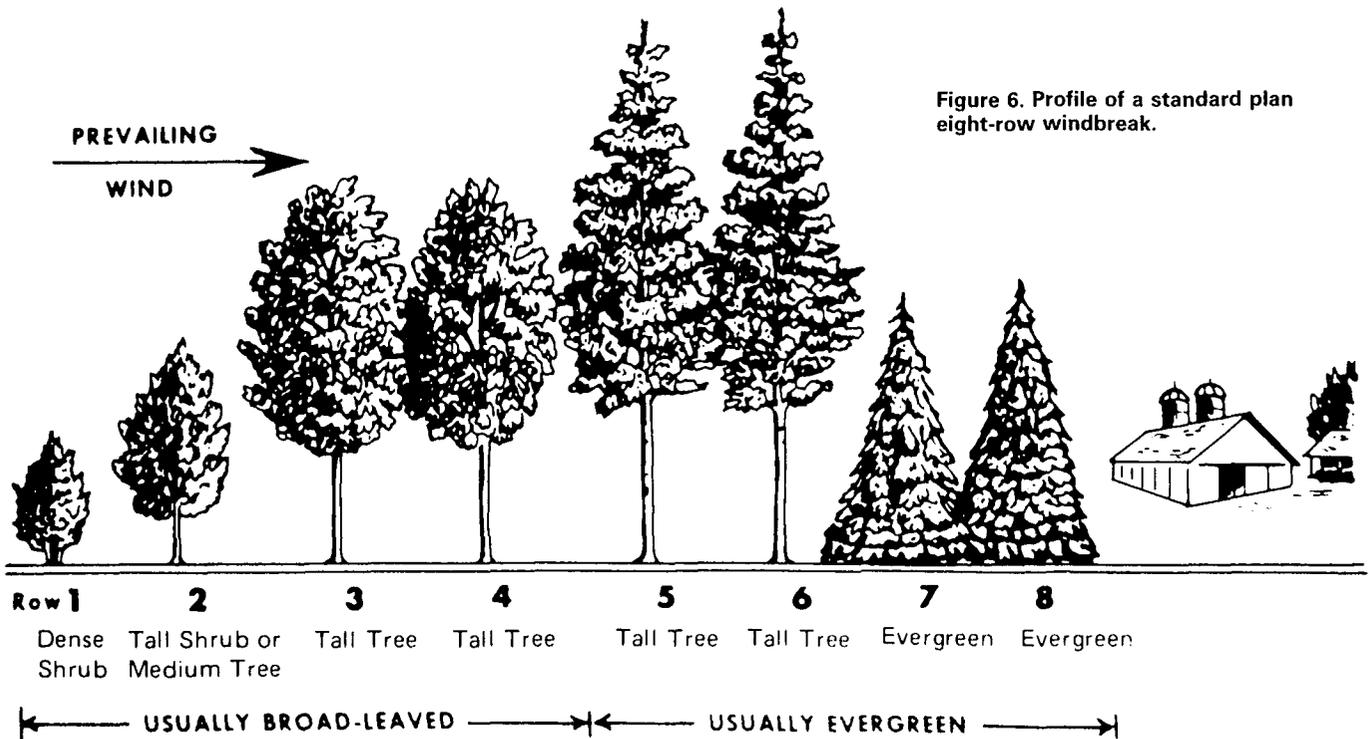


Figure 6. Profile of a standard plan eight-row windbreak.

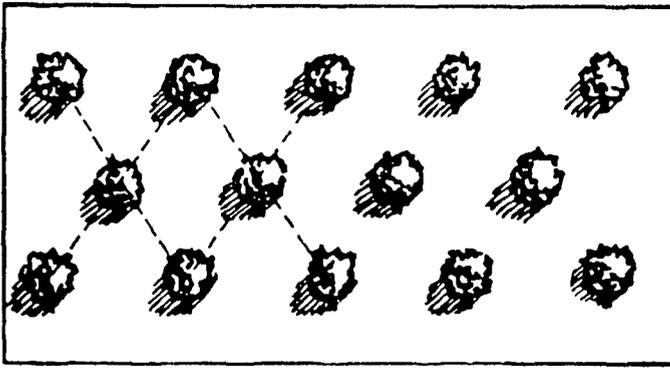


Figure 7. Proper alignment of trees—alternated or staggered.

A windbreak that includes these features provides: (1) protection to ground level, (2) maximum ultimate height, (3) year-round protection, (4) rapid growth, and (5) reasonably long life.

### What to Plant

Choose trees of proven hardiness in your locality. To check on how well certain trees will do, compare them with others of the same kind that have grown successfully on similar soils in your neighborhood. For specific recommendations, see your county extension director, Soil and Water Conservation District (SWCD), or local forester. Some suggestions follow.

#### SHRUBS

Plant shrubs about 4 feet apart within the row. Choose from: Tatarian honeysuckle, White Belle honeysuckle, purple-osier willow, lilac, Caragana, Amur honeysuckle, Zabels honeysuckle, and redosier dogwood.

#### TALL SHRUBS OR MEDIUM HEIGHT DECIDUOUS TREES

Plant these trees 5 to 8 feet apart in the rows. Choose from: golden willow, laurel-leaf willow, Russian olive, American wild plum, Amur maple, boxelder, chokecherry, Siberian crab, or one of the hardy strains of flowering crab.

#### TALL DECIDUOUS OR CONIFER TREES

Spacing of trees within the row (as well as between rows) is very critical. The closer the spacing the sooner the lower branches of adjacent trees begin to touch, the earlier you get protection from wind and snow. However, when lower branches begin to crowd they will die out from shading and this dying of branches progresses up the tree over time. Also, the closer the spacing, the greater the competition for soil moisture and the more tree vigor and growth will be reduced. Therefore, the eventual or final spacing of trees in well-established shelterbelts should be a minimum of 16 feet—preferably 18 to 20 feet. If you wish to plant closer than 16 feet you must plan on thinning later so

that the permanent trees are 16 to 20 feet apart. Thin before lower branches begin to die from crowding. To end up with 16 to 20 foot spacing after thinning, you could plant at 5-, 6-, 8-, 9-, or 10-foot intervals.

You should consider the following species for your shelterbelt: Deciduous trees—green ash, hackberry, cottonwood, Norway poplar, white willow, and silver maple. Silver maple and white willow grow rapidly and give early protection, however, they should be considered as temporary trees and removed later as they take up too much room and will crowd adjacent rows of trees even when rows are 20 feet apart. In southeastern and southern Minnesota, consider also walnut, butternut, and hard maple. Conifers—red (Norway) pine, ponderosa (western yellow) pine, Scotch pine, white pine, Norway spruce, Douglas fir (of hardy seed source), and Siberian larch (sheds needles in fall).

The standard 8-row windbreak includes four rows of tall trees. These may be all deciduous species or you may choose to include one or two rows of pine. Be sure to locate the pines next to the inside spruce rows. Leave a 16- to 20-foot space between the last row of deciduous trees and the adjacent row of pine.

#### CONIFERS FOR INNER ROW

Plant trees 8 feet or more apart in the row. Choose from: Black Hills spruce, Colorado spruce, white spruce, Norway spruce, and white cedar. Eastern redcedar should also be considered. However, since it (as well as other junipers) is the alternate host for the Cedar Apple Rust Fungus, it should not be planted if there are apple trees within the farmstead.

Spruce are recommended for the inner two rows because they have dense foliage and maintain their limbs close to the ground for most of their life. This growth characteristic helps prevent dust and snowstorms from filtering through the treebelt.

Other alternatives to two rows of spruce are (1) spruce and white cedar, and (2) spruce and flowering shrub or flowering crab, with the cedar, shrub, or crab used in the innermost row.

If limited space prevents your planting the standard eight-row windbreak, plan to use fewer rows rather than crowding trees. For example, five rows of trees with room to grow give better results than eight overcrowded rows. If you must plant fewer than eight rows, use this guide:

If you only have room for:	Use one of these combinations from figure 5:
7 rows	1,2,3,4,6,7,8 or 1,2,3,5,6,7,8
6 rows	1,2,3,4,7,8 or 1,2,3,5,7,8
5 rows	1,3,4,7,8 or 1,2,4,7,8
4 rows	1,2,7,8 or 1,4,7,8
3 rows	1,7,8 or 1,3,7

## Size of Planting Stock

### DECIDUOUS

Use 2-year-old deciduous seedlings, 14 to 16 inches high. This size is easiest to plant. They establish quickly, have a good root system, and cost is reasonable.

Good stock quality is necessary for success of initial establishment, survival, and growth. The first growing season is the critical period in the establishment of plantings. Healthy, well-formed trees with full and branchy root systems are important.

### CONIFERS

When ordering conifers, select transplants, not seedlings. Transplants are trees grown from seed in a nursery for 2 years and then lifted and planted in transplant rows. They are cultivated and cared for until they develop a good root system and sturdy stems.

Transplants are referred to by the term "2-1 or 2-2 stock" or similar designation. It means that the transplants are 3 or 4 years old, having been grown 2 years in seedbeds and 1 or 2 years in transplant rows. The 2-2 conifer planting stock is usually about 10 to 14 inches high. Some nurseries describe planting stock which has been transplanted twice as "TT."

Conifer transplants are especially recommended for shelterbelt plantings in southern and western Minnesota because of the less favorable environment for growing trees. Transplants compete better with grass and weeds and are easier to handle in planting—whether by hand or treeplanting machine.

Don't judge trees by the top only—the root system is just as important. Nutrients and moisture are absorbed through the roots. Big tops and small root systems spell losses.

### CUTTINGS

For some species, including the poplars, cottonwoods, and willows, planting cuttings gives excellent results (see page 11).

## CONTAINER STOCK

Since it takes from 2 to 4 years for the roots of bare-root conifer planting stock to become established and for significant height growth to begin, you may wish to consider planting container-grown conifers. Some conifer potted stock is available (SCS and private nurseries) in 6- to 8-inch pots. When planting container stock, the roots are not disturbed; therefore, survival is substantially increased. Greater height growth can also be expected the first year following planting.

## Time to Plant

Spring is the best time to plant shelterbelt trees—as soon as the frost is out of the ground. Then soil is moist, climate is mild, and trees can establish themselves. The trees have a full growing season ahead and can get a good start before weeds and grass become a problem. Fall planting of bare rootstock is often less successful. When you receive notice your trees have arrived:

1. Pick them up promptly.
  2. Don't assume that the packing material around roots is moist enough. Give it a good soaking without delay. Do not leave trees in the wrapped package more than 2 or 3 days because they are apt to dry out, heat, or mildew.
  3. If you are not going to plant the trees for several days, put the tree bundles in cold storage (34° to 40° F.) or "heel in" the trees in a trench—preferably in a cool, shady place. Make the trench deep enough and long enough to take the entire root system and a part of the lower stems.
- Cut ends and one side of the trench straight, the other side sloping. Place trees in the trench side by side in thin layers, then thoroughly pack dirt around roots. Trees may be left "heeled in" for a week or so if you do the job well (figure 8).

Figure 8. "Heeling-in" trees.



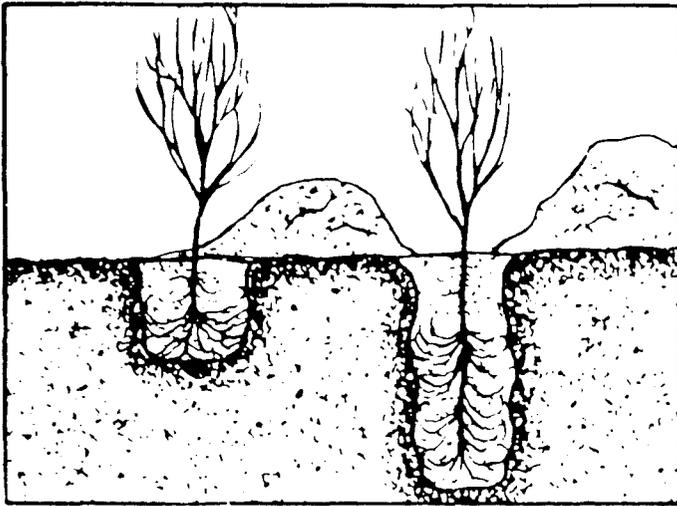


Figure 9. Left: Planting hole too shallow and too narrow. Right: Planting hole too deep and too narrow.

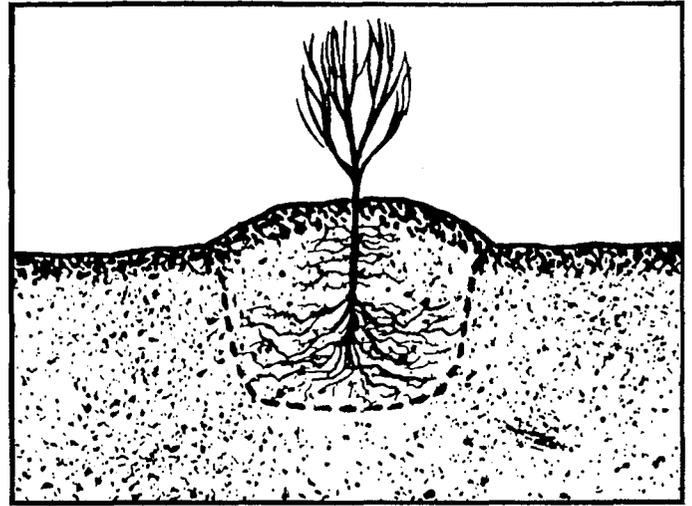


Figure 11. Soil hilled up too high.



Figure 10. Tree planted at proper depth with roots well spread and soil tamped down as the hole is filled.

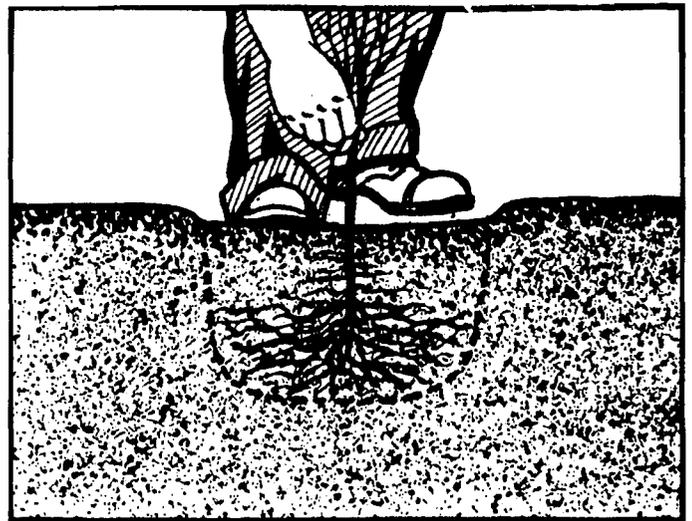


Figure 12. A good planting.

## Planting

When removing trees from the heeling-in trench for actual planting, take only as many as you can carry in a pail or plant in an hour. Re-cover roots of remaining trees with soil.

Keep tree roots moist at all times, from the moment of arrival to actual planting. Use a mixture of packing material and water in the pail to keep roots from drying out while planting. Dry roots mean dead trees. During planting, handle each tree carefully—do not skin the bark, break terminal buds, or injure roots.

Before planting, “stake out” rows. Line them up evenly and get the proper distance between them. Number rows and label stakes so you will know where each species should go. You are now ready to plant by hand or with mechanical planters.

## HAND PLANTING

Remove trees from the pail one at a time, but not until the hole has been freshly made. Never allow roots to become dry by being exposed to sun or wind, even for a moment. The delicate small rootlets are easily injured or killed. Roots of conifers are especially susceptible to damage from drying.

Use a shovel or spade in hand planting. If you prepared the soil properly, it will be loose, well pulverized and easy to plant.

The “hole method” of planting is recommended. Make the hole deep enough and wide enough to hold the entire root system without crowding (figures 9-12).

Hold the tree in a firm and upright position until you have tamped the soil firmly around roots (figure 10).

Packing the soil thoroughly is necessary to eliminate air spaces next to roots. If you don't firm the soil, trees may die during spring or summer dry spells. It is not necessary to pour water into the hole after or during the planting process particularly if the hole has been freshly dug. However, watering after planting helps to settle the soil around the roots.

Plant trees to the same depth they grew in the nursery bed. You can tell this by looking for the "soil ring." The part formerly in the ground is darker than the upper stem which was above-ground. If the ground is very loose, plant an inch or so deeper to allow for the settling of the soil to the right depth.

Above all, do not plant the tree too shallow. Do not "hill up" earth around planted trees (figure 9).

After you plant the tree, level or slightly depress the ground so there is a small catch basin for rain (figure 10).

### MECHANICAL TREE PLANTERS

Mechanical tree planters are available in most counties for farm tree-planting programs. Usually, arrangements for their use are made with the county

extension director or the SWCD. Often the Minnesota Division of Forestry, sportsmen's clubs, or forest industries have planters available.

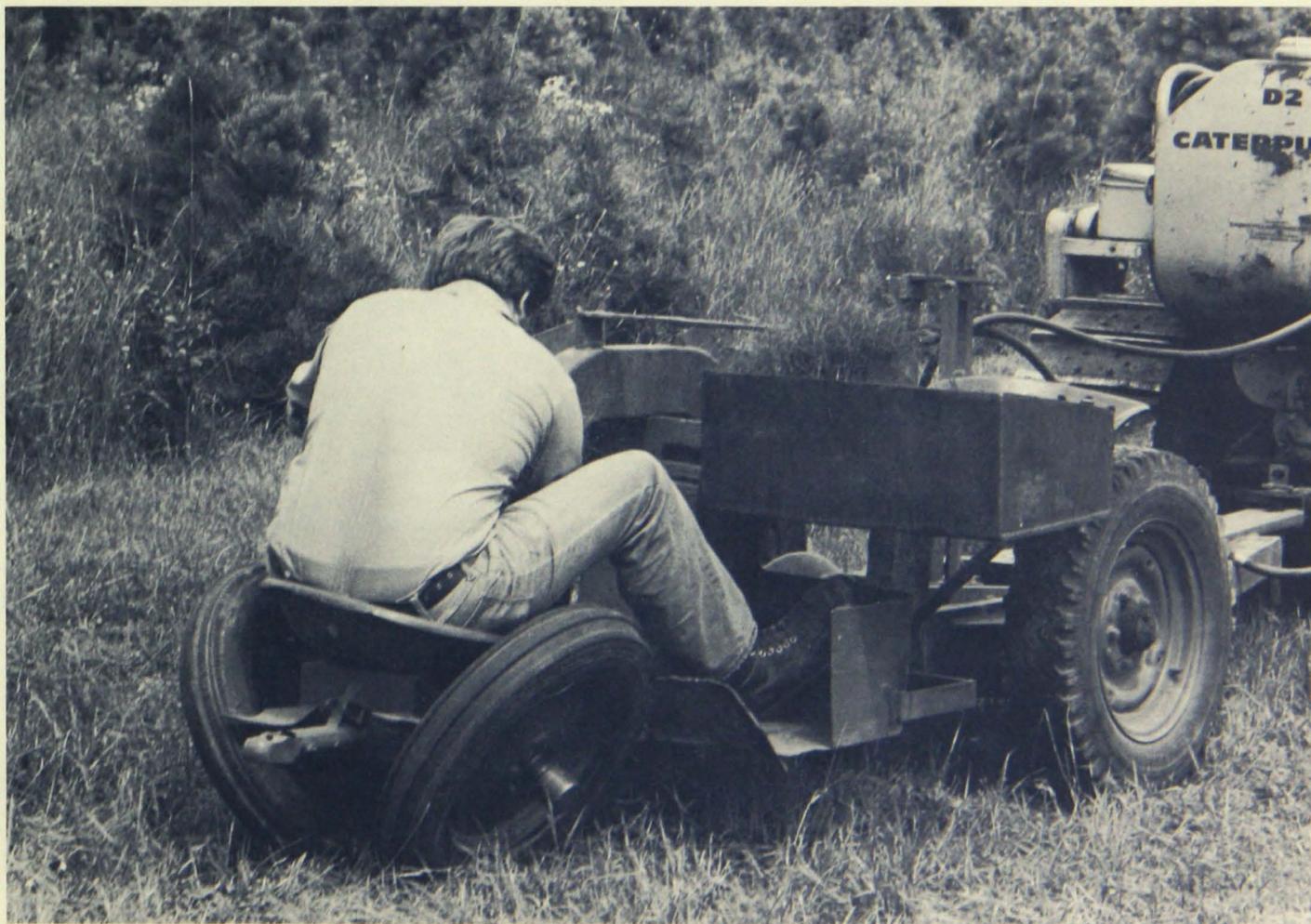
There are many kinds of tree-planting machines—light, medium, and heavy—made to suit planting conditions and terrain. Many are pulled by an ordinary farm tractor having a 3-point hydraulic hitch which regulates planting depth. Some machines operate independently of the tractor hydraulic system; depth of planting is controlled by mechanical devices on the tree planter itself.

Tree planters differ somewhat in detail, but they all contain these main features:

1. Coulters to cut sod, small roots, and ride the machine over hidden rocks.
2. Trencher to open a slot in which trees may be inserted.
3. Packing wheels to close and pack firmly the slot in which the trees are set.

With a mechanical planter (figure 13), you can plant trees more rapidly, uniformly, and with less effort than with other methods—as many as 1,000 trees per hour, varying with length of rows, terrain, and type of plant-

Figure 13. Planting with a mechanical tree planter.



ing stock. Spacing of trees during the planting operation is accomplished partly by adjusting tractor speed and also by the men on the planter who time their motions to the rate of travel.

Tubs or other receptacles to hold trees are part of the tree planter equipment. Place water and some packing material in these tubs to keep roots from drying.

## Cuttings

Cuttings are pieces of branchwood taken from healthy trees, especially poplars, willows, and cottonwoods. Properly cut and planted, stem cuttings will take root and grow into trees. Cuttings may be made when trees are dormant either in early spring (before March 15) or in the fall and kept in moist sand in a cool place over winter.

Cuttings 12 to 16 inches long and one-fourth to one-half inch in diameter establish themselves readily. Make cuttings from the young (1- or 2-year-old) wood and well-developed portions of healthy tree branches.

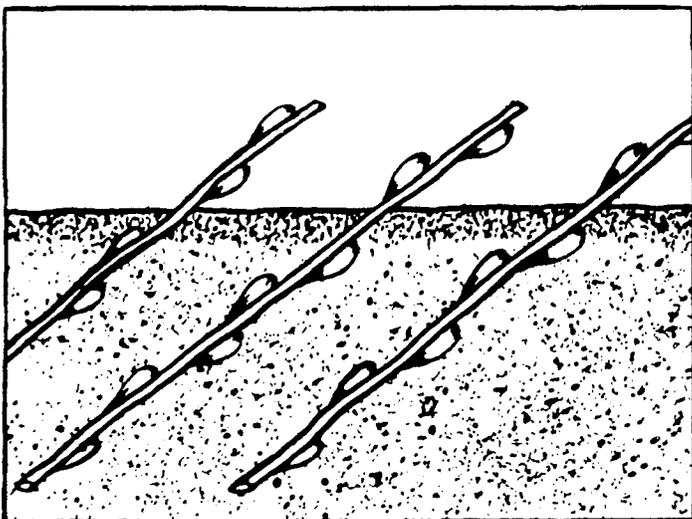
To plant cuttings:

1. Soak cuttings in water for at least 24 hours before planting.
2. Make a slit with a spade or machine and carefully insert the cutting. Do not push cuttings into the soil. This practice breaks off buds, damages bark, and peels it back, killing the cambium layer beneath.

Another method is to plow a furrow, lay the cutting in the furrow, and plow the earth back on the cutting to the proper depth. Tamp the earth on the low end to force it into close contact with the future root system.

3. Plant cuttings at an angle of 45° to 60°, but placed so that the buds point upward. Leave only two good buds above ground (figure 14). This process is essential for establishing a strong, well-developed root system and good top growth.

Figure 14. Planting at a 45° angle brings soil in close contact with cuttings.



Planting cuttings in a slanting position keeps them in close contact with the soil, even after the ground settles slightly. If cuttings are planted straight up, the soil often settles away from them in dry periods (figure 15).

After planting, tamp the soil firmly around the low end. Properly planted cuttings grow 2 to 4 feet in 1 favorable year if kept free of weeds or grass. Rooted cuttings give better results than nonrooted cuttings.

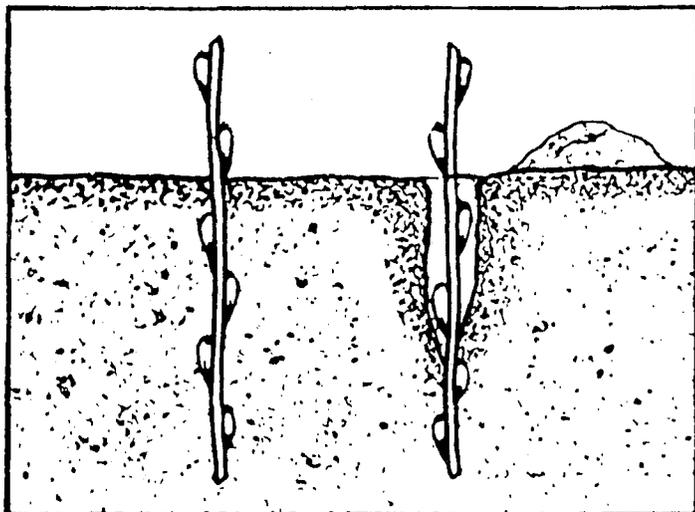


Figure 15. If cuttings are planted vertically, the ground settles away from them.

## Renew Old Groves

Old farm groves established many years ago without much thought to arrangement or good planning have now lost most of their usefulness and protective effectiveness. Over crowding from close spacing, old age, disease, insects, storms, grazing livestock, and general neglect have taken their toll.

Renew or strengthen sparse or open groves by adding new rows or trees and shrubs on the inside or outside as space permits. If there isn't enough space between the present grove and the house, cut down one or more rows on the inside of the old grove. Then replant with trees recommended.

Many farm groves have openings due to tree losses. Dust and snowstorms then "funnel through," as through a broken window or an open door in a house. Shut this opening with tree replacements.

## Insects, Diseases, and Rodents

Watch for symptoms of insects and diseases and injury caused by field mice, pocket gophers, and rabbits. If ignored, these factors can cause serious injury and loss of trees.

Insect and disease control depend on early discovery and recognition. For help in diagnosing tree problems, consult your county extension director, SWCD, or local state forester.

Rabbits girdle trees, chew off tops, and clip side branches of hardwoods and conifers. Watch for rabbit damage every year. Rabbits are most active in late fall, winter, and early spring when other foods are less available. Improved rabbit repellents give effective control, but good results are also obtained by "boy, dog, and gun."

Field mice also damage and girdle trees. Trash, dead grass, and high weeds invite rodents to set up housekeeping. Keep the planted area weed free. Scattering poisoned grain in the planted area is effective—if poultry or wild birds do not have access to the area.

Pocket gophers may kill well established hardwoods and conifers. Losses are especially high in spring and fall when they gnaw off the roots. Above-ground symptoms are dried, pale-green foliage and trees leaning to one side. The tree is easily pulled out because the roots are gone. For suggestions on protecting trees from animal damage see *Controlling Pocket Gophers*, Fish and Wildlife Leaflet 307 and *Protecting Trees and Shrubs From Animal Damage*, Forestry Fact Sheet 8.

These are available at local county extension offices, the Department of Entomology, Fisheries, and Wildlife, and the College of Forestry, University of Minnesota, St. Paul, Minnesota 55108.



Figure 16. Rodent damage can be serious. Pocket gophers killed this healthy young evergreen by gnawing off the roots below the ground.

## Care After Planting

### CULTIVATION

Frequent and timely cultivation during the growing season is just as necessary in the newly established shelterbelt as in growing any row crop. Trees, as well as row crops, simply cannot compete with weeds and grasses. A duckfoot cultivator is one of the best tools for cultivating a young planting. A section of a spring-tooth harrow or a tandem disk will also do a good job, but extra care should be taken so that small trees are not covered with soil.

Cultivation should be shallow and not too close to the trees to prevent damage to small feeder roots. These roots grow just below the soil surface and most of them are concentrated within an area covered by the lower (longest) branches. So, a good rule-of-thumb to follow is: do not cultivate under any part of the lower branches.

Do not "hill up" soil around the trees, especially around conifers. This will fill in the "catch basins" which were constructed around the trees at planting time to catch rain.

Cultivation should be continued periodically to keep weeds under control. The number and frequency of cultivations depends on the amount and frequency of rainfall. The last cultivation, in late summer or early fall, should be timed so that weeds will be well under control. In no case should the weeds be allowed "to go to seed" before winter begins.

Farmstead shelterbelts are usually planted on good agricultural soil. The wide strips between the tree rows are not producing anything while the trees are young. These strips could be made productive for several years by planting to vegetable gardens, including sweet corn. The strips for gardening will become narrower each year as the trees take up more and more space. Cultivating vegetable gardens will also serve as a weed control for the trees. Obviously all the land between the tree rows would exceed most needs for a vegetable garden. However, some of it could be planted to sunflowers or field corn. Part of the crop could be harvested and part could be left for wildlife.

### MULCHING

Mulching to control weeds and grasses was not recommended in the past because it was believed that the mulch material would provide a habitat for rodents, especially mice and that the rodents would feed on the bark and girdle the trees. However, new information indicates that mouse damage is related more to population levels and the presence of a dense cover of weeds and grass rather than whether young trees are mulched.

Mulching will benefit the total planting during the establishment period. The practice is particularly useful for conifer species because their slower growth makes them more susceptible to weed competition. Mulch tends to increase survival and growth rate, es-

pecially during dry seasons, because mulch prevents the soil from drying out. Additional watering is not necessary as long as the soil under the mulch is moist.

There are various materials that can be used as mulch, such as: leaves, grass clippings, hay, straw, cobs, sawdust, wood shavings, and wood chips. Leaves, grass clippings, hay, or straw have to be applied annually because of their rapid decay. Hay or straw may introduce weed seeds. Sawdust tends to dry out. Cobs, especially ground cobs, make excellent mulch and will last for 2 or 3 years. Wood shavings or a mixture of shavings and sawdust is also an excellent mulch (preferred to wood chips) and will last several years longer than cobs.

Since decay organisms use nitrogen in the decay process, it is advisable to apply a little nitrogen around the trees, especially when wood materials are used. Although mulch tends to keep weed competition down it is good insurance to apply a pre-emergent chemical herbicide before applying the mulch. A good practice would be to apply a band of herbicide along the entire tree rows before mulching. The band should be wide enough so that the mulch is well within the treated strip. When cultivating, the operator should keep the

cultivator several inches from the mulch. If weeds are allowed to grow right up to the edge of the mulch, there would be a tendency to cultivate close to the mulch; after several cultivations most of the mulch would eventually be scattered all over the shelterbelt area and defeat the purpose of the mulch.

As mentioned before under "planting," a saucer-shaped "catch basin for rain" should surround the tree after planting is completed. Mulch should be applied in the same manner. Completely cover this basin with mulch and extend a few inches beyond, then rake the mulch a few inches back from around the trunk (figure 17) to discourage mice that might be present from gnawing on the bark. A rule-of-thumb: mulch should extend at least 6 inches beyond the ends of the lower branches. Mulch depth should be about 3-6 inches. This would take about 1 bushel for a small seedling—larger trees would require more mulch. Mulching should be repeated when necessary for about the first 6 years after planting or until the lower branches shade the soil enough to prevent the soil underneath the branches from drying out.

Applications of well rotted barnyard manure can be beneficial to young trees—not only from the fertility

**Figure 17.** A generous mixture of sawdust and woodshavings used to mulch a young ponderosa pine. A generous application of mulch will conserve more moisture. Note mulch was raked back a few inches from the main stem of the tree to discourage mice.



standpoint but also for loosening heavy, compact, hard-to-work soils. Do not use fresh manure: the ammonia injures tender roots.

## CHEMICAL WEED CONTROL

Chemical herbicides provide an effective measure for controlling weeds and grasses in windbreaks and shelterbelts and relieve the farm operator of time-consuming mechanical cultivation.

Caution: Always read the container labels for full directions on how to use the chemical product.

Simazine is a pre-emergent weed killer that controls most grasses and broad-leaved weeds. Apply it before weeds emerge. It is safe to use around most tree and shrub species planted in shelterbelts and windbreaks. Avoid using it around honeysuckle, poplar, cottonwood, and willow.

In established plantings, apply simazine in late fall or early spring for maintenance weed control. In new plantings on clean-tilled ground, make applications during or after the trees are planted and before weeds emerge.

Casaron is also a pre-emergent type of weedicide. Whereas simazine may be applied in either spring or fall, casaron works best when applied in the fall. The granular form is recommended. When casaron is applied after frost and freezing temperatures have occurred, no soil incorporation is necessary.

Where you intend to cultivate between tree rows, economical weed control can be obtained by applying simazine or casaron in a 4-foot band over the tree row. If you treat narrower bands, tall weeds will fall across the treated strip and cover the trees.

Amizine is a combination of a post-emergent herbicide and simazine. This combination is particularly effective in cleaning up shelterbelts that are overgrown with weeds and grasses.

Apply amizine on growing weeds in the early part of the growing season or before weeds have matured and gone to seed. DO NOT spray amizine on any tree foliage. Use a directed spray to prevent contact with the leaves and needles of your windbreak or shelterbelt trees.

The usual method of applying amizine is to make band applications between tree rows. You can apply it with a boom spray with nozzles 4-6 inches above-ground designed to cover a 4-foot swath up to the base of the trees. Use a low-pressure cone-shaped coarse spray directed away from tree foliage.

For additional information on chemical weed control, see *Chemical Weed Control in Shelterbelts and Forest Plantations*, Forestry Fact Sheet 13. It is available at your county extension office or the College of Forestry, University of Minnesota, St. Paul, MN 55108.

## SUNSCALD

New plantings of small conifers are sometimes injured by severe sunscald or hot, searing, dry winds. Young trees can be protected by placing a shingle or board 1 foot or more from these small trees on the

south or west side to provide shade during the hot summer months. Another method is to plant tall row crops such as corn or sunflowers on the west side of conifer rows in the west belt and on the south side of conifer rows in the north belt. When harvesting the corn or sunflowers, part of the crop could be left for wildlife. It would be advisable to harvest the crops by hand so that the stalks remain standing. These stalks will serve as winter protection for the young trees and help catch snow that might otherwise blow into the farmstead area. The snow will provide added moisture for the trees when they begin growing in the spring.

## WATER WHEN NECESSARY

Watering may be necessary, especially during droughts. When watering, give the trees a good soaking once or twice a week. Frequent light watering may encourage rooting near the surface.

Keeping topsoil loose by shallow surface cultivation prevents soil cracking and reduces moisture losses from evaporation.

## DO NOT PRUNE

Don't be eager to prune young shelterbelt trees for aesthetic reasons. Density of leaf surface and the number of stems in the grove are factors in wind protection efficiency. The denser the planting, the better the protection. Remember, you want a tight storm barrier. Pruning trees makes a sieve for the snow and wind to filter through. Severe pruning lets light in on the ground which encourages a growth of grasses and weeds, allowing surface soil to dry out.

A valid reason for pruning is to correct growth deformities or to remove damaged limbs or limbs that may interfere with other trees. For example, a tree may send up more than one leader. Select the best terminal and cut back the rest.

If trees become crowded, thin out individual trees. Pruning and thinning are tasks to be considered only after a number of years when health, efficiency, and growth are established.

## WILDLIFE CONSIDERATIONS

In recent years, with increasing demands on the farmer to produce more food, practically every square foot of productive land is planted to crops. Some of this land is used to provide food and cover for wildlife. As a result, our wildlife species have to travel longer and farther in search of food and shelter.

Shelterbelts will provide good shelter but little food for wildlife, unless the belt includes wildlife food-producing shrub and tree species. So, by planting a shelterbelt, the farmer can return some of the shelter he has taken away from wildlife. He can also return some of the food by planting such crops as corn, sunflowers, or sorghum between the tree rows as long as the trees do not require all the space. These crops, if not planted too close to the trees will not compete for soil moisture and nutrients and will provide summer and winter protection for young trees.

Figure 18. Spring harvest of corn left overwinter for wildlife food and cover—University of Minnesota Agricultural Experiment Station, Waseca.



Farmers can also encourage the return of wildlife, especially pheasants, by planting several rows (at least 6) of a game food-plant such as corn (figure 18) or sorghum adjacent to their shelter-belts and leave them over winter. If the land adjacent to the shelterbelts is in corn, they might leave several rows (unpicked) over winter.

## Conclusions

- A good farmstead shelterbelt contributes to your home's comfort, your farm's value, home beautification, livestock feed savings, wildlife habitat, and the protection of orchards and gardens. It provides a living, growing "overcoat" around the home in winter.
- Proper site preparation before planting assures good survival and sustained growth.
- Arrangement of a shelterbelt in relation to prevailing stormwinds is of utmost importance. Usually, it should be located on the north and west sides of the farmstead.
- Selecting trees and shrubs of proven hardiness and suited to the soil, climate, and purpose is always essential.
- Proper spacing of trees within and between rows helps provide early benefits and long windbreak life.
- Regular cultivation of trees combined with application of herbicides during the growing season to eliminate weeds and grasses and to conserve moisture is a "must."

- Mulching trees conserves moisture and increases survival and growth.
- Protection of your windbreak from livestock, rabbits, and other rodents is necessary.
- Early recognition of insect and disease damage, with proper steps taken for control, pays dividends.
- Renovation of deteriorating, overage groves is a growing need on many Minnesota farms.
- While the trees are becoming established, the land between rows could be utilized for vegetable gardens and row crops for wildlife food.

## If You Are Building .....

If you are considering rearranging buildings on your farm, plan your shelterbelt at the same time. You should have your planting plans and soil prepared the summer before actual spring tree-planting time.

Consider the best location for new buildings in relation to the following: drainage, prevailing winds, and soil factors; grouping in relation to other permanent buildings; and field arrangement, feedlots, pastures, gardens, orchards, or a future outdoor recreation area.

Your plantings should aim at protecting the whole farmstead and not just parts of it. Buildings located too close to main highways or other roads, or poorly located in relation to other buildings, reduce opportunities for designing a fully effective shelterbelt.

Plant trees even before you build; it takes longer to grow trees than to put up buildings.