

PLANTING

THE FARMSTEAD SHELTERBELT



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UNIVERSITY OF MINNESOTA

AGRICULTURAL EXTENSION SERVICE

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A GOOD FARMSTEAD SHELTERBELT WILL—

- Reduce the effects of the cold, piercing winter winds on both humans and animals.
- Moderate the effects of hot, dry, searing summer winds.
- Beautify the home and farmstead, making it a more attractive place to live.
- Keep snow from drifting around buildings, roads, and walks.
- Save fuel. A good shelterbelt can save up to 30 percent in fuel in many areas.
- Cut down on feed costs. Cattle protected against the cold winter winds will use feed for growth and not merely to keep warm. Livestock feeders in Nebraska and South Dakota have estimated that a good shelterbelt saves them \$800 in feed during the year, and dairy-men in the same area place their savings in feed at \$600 per year.
- Protect feed lots, garden, and orchard.

Planting the Farmstead Shelterbelt

Parker Anderson and Marvin Smith

A GOOD SHELTERBELT will not only add to the comfort and enjoyment of your farm home and farmstead but will also add thousands of dollars to the value of your farm. A barren, exposed farmstead has little to offer in comfortable living and family pride. On the other hand, a well-planned shelterbelt protects livestock, provides good conditions for successful orchards and gardens, and often makes possible a family picnic area.

This bulletin tells what factors you should consider in establishing a new shelterbelt or in renovating your old shelterbelt. It tells how you can plan, plant, and establish this valuable asset on your own farm. The information in this bulletin is based on experience obtained in establishing shelterbelts in Agricultural Extension Service work since 1926, and on the results of research and trials in Minnesota and other states.

LOCATION OF THE SHELTERBELT

Basic Layout

For greatest protection from prevailing north and northwest winds, plant the shelterbelt on the north and west side of your farmstead. For the average Minnesota farm, the shelterbelt should:

- Run 400 feet on both the north and west sides of the farmstead. It is seldom necessary to plant trees on more than two sides when you have a good, solid, mixed, planted grove.
- Not be closer to the house and barn than 100 feet (figure 1). Trees within 50 or 60 feet of the house (which is common with old pioneer groves) change air circulation movements and encourage the snow to pile up around buildings and drives. At the same time the 100-foot distance will give you room for garden, orchards, sheltered feed lots, and even picnic areas.
- Extend south and east at least 50 feet—preferably 100 feet—past the last main building. This will avoid the winds whipping around the ends of the protective grove. (Figure 1.)

- Be at least 90 feet deep and consist of at least 8 rows of trees in the main belt. In very exposed areas, a *snow catch* of hardy, tall shrubs should be placed 40 to 60 feet beyond the main belt (figure 3).

Where the south wind is a problem, the west arm of the shelterbelt can make a right angle (or curving turn) in for about 100 feet to protect against storms coming from that direction.

Never surround your farmstead with trees on all four sides. This creates a "dead air pocket" in the center. As a result, in winter the trees will deflect the snow upward and then drop it right in the farm yard. Trees on all four sides can also make hot summer months unbearable, by blocking air circulation.

A shelterbelt will give good protection for a distance of six times the height of its trees. This means that most of the farmstead lying within 300 to 400 feet of the shelterbelt is protected.

Often highways or other land problems will prevent you from following the suggested standard plans. You may have to eliminate some tree rows or make other adjustments. Often, however, you can establish a complete planting on one side and then make the

best possible adjustment for the other side of the farmstead.

Spacing

Spacing is important. The rows of trees are spaced 10 to 16 feet apart, and the trees planted 8 feet apart in the rows. Such spacing maintains good

growth without too much competition and allows orderly growth form. The spacing between rows also means that regular farm machinery can be used for cultivation.

Best results are assured by planting eight to ten rows of trees, using mixed species. Plant fast growers for quick results, long-lived trees for perma-

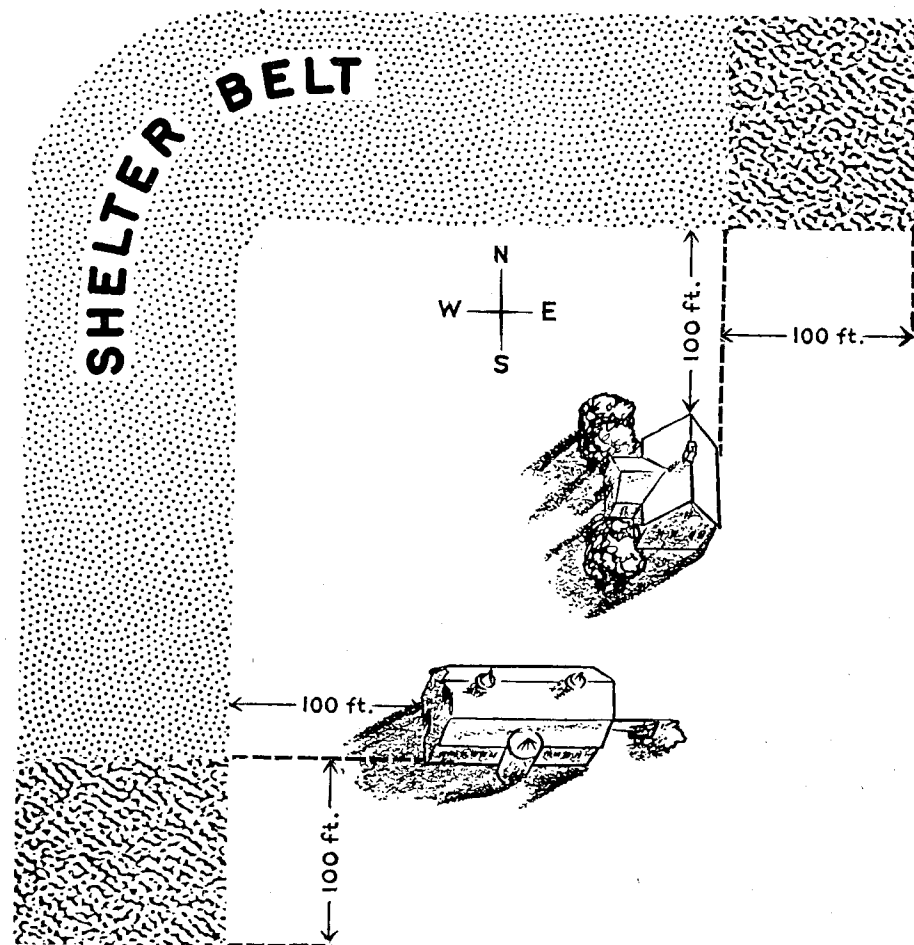


Fig. 1. Basic layout of the shelterbelt. It shields the farmsteads on the north and west, the directions from which most of Minnesota's storm winds come. The inner row of trees should be at least 100 feet from farm buildings and the home. As indicated here by the darker areas, the plantings should extend 100 feet beyond the limits of the buildings for protection against winds whipping around the southern and eastern ends of the shelterbelt. The plan for a particular farm will vary according to how exposed the area is (see Figs. 3 and 4) and the space available.

nancy, and conifers for 100 percent protection (for 12 months of a year). Such mixed plantings also give color to the farmstead and beautify the landscape. Furthermore, as a result of these mixtures, a small forest condition is created, again favoring more desirable growing conditions.

Wind blowing across the land travels in about the same manner as water flows over the land. The direction of either can be changed by high and low land or certain obstructions that deflect the flow. Dams built to slow up, retain, or retard water are designed so as to have 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. (See figure 2.)

LAND PREPARATION

Scarcely anything will assure better survival or faster growth when establishing a shelterbelt 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 corn or potatoes, the year before planting will assure a good, clean, pulverized soil. The soil will then hold moisture well and be free of weeds and quackgrass.

Soddy Land

Do not plant trees on soddy ground or in an alfalfa field, without first plowing well and working down for two years before setting out trees. This is especially necessary on heavy soil where moisture is not always sufficient during the growing season.

Plow just deeply enough to turn the sod, then disk thoroughly to cut it into small pieces. Do so the summer before actual planting. Then plow deeper, following with a disk and spring-tooth

harrow during the summer to keep down grass and weeds. Finally, let the area lie rough over the winter so as 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.

On well-prepared land, hardwood trees grow amazingly fast and begin to pay off in five or six years. By then the evergreens will have developed to where they are growing from 8 to 12 inches per year or more.

Such preparation "pays off." Areas where wind or water erosion of light, sandy soils is apt to be a problem are exceptions to that rule, however.

Other Preparation

Even before planting, fence out cattle, sheep, hogs, and chickens. Those animals will bruise, trample, or break trees and dig up roots. And the chickens will peck off new growth and needles, and scoop out holes at the base of trees to dust themselves. When the trees get taller, the chickens will roost in them, plastering the stems and branches with droppings which can kill the tree.

When fencing, allow about 12 feet between the fence and the trees. This prevents cattle from reaching through to nibble at the trees. It also allows room for permanent cultivation, and protects the trees from debris or grass fires.

WHAT TO PLANT

Choose trees of proven hardiness in your locality. Select them according to your planting objectives, your soil, and your climatic conditions. You can check on how well certain trees will do by comparing them with others of the same kind that have grown successfully in your neighborhood. Some suggestions and recommendations are given on pages 10-12.

SOURCES OF STOCK

Planting stock for shelterbelt, forest crop, and wildlife purposes is available from nurseries operated by the Minnesota State Department of Conservation. The Division of Forestry provides forest planting stock in lots of 500 seedlings or more for general forestry purposes, including shelterbelts and field windbreaks.

A second public source of planting material is the Bureau of Wildlife Development. The bureau distributes trees and shrubs in western Minnesota to landowners who agree to plant them for wildlife food and cover. Shelterbelts are considered very beneficial to upland game birds, especially to the ringneck pheasant.

You may find that tree species of certain age classes, especially the conifers, are more difficult to obtain. Many shrubs recommended for use in the shelterbelt are not now available through public agencies.

There are, however, many reliable commercial nurseries throughout the state which can and do supply excellent planting stock. They can furnish trees and some shrub varieties that public nurseries do not or cannot supply.

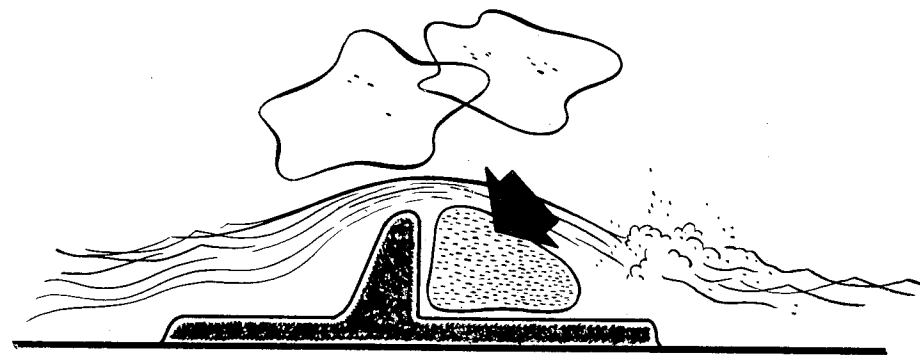


Fig. 2. A shelterbelt is designed to "spill" the storm winds far over the farmstead, the same way that a dam deflects the flow of water. The shorter shrubs and trees on the outside serve to force the main current of the wind upward, to clear the crest formed by the taller trees on the inside (see Fig. 6). Since the winds continue at that height for some distance, the farmstead lies in the sheltered area (arrow) below the "dam."

Buying Tips

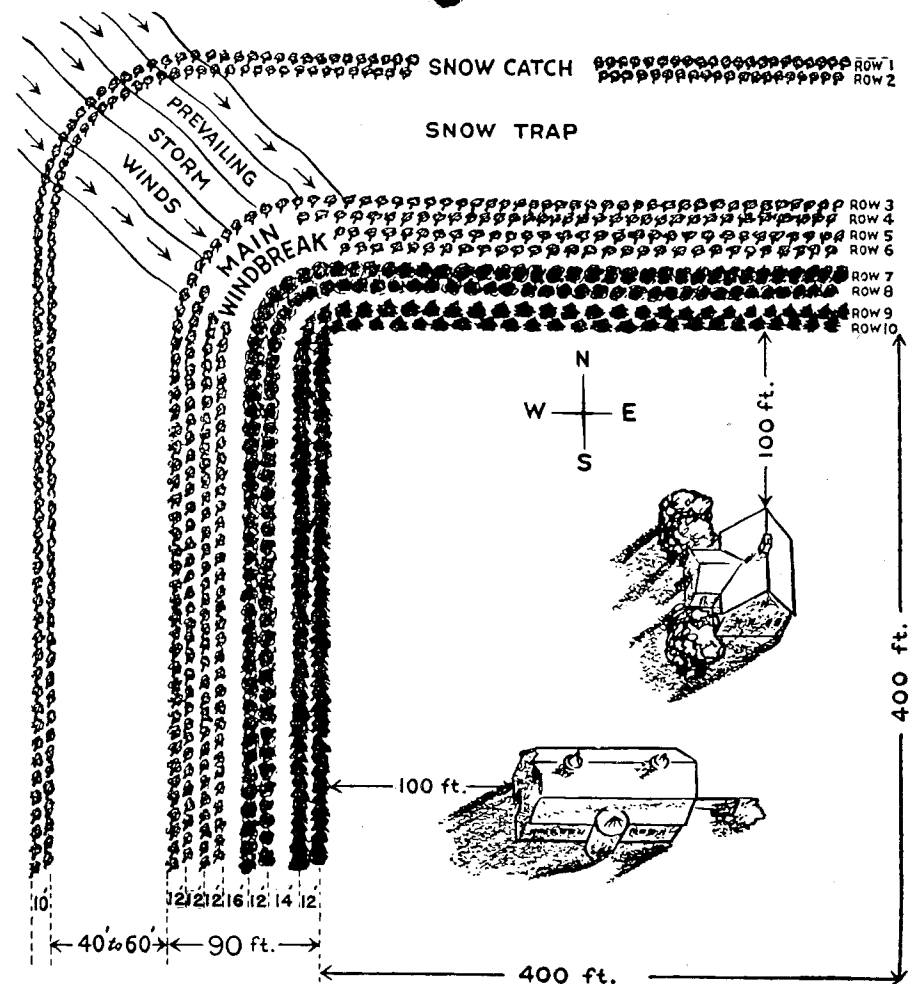
Purchase trees from reliable sources, as close to your home as possible. Such stock is better acclimated, is more suited to your soil, can be quickly delivered early in the spring, and costs less to ship.

Order enough, at least 10 percent more than is required for your planting program. You can then cull out the poor, scrawny, or damaged trees. These "culls" can be lined out in the garden, cared for, and later used as replacements when some trees fail.

Order early, in the fall or early winter, before December. This assures delivery of what you want in the early spring.

SHELTERBELT PLANS

This bulletin offers two shelterbelt plans—one for very open windswept areas and the other for less storm-exposed areas. The first is presented in detail (figure 3). The second, shown by the drawing, is a variation of the first (figure 4).



PLAN 1—OPEN, EXPOSED, WINDSWEPT AREAS

- Rows 1 and 2 (the "Snow Catch"). Common lilac, honeysuckle, Amur maple, Caragana, Russian olive, buffalo berry, low willows, wild plum, chokecherry, or pincherry. (Leave 10 feet between rows; space shrubs 2 to 3 feet apart within the rows.)
- Rows 3 and 5. Cottonwood, Canadian poplar, Northwest poplar, Norway poplar, Populus robusta, tall willows, silver maple, or boxelder. (Space trees 8 feet apart within the rows.)
- Rows 4 and 6. Green ash, elm, Harbin elm, hackberry, or silver maple. Also, in southeastern and south central Minnesota, walnut or butternut. (Space trees 8 feet apart within the rows.)
- Rows 7 and 8. Red pine, jack pine, Western yellow pine, Scotch pine, or white pine. (Space trees 8 feet apart within the rows.)
- Rows 9 and 10. Colorado spruce, Black Hills spruce, or white spruce. Also, in southeastern Minnesota, Norway spruce. Juniper ("red cedar") can be used if not in an apple-growing area. (Space trees 8 feet apart within the rows. A fence 10 to 12 feet inside of Row 10 will help protect new plantings from livestock.)

Fig. 3. Planting plan for storm-exposed areas. Tree rows can be spaced 10-16 feet apart for tractor cultivation, which ever distance is most convenient for use of farm power equipment. For the species best suited to your area, see Extension Folder 85, "Tips on Tree Planting."

Plan No. 1—Open, Exposed, Windswept Areas

The shelterbelt consists of a *snow catch*, a *snow trap*, and the *main shelterbelt*. (See figure 3.)

The *snow catch* consists of two rows of low trees or tall shrubs to catch or retard the snow, causing it to pile up in the snow trap area located between it and the main shelterbelt. Without a snow catch and snow trap, snow will pile up in the main grove, often breaking limbs of taller trees or breaking down young growing trees.

Plant rows 1 and 2 of the shelterbelt (the snow catch) to low-growing shrubs which grow 6 to 8 feet high (figure 3). After these shrubs are well established, trim them back to one third of their height the second year.

Later trim them back again to one third of their height every second or third year. This encourages them to become more dense. Plant shrubs in the snow catch 2 to 3 feet apart in the rows, and plant the rows 10 feet apart. The rows may be spaced even further apart to allow cultivation with farm power equipment.

The *snow trap* piles back the drifts in direct proportion to the height and density of the shrubs or trees in the snow catch. This varies from 5 to 15 times their height, depending upon the density of planting, species used, and storm conditions. A 60-foot space as a snow trap will give the best results. In summer this open snow trap area may be used for alfalfa, sweet clover, potatoes, corn, or a long farm garden. Present power equipment makes long gardens easy to cultivate without hand labor.

The *main shelterbelt* requires an area approximately 90 feet wide to provide room for eight rows of trees. This main belt consists of two rows of fast-growing broadleaved trees, usually short-lived species; two rows of long-lived, broadleaved trees; and four rows of hardy conifers, such as pine and spruce.

This combination insures the best year-round protection. The fast-growing trees not only give early protection but also serve as a "nurse crop" for the longer-lived, more permanent trees. These fast-growing varieties may be removed later as the better, long-lived trees begin to need more growing space.

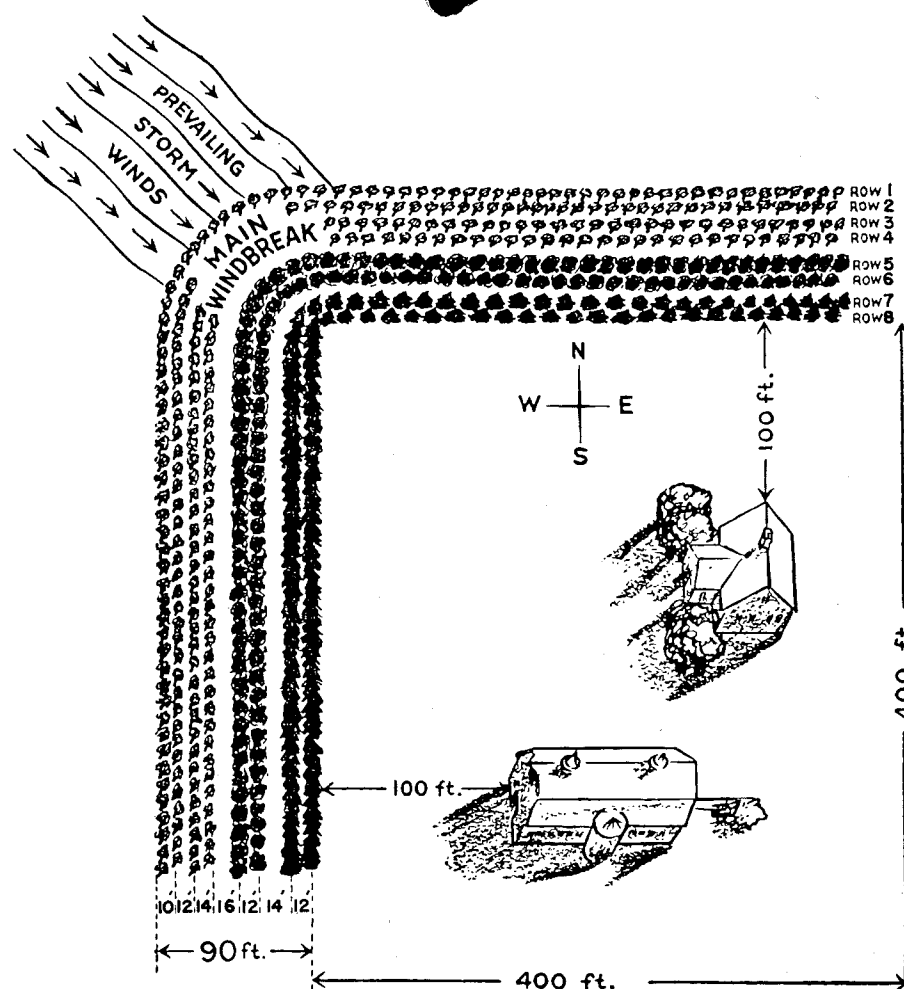
Rows 3 and 5 usually consist of fast-growing trees such as cottonwood; the fast-growing poplar hybrids such as Norway poplar, northwest poplar, Canadian poplar, and *Populus robusta*; the hardy, tall willows; boxelders; or Siberian elm (Dropmore or Harbin strain). Plant these trees 8 feet apart in rows, spacing the rows 10 to 16 feet apart. When possible, alternate or stagger all trees to check the wind penetration (figure 5).

Rows 4 and 6 should consist of the more permanent, long-lived trees—such as green ash, common hackberry, American elm, and silver maple. In south central and southeastern Minnesota, walnut, butternut, and hard maple may also be used. Long-lived species not only make a more permanent shelterbelt but also provide repair materials, fence posts, fuel, and even lumber for home use and later market use. Trees in rows 4 and 6 should be spaced 8 feet apart in the rows. Plant the rows 10 to 16 feet apart.

When rows 4 and 6 begin to be crowded by the fast-growing trees (rows 3 and 5), and are able to furnish the protection required, rows 3 and 5 may be cut out and used or sold. This will leave a growing space of 20 to 24 feet between rows 4 and 6.

Leave a space of 16 feet between the last row of hardwood trees (in row 6) and the first row of pine (row 7). When hardwoods grow too close to the pines, they are apt to overshadow or overtop them, hindering development. This may deform or kill the pines, leaving open spaces in the rows.

Rows 7 and 8 should consist of hardy pines—such as red pine, western yellow pine, jack pine, or Scotch pine, depend-



PLAN II—LESS EXPOSED AREAS

- Rows 1 and 2. Tartarian honeysuckle, common lilac, Amur maple, Caragana, Russian olive, buffalo berry, low willows, or service berry. (Leave 8 to 10 feet between rows, space shrubs 2 to 3 feet apart within the rows.)
- Rows 3 and 4. Cottonwood, Canadian poplar, Northwest poplar, Norway poplar, *Populus robusta*, tall willows, silver maple, or boxelder. (Leave 12 to 14 feet between rows, space trees 8 feet apart within the rows.)
- Rows 5 and 6. Red pine ("Norway pine"), western yellow pine, Scotch pine, jack pine, or white pine. (Space trees 8 feet apart within the rows.)
- Rows 7 and 8. White spruce, Black Hills spruce, or Colorado spruce. Juniper ("red cedar") can be used if not in apple-growing area. (Space trees 8 feet apart within the rows. A fence 10 to 12 feet inside of Row 8 will help protect new plantings from livestock.)

Fig. 4. Planting plan for areas less exposed to storms, where the "snow catch" and "snow trap" are not needed. (See note under Fig. 2 on spacing for tractor cultivation and selecting species for your area.)

ing upon soil and climatic conditions. These species have been named in the order of general preference depending on the region of the state. Space pine trees 8 feet apart in the rows, and the rows 10 to 16 feet apart. Again these trees should also be alternated or staggered in planting (figure 5).

Leave a 14-foot space between the last row of pine and the first row of spruce. If too close, the spruce are likely to be suppressed by the faster-growing pine. Space the trees in rows 9 and 10—consisting of white spruce, Colorado spruce, Black Hills spruce, or red cedar (juniper)—8 feet apart in the rows. Space the rows 10 to 16 feet apart. Such spacing assures an impenetrable wind and snow barrier in the shortest time possible.

Spruce have dense foliage and maintain their limbs close to the ground for most of their life. This growth characteristic prevents dust and snow storms from filtering through the tree belt. Spruce are, therefore, the best species for the inner two rows. Locating the spruce on the inside where they can be seen by the family is also one of the first steps in home beautification. Spruce and pine have foliage the year around, and, therefore, provide the greatest winter protection and summer beauty.

Plan No. 2—Less Exposed Areas

Where farmsteads are less exposed to open, windswept land, the snow catch and the snow trap can be eliminated. The first two rows, 1 and 2, are hardy shrub plantings that will act as primary storm barrier and wind deflectors. Rows 3 and 4 are hardy, fast-growing trees that will provide early results while the conifers develop. Two rows of pine, (5 and 6) follow on the inside. Rows 7 and 8 are spruce. Spacing the rows and distance between rows is explained in figure 4.

The close shelterbelt spacing of all trees, as these plans recommend, encourages early ground shading. That

helps in "killing off" competing weeds and vegetation. Close spacing gives better year-round protection against winds. Because of this dense spacing, too, the annual leaf litter forms a mulch

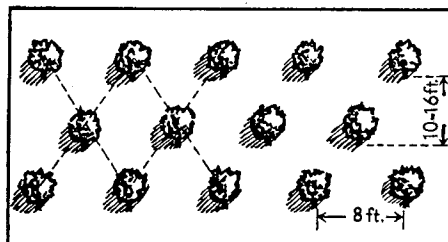


Fig. 5. Proper alignment of trees.

which helps retain soil moisture and discourages grass and other undergrowth. You may space tree rows wider apart if that makes cultivation by power equipment easier.

We suggest that the deciduous stock (hardwoods) be planted 3 to 4 years prior to planting the conifers. This assures better conifer establishment, because they are sheltered from drying winds and storm damage during their early growing stages.

SIZE OF PLANTING STOCK

HARDWOODS — Use two-year-old hardwood seedlings, 14 to 16 inches high. This size is easier to plant. They establish themselves quicker, have a good root system, and cost less.

Good *stock quality* is important to success of initial establishment, survival, and growth. The first growing season is the critical period in the establishment of plantings, so healthy, well-formed trees with a branchy, fibrous root system are very important.

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

sturdy stems. Such transplants are referred to by the term "2-2 stock." It means that the transplants are four years old, having been grown two years in seedbeds and two years in transplant rows. This 2-2 conifer planting stock is usually about 10 to 14 inches high.

Evergreen 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 much easier to handle in planting—whether by hand, plow, or tree planting machine.

Norway pine, Scotch pine, western yellow pine, the spruce, and cedar particularly should be 2-2 stock.

Don't judge trees by the top only. The important part to consider is the root system. Food and moisture requirements must come from the root system. Big tops and small roots spell losses.

can establish themselves easier. They have a full growing season ahead, and they can get a good start before weeds and grass become a problem. Fall planting of forest trees has never proved successful.

HANDLING TREES UPON ARRIVAL

1. Call for your trees at the express office as soon as they arrive.

2. Pour fresh water into the package immediately, before leaving town. Nearly all trees come with their roots packed in moist moss to prevent them from drying out while in transit. Do not leave trees in the wrapped package too long or they will dry out, heat, mildew, or otherwise become seriously damaged.

3. On arriving home, "heel-in" the trees in a trench—preferably in a cool, shady place. Make the trench deep enough and long enough to take the



Fig. 6. Profile of an established shelterbelt. Note how the plantings can create the "dam" effect described under Fig. 2.

CUTTINGS—For some species such as the poplar family (cottonwood and the various poplars), or willow, the planting of rooted cuttings gives excellent results. See page 16.

TIME TO PLANT

Spring is the best time to plant shelterbelt trees—just as soon as possible after the frost is out of the ground. Soil then is moist, the sun is mild, and trees

entire root system and a part of the lower stems, but narrow enough so you can straddle it easily.

Cut the ends and one side of the trench straight, the other side sloping. Place the trees in the trench side by side in thin layers, then thoroughly pack dirt around the roots. Soil removed from the trench can be used to pack around the roots. Trees may be left "heeled-in" for a week or so, if the job has been well done. (Figure 7.)

Planting

When removing the trees from the heeling-in trench for actual planting, take only as many as you can carry in a pail half-full of water, or that you can plant in an hour. Cover the roots of the remaining trees with dirt again.



Fig. 7. "Heeling-in" trees.

Never allow the tree roots to become dry. *Dry roots mean dead trees.*

Keep tree roots moist at all times, from the moment of arrival up to actual planting. During planting, handle each tree carefully so as not to skin the bark, break terminal buds, or injure the roots.

Before planting, "stake out" the rows. Line them up evenly and get the proper distance between them. *Number* the rows and label the stakes so you will know where each species should go.

You are now ready to plant by hand, with farm equipment, or with mechanical planters.

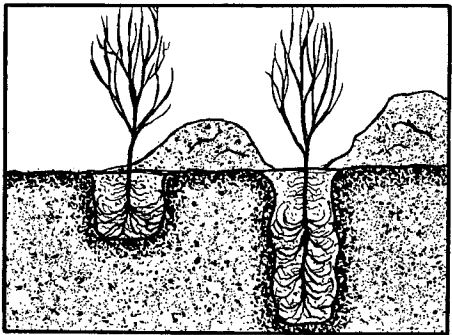


Fig. 8. (Left) Planting too shallow and too narrow. (Right) Too deep and too narrow.

Hand Planting

During planting, carry the small trees in a bucket half-filled with water. Take trees out one at a time, but not until the hole has been freshly made. Never allow evergreens particularly to become dry by being exposed to sun or wind, even for a few minutes. The delicate small rootlets of evergreens are easily injured or killed upon exposure to sun or wind. *Dry roots mean dead trees.*

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

The "hole method" of planting is recommended. Make the hole deep enough and wide enough to take the entire root system without crowding. (Figures 8-11.)



Fig 9. Tree planted at proper depth, with roots well spread and soil tamped down as the hole is filled in.

Hold the tree in a firm and upright position until you have tamped the soil firmly around the roots (figure 11). Packing the soil thoroughly is necessary to eliminate air spaces next to the roots. If this is not done, heavy losses may occur during spring or summer dry spells. In the case of shelterbelt planting, it is not necessary to pour water into the hole after or during the planting process, particularly if the hole has been freshly dug.

DEPTH—Plant your trees to the same depth they grew in the ground before being dug. You can tell this by looking for the "dirt ring." The part formerly in the ground will be darker than the upper stem which was above ground. If the ground is very loose, plant an inch or so deeper in order to allow for the settling of the dirt to the right depth.

Above all, do not plant the tree shallow. Do not "hill up" dirt around planted trees (figure 10).

After the tree is planted, the ground should be level or slightly depressed to serve as a small catch basin for rain (figure 11).

Plant each tree carefully and well.

Planting with Farm Equipment

Good planting can be done rapidly with a tractor pulling a two-bottom plow, if the ground is loose and in a mellow condition. The following is the usual procedure:

1. Stake out the rows where trees are to be planted in order to turn a reasonably straight furrow and assure a neat job.

2. Place a box on the plow beams to hold enough trees to plant each row or several rows.

3. Have the man doing the planting sit on a board placed across the plow beam, holding the trees and resting his

feet on the moldboards for support. He places the tree in the furrow made by the first plow and holds it there momentarily until the second plow covers the root system with soil.

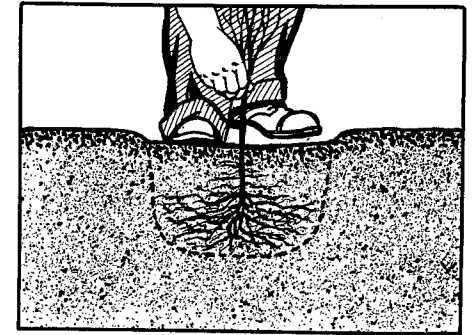


Fig. 11. A good planting.

Proper spacing of the trees in the row can be regulated by the speed of the tractor or the speed and ability of the man "setting in" the trees, who times his spacing at regular intervals.

4. After the trees have been "set in" have one or two men follow behind the plow, straightening up the trees and tamping the dirt firmly around the roots with their feet (figure 12).

Mechanical Tree Planters

Mechanical tree planters are now available in many counties for farm tree-planting programs. Availability of the planters varies with the counties. A considerable number were provided by the Minnesota Bankers' Association, which can usually be scheduled through the county Extension office. In some areas Soil Conservation districts, the Minnesota Forest Service, sportsmen's clubs, or forest industries have planters available.

There are many kinds of tree-planting machines—light, medium, and large—made to suit planting conditions and terrain. Many are pulled by an ordinary farm tractor, having a hydraulic lift attachment which regulates

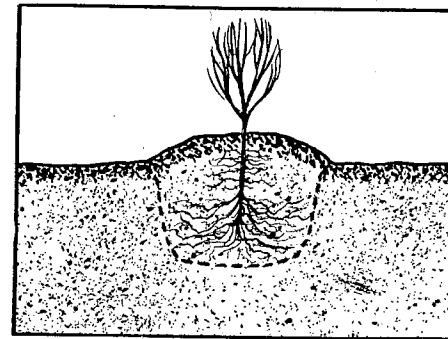


Fig. 10. Dirt hilled up too high.

planting depth. Some machines operate independently of the tractor hydraulic; depth of planting is controlled by mechanical devices on the tree planter itself.

Some planters have a sod-scalping attachment that turns back the sod before the slit is made for tree placement. This provides a sod-free area for trees to grow without sod competition for the first few years.

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

1. Coulter to cut sod and small roots.
2. Middle-buster type plow to scalp a shallow furrow. (Optional equipment.)
3. A trencher to open a slot in which trees may be inserted.
4. Packing wheels which close and pack firmly the slot in which the trees have been set.

The mechanical planter will plant trees more rapidly and uniformly and with less effort than other methods. Survival of machine-planted trees is

above average compared to other methods of planting.

A tree-planting machine will plant about 1,000 trees per hour depending upon length of rows, terrain, and type of planting stock. Spacing of trees during the planting operation is done by the planter or planters, who merely time themselves to tractor speed, setting the trees into the formed slit as the machine goes down the planting rows. (See figure 13.)

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

CUTTINGS

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

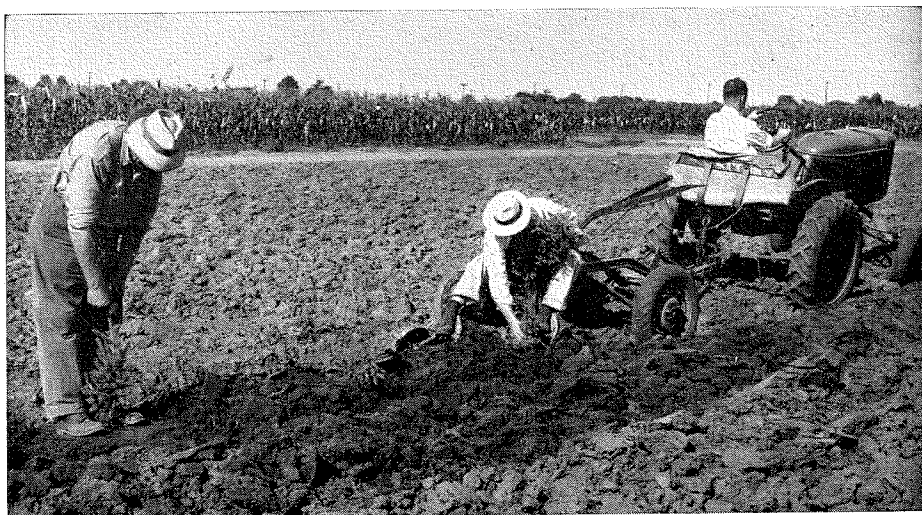


Fig. 12. Trees should be straightened by hand and soil tamped around the roots when planting with a tractor and a two-bottom plow.

Cuttings 12 to 16 inches long and $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter establish themselves readily. Make cuttings from the younger and better developed portions of healthy tree branches.

Planting Cuttings

1. Soak cuttings in water for at least 24 hours before planting.

2. Make a good opening with a spade or machine and carefully insert the cutting. Do not push the cuttings into the soil. That damages the bark and peels it back, killing the cambium layer just beneath the bark.

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. The earth on the lower end should be tamped to force it into close contact with the future root system.

3. Plant cuttings at an angle of 45 to 60 degrees, but placed so that the buds point upward. Leave only two good buds above the ground (figure 14). This is essential to establishing a stronger, more fibrous, root system with a good top growth.

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

After planting, the soil should be firmly tamped around the lower end.

Properly planted cuttings will grow 2 to 4 feet in one favorable year, if kept free of weeds or grass.

Rooted cuttings will give better results than freshly made cuttings.

RENEW OLD GROVES

Old farm groves established many years ago without proper arrangement or good planning have now lost their usefulness and protective effectiveness.

Old age, disease, insects, storms, grazing cattle, and general neglect have taken their toll.



Fig. 13. Planting with a mechanical tree planter. Survival of machine-planted trees is above the average of other methods.

Sparse or open groves can often be renewed and strengthened by adding new rows of the proper trees on the inside or outside, if space permits. If, however, there isn't enough space between the present grove and the house, it is sometimes a good idea to cut down a row or two on the inside of the old grove, and then replant with the proper trees.

Many farm groves have openings due to tree losses. Dust and snow storms then "funnel through," just as if you have a broken window or open door in a house. *Shut this opening by tree replacements.*

INSECTS, DISEASE, AND RODENTS

Watch for symptoms of insects and disease, losses through field mice, pocket gophers, and rabbits. These factors have caused heavy losses in both young and well established shelterbelts.

Control of insects and disease depends upon early discovery and recognition; consult with your county agent, extension forester, county forester, or

other public foresters. They can offer you sound and practical solutions.

Rabbits girdle trees, chew off tops, and clip side branches of both hard-

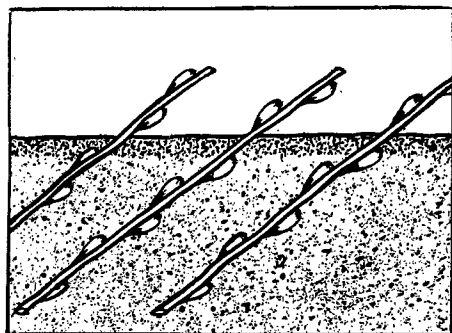


Fig. 14. Planting at a 45-degree angle brings the soil in close contact with the cuttings.

woods and conifers. Watch out for rabbit damage every year. Rabbits are most active in late fall, winter, and early spring when other foods are less available. Rabbit repellents have been increasingly successful but good results are obtained by "boy, dog, and gun."

Field mice also damage and girdle trees. Trash, dead grass, and high weeds give rodents an invitation to establish themselves. Keep the planted area weed-free. Scattering poisoned grain in the planted area is effective—providing farm flocks or upland game do not have access to the area.

Pocket gophers have killed many well established hardwoods and conifers. In winter, if their burrows come close to the tree roots, the gophers gnaw off the tender side-roots beneath the ground. When spring comes, many evergreens have dried up needles and noticeably lean to one side. When the tree is pulled out and examined, all that remains is a "knob" of roots. All the side-roots have been eaten off by the gophers (figure 16).

For suggestions on controlling gophers see Extension Folder 75, "Controlling Pocket Gophers." Copies are available at your local county extension

office or Bulletin Room, Institute of Agriculture, University of Minnesota, St. Paul 1, Minnesota.

CARE AFTER PLANTING

Cultivate Frequently

Frequent cultivation at proper intervals during the growing season conserves moisture in the soil, helping to carry trees through late summer dry periods. A duckfoot cultivator is one of the best tools for cultivating a young plantation. Cultivate shallow and not too close to the trees to avoid cutting off or pulling out small roots immediately below the surface.

A section of a spring-tooth harrow is also a good tool. Disk cultivators are not recommended, because they ridge up the soil around the trees which encourages rainfall run-off.

Do not "hill up" dirt around the trees, especially around evergreens. Roots of trees need some air. Piling dirt high will encourage the growth of an extra set of surface roots, causing the lower and more important roots to cease functioning.

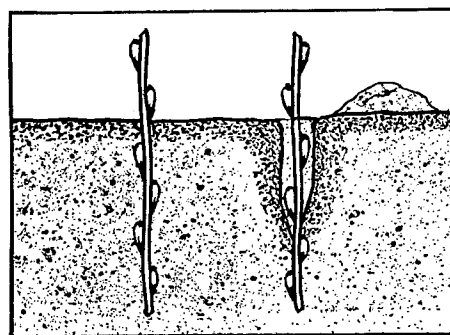


Fig. 15. If the cuttings are planted straight, the ground settles away from them.

Interplant Crops

During the first few years when the trees are small, corn or some other cultivated crop may be drilled between the rows. After the corn is picked, the standing cornstalks may be left over

winter. They will help catch and hold snow around the trees, reducing the danger of winterkilling and frost-heaving action.

Stop Cultivation in Late August

Cultivation after the last part of August is unnecessary. Late cultivation stimulates growth in the fall when the trees should be getting ready to harden up for winter. Pull late weeds or let them stand over winter. Tall weeds help to catch a blanket of snow, offering additional winter protection.

Continue Cultivating Several Years

Continue cultivation and protection until the trees are large enough to care for themselves. This is when trees are high enough to shade and protect the ground; otherwise grass and weeds will return to stunt or even kill tree growth.

Sun Scald

Small evergreens are often injured by severe sun scald or hot, searing, dry winds. Placing a shingle or board a foot or more from these small trees, on the south or west side, will prevent hot sun losses. Don't cover trees with burlap, paper, or old sacks; this only results in additional loss.

Avoid Mulching

Mulching is not recommended as an effective substitute for timely cultivation in the newly established shelterbelt. If the land is too steep and it would be unwise to cultivate, then a mulch could be suggested instead. Otherwise, the fine dirt mulch obtained by periodic tillage is much preferred in new shelterbelts.

In limited rainfall areas—which include most of southern and western Minnesota—there is some likelihood that a mulch thick enough to kill weeds would hold the soil moisture closer to the surface. In that case, the root growth would also be nearer to the surface and therefore more exposed to drought or winter injury.

Whether it is clean straw, cobs, hay, or wood waste that is used for a mulch, it can make an attractive home for mice and rabbits. This is another reason



Fig. 16. Rodent damage can be costly. Pocket gophers killed this healthy young evergreen by gnawing off the side-roots below the ground.

for not using a mulch, especially in the winter when rodents feed on tree bark and girdle many trees.

Applications of well-rotted barnyard manure can be beneficial to young trees—not only from the fertility standpoint but also in loosening up heavy, compact soils which are hard to work. Do not use fresh manure; the ammonia in it will injure tender roots.

Water When Necessary

Watering may be necessary, especially during droughts. If watering is done, give the trees a good soaking. However, too frequent watering will only encourage roots to grow near the surface and so become more dependent on artificial help and more easily affected by surface conditions.

Keeping the topsoil loose by good surface cultivation will keep the soil from cracking and reduce soil moisture losses.

Do Not Prune

Don't prune shelterbelt trees. The denser the planting the better the pro-

tection. Remember you are seeking an impenetrable storm barrier. Pruning trees makes a sieve for the snow and wind to filter through. Severe pruning lets light in on the ground. This encourages a growth of grass and weeds, allowing surface soil moisture to dry out. The exception is in the case of growth deformities. For example, a spruce, pine, or hardwood tree may send up more than one leader. Select the best terminal and cut back the rest.

Instead of pruning limbs when the trees are young, thin out individual trees later if crowding makes it necessary. Density of leaf surface as well as the number of stems in the grove are factors in wind protection efficiency. Pruning and thinning are problems to be considered only after a number of years when health, efficiency, and growth are established.

CONCLUSIONS

1. A good farmstead shelterbelt contributes to the home's comfort and the farm's value, home beautification, livestock feed savings, and the protection of orchards and gardens.

It provides a living, growing "overcoat" around the home in winter.

2. Thorough ground preparation before planting promises a good survival and sustained growth.
3. Proper location of shelterbelt in relation to prevailing storm winds is of utmost importance. Usually it should be located on the north and west sides of the farmstead.
4. Selecting trees and shrubs that are of proven hardiness and suited to the soil, climate, and purpose is essential.
5. Proper spacing of trees within the rows and between rows assures early results and long-time service.
6. Regular cultivation of trees during the growing season to eliminate weeds and grass and to conserve needed moisture is a "must."
7. Constant protection from farm livestock, rabbits, and other rodents is needed.
8. Early recognition of insect and disease damage, with proper steps taken for control, will protect the shelterbelt.
9. Remove unsuitable, old groves by replanting and readjustment to provide needed protection.

IF YOU ARE BUILDING—

If you are one of the fortunate few who can start building anew on your farm, you'll want to plan your shelterbelt at the same time as your building. Actually you should have your planting plans and soil prepared the summer before actual spring tree-planting time.

Take time to consider the best location for new buildings in relation to drainage, prevailing winds, and soil factors and to grouping in relation to other permanent buildings and to field arrangement, feed lots, pastures, gardens, orchards, or a future outdoor picnic area.

Your planting plans 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, merely 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.