

TREES

Against the WIND



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TREES AGAINST THE WIND

The pioneers needed trees when they began to "prove up" on their homesteads in the treeless areas of the Northwest. They needed hardy trees that would grow fast to provide shade and to give protection from the wind. Through the years many farmers made windbreak plantings without giving much thought to selection of species. They planted what they could get that would grow fast. They made wide use of Lombardy poplar, eastern cottonwood, silver poplar, black locust and other fast growing species.

Windbreak design was simple. A single row to 5 or 6 rows of one species was the common thing. Rarely were two or more species used in a planting. Location depended upon the farmer's judgment, which was often sharpened by what he had observed of other windbreaks planted earlier in the area.

Northwest farmers are still planting windbreaks. Now they can plan windbreaks with as much surety of success as a planned crop rotation or livestock breeding program. Research and field experience during the past 30 years have introduced more desirable windbreak species. Much detail has been worked out on how location and design affect windbreak efficiency. The information and recommendations in this bulletin are based on extensive field studies and experiments on windbreaks in several states.

WHAT IS A WINDBREAK?

A windbreak is one or more rows of trees and shrubs planted in such a way as to form a living barrier against the wind to protect farmstead, feedlot or field. This barrier is placed some distance from the area needing protection. Usually the best protection is gained by having the windbreak on two sides of the farmstead.

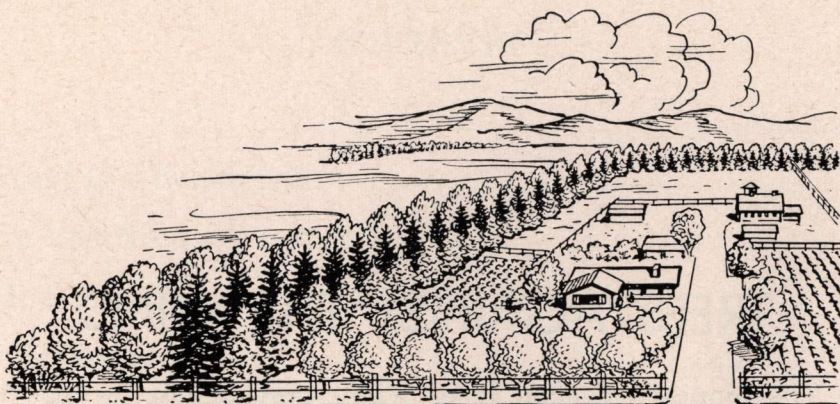


Fig. 1. A dense windbreak deflects and breaks up strong wind currents. The protection afforded by a good windbreak makes the farmstead a more desirable place to live.

DO YOU NEED A WINDBREAK?

Your need for a windbreak is measured by the benefits you would derive from one. Experimental results and the opinions of other farmers can help you determine what benefits you could receive from a windbreak.

A Nebraska experiment station measured the fuel requirements for two similar houses. One house was protected by a windbreak. The other was fully exposed. The protected house used 23 percent less fuel. Other tests have shown fuel reductions as high as 32 percent due to windbreaks.

A survey showed that 86 livestock feeders in Nebraska and South Dakota figured they averaged a feed savings worth \$800 annually due to their windbreaks. Livestock with protection made better gains on feed or stayed in better shape on maintenance rations than similar livestock without the protection from the wind.

A study involving 323 farms in the Great Plains showed that family orchards and gardens averaged an annual gain of \$67 per farm due to windbreak protection. The Tree Fruit Experiment Station at Wenatchee, Washington, reported that bees prefer to work in orchards that are protected by windbreaks. An Idaho study reported yields of field crops were increased by one percent to seven percent by windbreak protection. A recent Nebraska experiment showed that 34 acres of land protected by windbreaks produced as much canning tomatoes and beans as 40 acres of similar land without protection.

A recent survey was made in South Dakota primarily to find out how windbreaks influence crop yields. Corn, oats and barley with windbreak protection averaged 8-9 bushels per acre increase on 677 fields. Alfalfa averaged $\frac{3}{4}$ -ton per acre increase on 123 fields.

Corn silage on 13 fields showed 3-4 tons per acre increase and potatoes on 4 fields gained about 80 bushels per acre.

The survey further revealed that few farmers felt that windbreaks sapping and shading the ground was a factor in crop yields. Nearly all the farmers felt that their windbreaks more than pay for the land they occupy. All agreed that trees improve the livability of the farm and of the community. Many commented favorably upon the effects that windbreaks have upon soil blowing, crop damage and drifting snow. All noted beneficial effects that windbreaks have on the wildlife population. Most of the farmers were enthusiastic about the benefits noted from winter feeding of livestock on the lee side of windbreaks.



Fig. 2. This feedlot in Canyon County, Idaho gets good protection from the young windbreak. In localities where snowdrifting is a problem, windbreaks should be set back at least 60 feet from the feedlots if they are to be used in winter.

Emphasizing some of the windbreak evaluations made by the South Dakota farmers, an experiment in Kansas showed that a well-designed field windbreak caught 3.5 times as much snow as the best arrangement of snow fences the researchers were able to make. And in Texas, biologists surveyed 0.5 mile of windbreak and found it was sheltering enough bird life to destroy an estimated 260 pounds of insects during the year.

Here are some opinions of Northwest farmers who know the values of good windbreaks:

"We would not attempt to put a dollar value on this windbreak; but if we did, it would be up in the thousands. People come from all around just to enjoy our grounds," said a Umatilla County, Oregon, housewife who has enjoyed the protection of an eight-row windbreak for ten years.

"It's a downright comfortable feeling to be able to walk from the house to the barn without so much as holding your hat. My

snowdrifts are out at the windbreak now, instead of being around the house and other buildings," said a Madison County, Idaho, wheat farmer.

"Here by this windbreak I can work on my machinery when cold spring winds keep my neighbors indoors," commented a Canyon County, Idaho, farmer.

"Before we had our windbreak, the house had to be cleaned oftener. Now the windbreak stops a lot of dust that we used to get from our fields," said a grateful housewife in Twin Falls County, Idaho.



Fig. 3. "We would have built in town if it hadn't been for this windbreak," said the Ralph Robinsons of the Grande Ronde Valley, near LaGrande, Oregon. The willows have done especially well on the sub-irrigated soil. This mature windbreak has been about the same for the last 30 years. Even without evergreens, it gives good winter protection.

A Bannock County, Idaho, couple said they thought the greatest satisfactions from their windbreak were due to the outdoor living area the windbreak made possible and to the splendid play area it provided for the children.

Duane Hessler, Jerome County, Idaho, stated that his grain crop near the windward side of his farmstead windbreak was at least 50 percent better than the field average. As a result of this observed increase in yield, Mr. Hessler planted a 3-row field windbreak, $\frac{1}{4}$ mile long on the west side of his farm. Also, Dick Overfield, six miles west of Jerome, observed after he raked his beans that the rows within the protection zone of his windbreak were almost double the size of the rows in the unprotected part of the field.

Experimental studies and farmers' experiences have shown that windbreaks provide worthwhile benefits in four main areas. Windbreaks that have been well planned and that have had good care will:



Fig. 4. An irrigated single-row willow field windbreak located near Ellensburg, Washington. The windbreak is over 35 years old. Soils and crops on the lee side of such a windbreak will be protected for a distance of at least 600 feet.

— Soil Conservation Service Photo

Improve the Liveability of the Farmstead

The home and other farm buildings are sheltered from hot or cold winds. Snowdrifts are prevented from blocking roads and driveways. Spring and summer dust is reduced. There is a place for a sheltered outdoor living area. Some windbreak species produce edible fruits. The farmstead is made more attractive and more valuable.

Protect Field Crops, Gardens and Orchards

Wind speed is slowed down. Soil blowing is reduced. Soil moisture evaporation is lessened. Crop damage from soil particle blasting, firing, wind breakage and blowdown is reduced. Crop yields are increased. Orchard pollination is aided and fruit quality is improved.

Cut Livestock Feed Costs

Cattle with windbreak protection gain more than cattle in unprotected areas on the same rations. Protected cattle also lose less weight during blizzards or severe cold spells than do unprotected herds. Feeding operations are made easier.

Benefit Wildlife

Trees and shrubs in windbreaks shelter birds and animals and give them places for nests and dens. Some tree and shrub species that have high windbreak value also produce abundant wildlife food.

HOW LONG DOES IT TAKE TO GROW A WINDBREAK?

Most people think that trees grow slowly. Some farmers hold that as a major objection to planting trees. An Oregon county agent told this story of a tree planting demonstration in the early days

of windbreaks: A young farmer who was attending the demonstration showed impatience. Finally he exclaimed, "Trees take too long! I can't wait for trees to grow." An old farmer in the back of the group commented dryly: "John, you're going to wait anyhow. Why not grow trees while you wait?"



Fig. 5

An Austrian pine windbreak after 4 years field growth under 12 inches precipitation at Sherman Branch Experiment Station near Moro, Oregon.

The same planting 8 years later. Many of the trees were 18 feet tall. Experience has shown ponderosa pine to be a better tree than Austrian for dryland windbreaks.

Irrigated windbreaks under 5,000 feet elevation will provide some protection within 3 years and usually will give good protection in 5 years. Dryland windbreaks ordinarily will furnish full protection in 7 to 12 years. Evergreens make less growth than deciduous trees in the first ten years, but will catch up as plantings get older. Good care will reduce the time it takes a windbreak to provide its maximum protection. The average time necessary for a windbreak to provide needed protection is a short period when compared to the span of years that the average farmer spends on his place.

Planning your windbreak well in advance of the planting date is good business. Only a well planned windbreak that receives good care can provide the maximum protection and satisfaction. Your windbreak will be a long-term investment. It deserves careful planning which will enable you to:

- Locate the windbreak where it will be most effective.
- Design the windbreak to fit the available space and to meet the purpose of the planting.
- Allow ample room for good tree growth and for free use of your cultivating equipment.
- Determine the tree and shrub species that are best adapted to your soil, water and climate and that will provide you the most benefits.
- Prepare your planting site ahead of planting time.

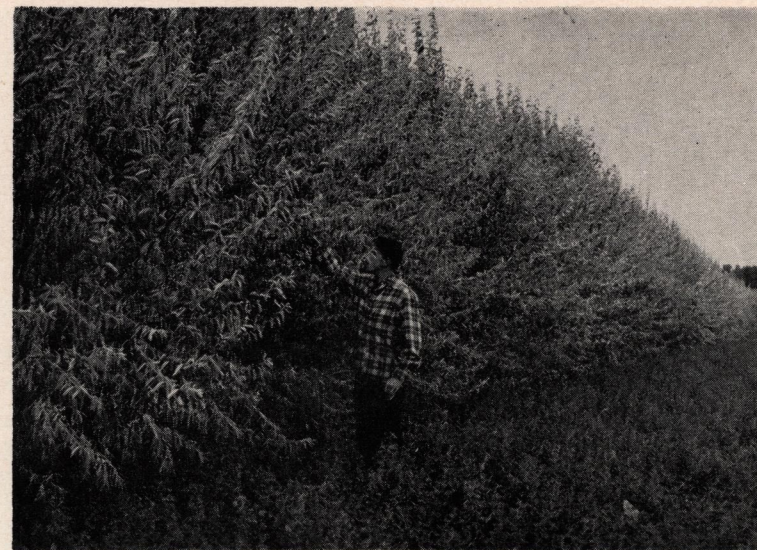


Fig. 6. The Russian olive row in a 5-row irrigated windbreak on the Art Suhr farm, Jerome County, Idaho. This picture shows the trees as they neared the end of their fourth growing season.

— Soil Conservation Service Photo

Provide fencing if it is necessary to protect the new planting from livestock and poultry.

Arrange in advance for planting tools, water and help that you may need so that you will be ready to plant when your planting stock arrives.

Insure safe storage of your trees in case your order arrives early or the weather does not cooperate.

Make your plan fit your irrigation system and set the planting date to coincide with available water.

The points listed above are important in the planning of all windbreaks. The rest of this section gives details on planning and design as they pertain to the different types of windbreaks.

Farmstead Windbreaks

Give careful consideration to these matters of design in order that your windbreak can yield its maximum benefits:

- | | |
|---------------------------|-----------------------|
| location of the windbreak | kinds of trees to use |
| number of rows | spacings to use |
| arrangement of rows | |

Locate your windbreak so that as nearly as possible it makes a right angle with the prevailing winds. Placing your windbreak at a right angle to the wind makes it more effective than if it cuts an oblique angle with the wind currents.

Place your windbreak about 100 feet from the house. At this distance you will get good protection. At the same time you will avoid the sultry air condition that occurs near the lee side of a dense

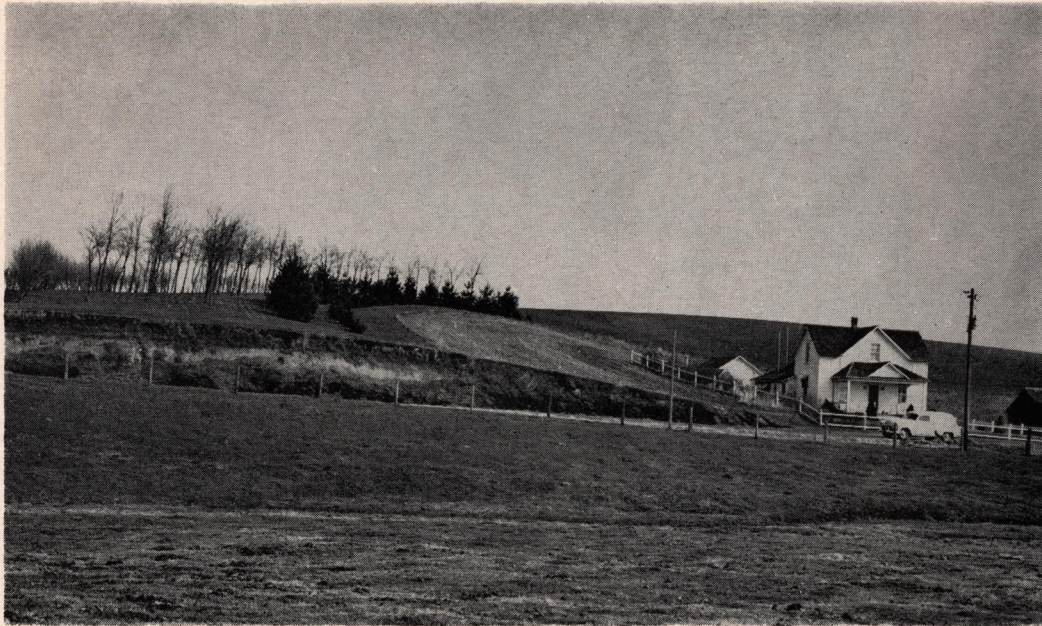


Fig. 7. This 7-row dryland windbreak on a Latah County, Idaho, farm shows good design and is well located with respect to the farmstead. Note the well-kept appearance. The rows are too close together. The trees will become crowded as they approach mature size.

— Idaho Department of Fish and Game Photo

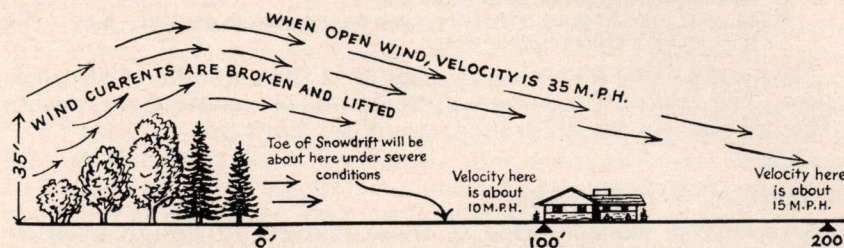


Fig. 8. A dense windbreak correctly located will effectively reduce wind velocity and control snow drifting.

windbreak on hot days. You will also avoid the risk of troublesome snowdrifts in winter. If you have considerable snow and wind in your locality, then locate your windbreak about 150 feet from buildings, driveways or areas that need to stay free of drifts. Should the arrangement of your farmstead make this impractical, then consider a snowtrap planting. A snowtrap is a single row or double row of dense shrubs paralleling the main windbreak 60 to 100 feet away on the windward side. It will help prevent drifts in the farm-

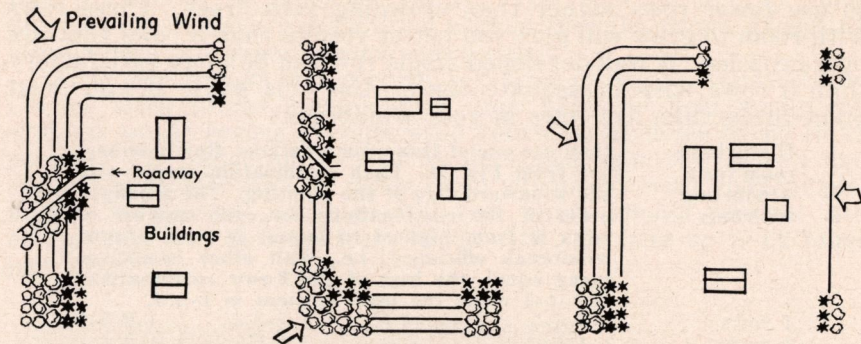


Fig. 9. Prevailing winds, farmstead layout and snowdrifting are important factors to consider in windbreak planning. No set windbreak pattern can be prescribed. By following the principles of design discussed in this section, you can plan a windbreak to fit your farmstead situation.

stead. Never plant a windbreak closer than 60 feet to the house or other main areas of the farmstead.

Extend your windbreak at each end 50 feet beyond the boundaries of the farmstead. This will prevent winds from whipping around the windbreak into the area you want protected. Avoid planting across old straw stack bottoms, manure piles or barnyard drainage ways because trees grow poorly in such locations. If you have to cross roads, driveways or large ditches with your windbreak, try to make the crossings at oblique angles to prevent direct wind tunnels through the planting.

A 5-row planting makes a very efficient farmstead windbreak. We might say this is the point where you get the greatest amount of protection per row of windbreak. You will get the best protection by using different kinds of trees and shrubs in a combination that forms a dense wind barrier at all times of the year.

If limited space prevents your planting a 5-row windbreak, plan

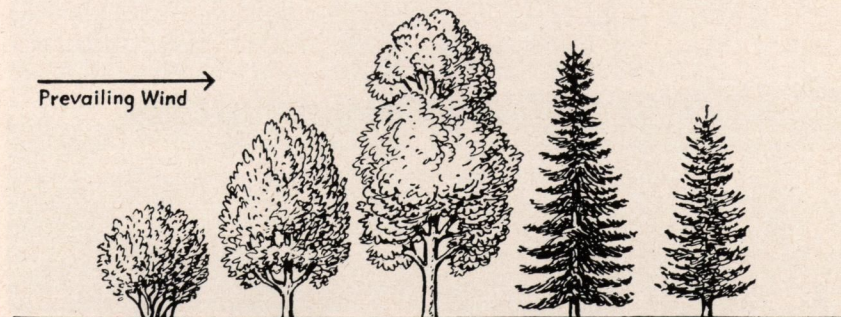


Fig. 10. Use a combination of trees and shrubs that form a dense year-around wind barrier from the ground level to the height of the windbreak.

to use fewer rows rather than crowding your trees. Three rows with room to grow will give you better results than 5 rows that are over-crowded. A well developed single row can be more satisfactory than 3 rows with inadequate space. Use this guide if you must plant fewer than five rows in your windbreak:

If you have room for a windbreak with only	then use one of these combinations. Row numbers are from Fig. 10. Each combination starts with the windward side of the planting. The adjudged order of the combinations for each number of rows is from highest to lowest in year around windbreak efficiency; i.e., with other conditions being equal, the best of the 3-row combinations is 1-4-5 while the least efficient is 1-2-3.			
4 rows	1-5-4-5,	1-2-4-5,	1-2-3-5,	1-2-3-2
3 rows	1-4-5,	1-3-5,	1-2-5,	1-2-3
2 rows	5-4,	1-4,	1-3,	1-2
1 row	5,	4,	2,	3

Plan your windbreak to fit the space you have available, keeping in mind that protection increases with the number of rows if the trees have room to grow. Recommended spacings and kinds of trees to use are given on pages 17 and 18.

Field Windbreaks

You can design field windbreaks to protect your soils and crops, using the same principles that are basic in farmstead windbreaks. Field protection is needed more than most people realize. For example, few people know that a wind with only 15 miles per hour velocity will start surface movement of particles on a bare soil. Since the soil moving capacity of wind is in proportion to the square of the velocity, a wind of 30 miles per hour becomes quite damaging to any bare soil. The dust that is blown from fields on windy days has been found to contain 10 to 20 times more humus and phosphate



Fig. 11. This mature windbreak in southwestern Idaho provides full protection for the farmstead and makes a very attractive setting for the farm buildings.

than the heavier particles left behind. The reduction in crop yields due to wind damage is something seldom thought about, excepting cases where the losses become spectacular.

Field windbreaks will prevent soil from moving. Kansas State College wind tunnel tests showed that practical field windbreak systems would reduce average wind velocities on fields by 50 to 75 percent. The reduction in velocity depended upon the density and spacing of windbreaks. A dense main windbreak with good supplemental single-row plantings 300 feet apart should prevent soil erosion and crop damage from winds with velocities up to 60 miles per hour.



Fig. 12. These eight-year old single-row Lombardy poplar windbreaks in the windbreak system that protects the Sundale Orchards, Washington, are 35 to 40 feet tall. They have been irrigated and fertilized.

Field windbreaks should be tailored to fit your land and your needs. They make a permanent improvement on your farm. Therefore, they should be carefully planned. Field boundaries and irrigation systems should be permanently established because they largely determine the location of your windbreaks.

In this region most fields will be given adequate protection from the wind by a 3-row main windbreak along the windward border, supplemented by single-row plantings at 500-foot intervals parallel to the main windbreak. The usual maximum wind velocities in your locality and the nature of your soils may make it desirable to reduce or to increase the intervals between the supplementary plantings. If you have severe winds and/or light soils, you should plant 4 or 5 rows in your main windbreak.

The spacings shown in Figure 13 for the supplemental windbreaks will ordinarily reduce wind velocities by 50 percent. In most cases this will mean adequate protection. If usual maximum wind velocities in your locality are above 30 miles per hour and/or your soils are light, place the supplemental windbreaks about 350 feet apart. This spacing will usually reduce wind velocity by 70 percent. A 3-row main windbreak and 2 single-row supplemental plantings spaced at 420-foot intervals divide a square "forty" into equal parts and will occupy approximately $2\frac{2}{3}$ acres of land.

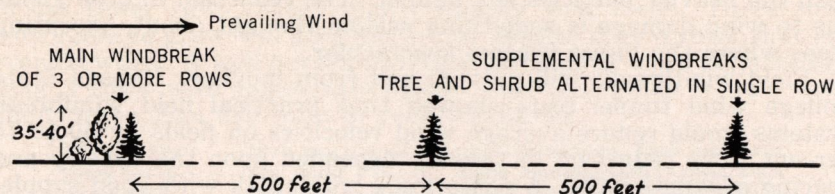


Fig. 13. This general design can be followed for most field windbreak systems.

Using the same row numbers given in Figure 10, these would be good row combinations for your main field windbreak: 1-4-5, 1-3-5, 1-3-2, 1-2-2. Each combination starts with the windward side. Use evergreens in one or more rows of your main windbreak if they do well in your locality.

An interplanted combination of a tree and a shrub works well in the supplemental rows. Alternate a tall evergreen or a tall deciduous tree with a dense shrub. If shorter intervals are used between the supplementary plantings, then a medium height dense evergreen or deciduous tree can be alternated with a shrub. Recommended spacings and species are given on pages 17 and 18.

Living Snow Fence

Single-row plantings of trees and shrubs paralleling your driveways and roads will hold the snowdrifts on the fields. A snowfence planting should never be closer than 50 feet to your road. It is safer to place it 60 to 100 feet back from the roadway.

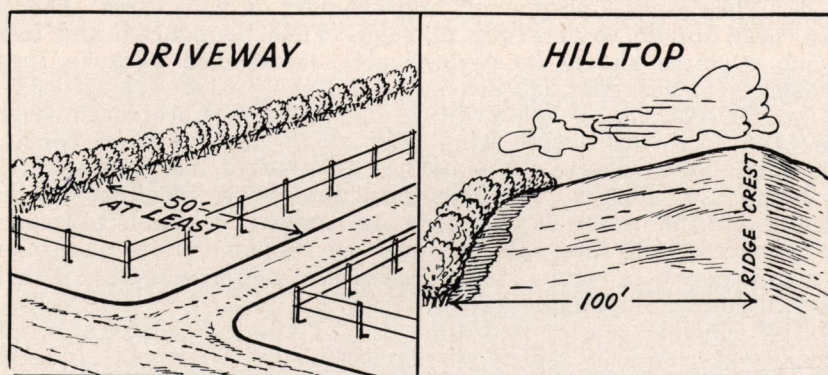


Fig. 14. Snow fence plantings should be placed at least 50 feet back from driveways or roads. Place hilltop snow fences 100 feet on the windward side of the ridge crests.

In some parts of the Northwest, deep snowdrifts accumulate on steep lee slopes. They cause serious soil erosion when they melt and they may delay spring farming operations. Living snow fences

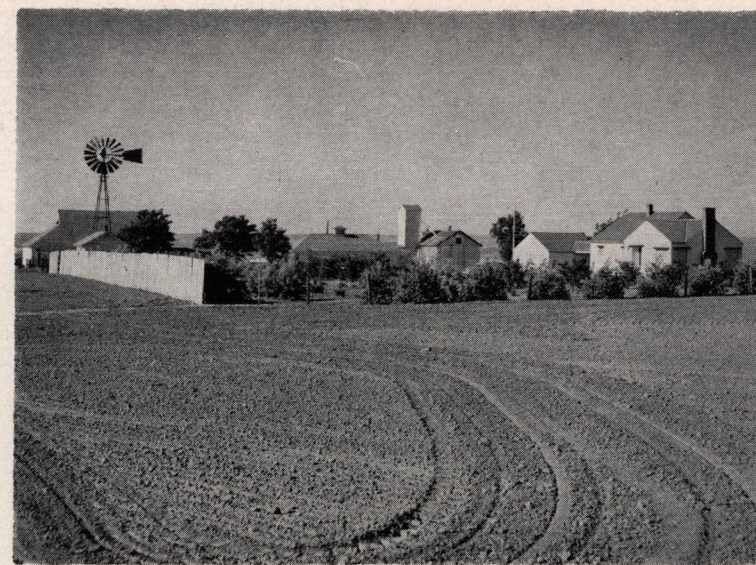


Fig. 15. This photo of the Roy V. Terney home west of Pendleton shows a well planned dryland windbreak in its fourth season. The species are Russian olive, ponderosa pine, Scotch pine and Douglas fir. The windbreak is set well back from the house. It is fenced and clean cultivated. Wide spacings will give the trees room for good development before they crowd each other.

will collect these drifts on gentler slopes on the windward sides of the ridge crests. Hilltop snow fences should parallel the ridge lines. Place them about 100 feet back from the ridge crests on the windward slopes.

Snow fence plantings may be planned as a part of your field windbreak system. In some areas this kind of planting has been used effectively to control drifting soil on cropland and prevent its collecting in irrigation ditches, along fence lines and in roadways. The choice of species for snow fence plantings can greatly enhance their values for wildlife.

GIVE YOUR TREES ROOM TO GROW

Use spacings in your windbreak plantings that will:

- provide your trees ample room for good growth
- avoid whipping damage to trees in adjacent rows
- prevent self-pruning or die-back of lower limbs
- leave adequate space to accommodate your tillage equipment



Fig. 16. This windbreak was planted with too little space between the rows. The row of spruce has been almost enveloped by branches of the fast growing black locust. Note the small diameters of the stems back inside the planting. Crowded space has prevented these trees from making normal growth.

Spacing is usually a compromise. Where land has high value or the room for a windbreak is limited, the usual tendency is to use close spacings in order to get more rows. Some farmers have planted on close spacings in order to get earlier protection. Close spacing does result in earlier protection, but the price you may pay for the earlier protection can be high. Close spacing hinders cultivation. It results in early competition among the trees, causing them to be more susceptible to insects and diseases. Close spacing causes lower limbs to die for lack of sunlight. This reduces a windbreak's effectiveness and gives it a scraggly, unsightly appearance.

Give your trees room to grow, even if it means using fewer rows in your windbreak. Give your trees room to grow, even if at the start it looks like they will never fill the spaces between. Adequate growing space tends to keep your trees thrifty. It gives assurance that your windbreak will have a better appearance and a longer useful life.

These are the recommended spacings to use in windbreak plantings:

Situation	Tree Types	Spacings to Use	
		On Irrigated Land (feet)	On Dryland (feet)
Farmstead windbreaks, main field windbreaks, and supplemental field windbreaks with more than one row: between rows between trees in the rows	All species	16	20
	Dense shrubs (Row 1)*	3	3
	Medium-size deciduous (Row 2)	6 to 10	8 to 10
	Tall deciduous (Row 3)	8 to 12	10 to 12
	Tall evergreens (Row 4)	8 to 12	10 to 12
	Dense medium height evergreens (Row 5)	6 to 10	8 to 12
Single-row supplemental field windbreaks and living snow fences between trees	Tall deciduous or tall evergreen inter-planted with dense shrub	6**	6 to 8
	Dense, medium-height evergreens	6	8
	Medium-sized deciduous	6 to 8	8 to 10
	Dense shrub	1.5 to 3	3

*Refer to Figure 10, page 18 for row numbers.

**The tall trees should be 12 feet apart with a dense shrub planted in between them.

The recommended spacings between rows have been proved sound through experiment. They give the trees room to develop good crowns before strong competition develops. They are also within the optimum range of spacing for highest windbreak efficiency. The spacings between trees are mostly listed as ranges to allow for differences in sizes of trees and in growing conditions. It would rarely be wise to go below the minimum tree spacings recommended.

When you have decided upon the spacings you will use, figure out the number of trees you will need for the planting. Order a few more trees than you need so you will have some replacements. Most of your trees that die will fail during the first growing season. You can hold some extra trees for replacements by planting them temporarily in one of the windbreak rows.

TREES TO USE

The trees and shrubs listed under Recommended Windbreak

Species are commonly used in the three northwest states. General information on their size, growth habits and adaptability is given in the appendix. Read these descriptions before you make your final selection. Some species have limitations that make them unsatisfactory for general use. In local areas the soils may limit the choice of trees that can be planted successfully. For these reasons it is recommended that you get technical advice on your choice of species for your windbreak.

Recommended Windbreak Species:

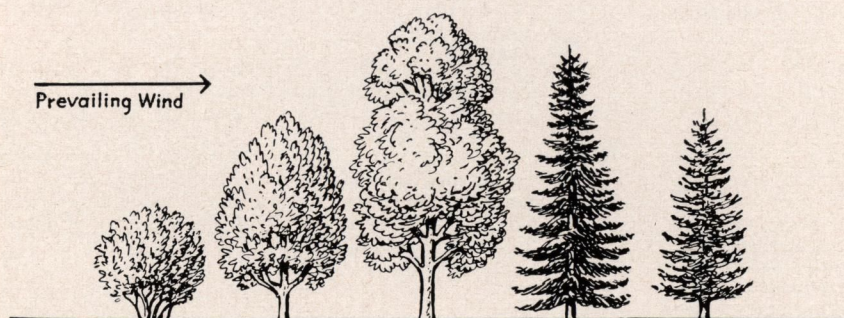


Fig. 10

Row 1 Dense Shrub Usually Deciduous	Row 2 Medium Tree Usually Deciduous	Row 3 Tall Tree Usually Deciduous	Row 4 Tall Tree Usually Evergreen	Row 5 Medium Tree Usually Evergreen
--	--	--	--	--

NON-IRRIGATED — Annual Precipitation 20 inches or more

Caragana or Siberian Peashrub	Mountain-Ash	Green Ash	Ponderosa Pine	Norway Spruce
		Siberian Elm or		
Common Lilac	Golden Willow	Chinese Elm	Scotch Pine	Blue Spruce
Tartarian Honeysuckle	Russian Olive	Hybrid Poplar	Norway Spruce	Austrian Pine
		Black Locust	Douglas Fir	Virginia Juniper

NON-IRRIGATED — Annual Precipitation from 20 inches down to 12 inches

Caragana or Siberian Peashrub	Russian Olive	Siberian Elm or Chinese Elm	Ponderosa Pine	Austrian Pine
Tartarian Honeysuckle		Green Ash	Lodgepole Pine	Rocky Moun- tain Juniper
Common Lilac		Hybrid Poplar	Austrian Pine	
Southernwood				

IRRIGATED — Elevations up to 5,000 feet

Caragana or Siberian Peashrub	Russian Olive	Black Locust	Scotch Pine	Norway Spruce
Tartarian Honeysuckle	Golden Willow	Green Ash	Austrian Pine	Austrian Pine
Common Lilac		Hybrid Poplar	Norway Spruce	Blue Spruce
			Ponderosa Pine	Virginia Juniper

HIGH ELEVATIONS — Above 5,000 feet

Caragana or Siberian Peashrub	Golden Willow	Hybrid Poplar	Lodgepole Pine	Rocky Moun- tain Juniper
Common Lilac	Russian Olive		Ponderosa Pine	Blue Spruce
Tartarian Honeysuckle				
Southernwood				

There are several other shrubs that are satisfactory in many localities. Some are well liked because their fruits make good jams and jellies. They have high value for wildlife. They are: Nanking cherry, American plum, chokecherry, sandcherry, Siberian apricot, native plum, hardy crabapple and Peking cotoneaster. Common privet, mugo pine and multiflora rose make good bird cover. Lombardy poplar and black willow are suitable tall trees under the right conditions. Both will grow in most localities. Western redcedar may be used as a tall dense evergreen where it is adapted. It is not generally suited to irrigated lands. Northern whitecedar, a medium-height evergreen, does well under irrigation and on dryland with at least 20 inches precipitation.

SOURCES OF PLANTING STOCK

Here are sources from which you may obtain planting stock. Clarke-McNary (Federal-State) Nurseries: Seedling trees and shrubs are produced for farmers in Idaho, Oregon and Washington by these federal-state nurseries:

Forest Nursery
University of Idaho
College of Forestry
Moscow, Idaho

Oregon Forest Nurseries
State Board of Forestry
Salem, Oregon

Webster State Forest Nursery
Route 4, Box 425-A
Olympia, Washington

Following is a list of commonly used windbreak species which can be obtained from the Clarke-McNary Nurseries. The symbols after each species' name indicate the states in which it is ordinarily available.

Deciduous:			Evergreens:		
ash, green	I	O W	Douglas-fir	I	O W
caragana or			juniper, Rocky Mt.	I	O W
Siberian peashrub	I	O W	pine, Austrian	I	O W
elm, Chinese		O W	pine, lodgepole	I	O W
elm, Siberian	I		pine, ponderosa	I	O W
honeysuckle	I		pine, Scotch	I	O W
lilac, common	I		spruce, blue	I	
locust, black	I	O W	spruce, Norway	I	O W
olive, Russian	I	O W			
poplar, hybrid	I				
poplar, Lombardy		W			
southernwood	I	W			
willow, golden	I	W			

The other species recommended ordinarily are available from the state fish and game departments and from private nurseries that specialize in stock for conservation plantings.

State Fish and Game Departments: Under their habitat improve-



Fig. 17. Tree planting stock for farms is shipped as seedlings or cuttings. Tops of evergreens usually range between 6 and 10 inches. Evergreens should have well balanced, fibrous root systems 8-10 inches long. Tops of deciduous species are ordinarily trimmed back to 10-12 inches height. Root systems of deciduous species should be well branched and about 10 inches long. Shown from left to right above are a 3-year old (2-1) blue spruce, 3-year (2-1) Douglas-fir, 2-year (2-0) ponderosa pine, 1-year (1-0) black locust and a 1-year rooted hybrid poplar cutting. The first figure in each of the parentheses shows the number of years in the seed bed and the second figure gives the years in the transplant bed.

ment programs, the state fish and game departments make tree and shrub planting stock available to farmer cooperators. If you would like to get maximum wildlife values out of your windbreak, it would be worth your while to contact your state fish and game agency. The addresses are:

Department of Fish and Game
518 Front Street
Boise, Idaho

Oregon State Game Commission
1634 S.W. Alder
P.O. Box 4136
Portland, Oregon

Washington Department of Game
600 North Capitol Way
Olympia, Washington

Private Commercial Nurseries: Some commercial nurseries produce trees for farm and forest plantings. They often have species not available from public nurseries. You may obtain from your county extension agent a list of commercial nurseries that produce seedling trees for farm and forest plantings.

Starts from Cuttings: You can use cuttings with success if you get good material and handle it right. These species can be grown from cuttings: golden willow, black willow, all poplars, southernwood, common lilac, common privet, Russian olive.

Take cuttings after the leaves have fallen. Make them from the shoot or branch growth of the last growing season. Cuttings should be 1/4-inch to 1/2-inch in diameter and long enough to contain 5 or 6 buds.

Plant cuttings only on irrigated land or on sites that have a good natural supply of moisture throughout the growing season. Cuttings can be planted in the fall but early spring is the best time. Plant them in moist soil at a 45° to 60° angle with the soil surface. Leave two buds above the groundline. Pack the soil firmly around

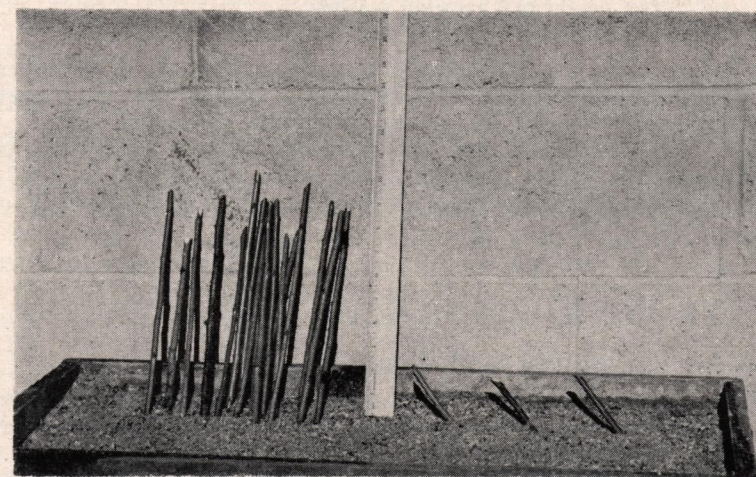


Fig. 18. Cuttings are usually 8 or 9 inches long. If planted at an angle with the ground surface, there is less chance of the soil pulling away from the cuttings when the ground surface dries.



Fig. 19. Vernon Ravenscroft, Gooding County, Idaho, displays the growth he gets during the first season on hybrid poplar cuttings under irrigation. His first planting of poplar cuttings averaged 28 feet height in 6 growing seasons.

the cuttings. The best practice is to root cuttings in a garden row and transplant them to their permanent location the next spring. Trim tops back to about 10 inches when transplanting.

If cuttings cannot be planted soon after they are made, they should be stored where it is cool and moist. They can be held for several weeks by burying them in moist earth to a depth of 9 to 12 inches.

GIVE YOUR WINDBREAK EVERY CHANCE

Ground Preparation and Planting

Trees do best in firm, moist soil that is free of perennial weeds and grasses. Summer fallow your planting site if it contains perennial weeds or crop plants.

Give prompt attention to your trees when they arrive. See that they stay moist and cool. If you cannot plant within 5 days after your trees arrive, heel them in.



Fig. 20. Thorough preparation of your site and careful planting of your trees are important no matter whether you plant by hand or by machine. This planting site has been well prepared. Note that the marker and planter tracks indicate good soil moisture.

— Soil Conservation Service Photo

For detailed information on ground preparation and planting, obtain a copy of Plant Your Trees Right, P.N.W. Bulletin No. 33.

Cultivation — Good Windbreak Insurance

Cultivate your windbreak often enough to control the weeds. Do your cultivating when the weeds are small, under 2 inches height. Shallow cultivation is best. Deep cultivation near the trees destroys many feeder roots and wastes soil moisture. Do not hill up the soil around young trees. It will injure or kill them if branches are covered.

Duck-foot cultivators and spring tooth harrows are good cultivating tools. In recent years "over the row" cultivators have become widely used for small trees. Some side delivery rakes work well without any changes. A good cultivating tool can be made by putting 16-inch flexible tines in a section harrow. A dump type hay rake fitted with smaller wheels does a satisfactory job.

If you do not have equipment that will cultivate in the row, hand hoeing may be necessary to control the weeds between trees. There are special tools, such as the grape hoe and shelterbelt cultivator, that swing out from the side of a tractor to remove the weeds from within the rows. Also, rapid progress is now being made in the development of weedicides and their use in plantings. Tests with certain weedicides in forest tree nurseries and field plantings are showing much promise. Some weedicides are now on the market, but not all can be safely used in young tree plantings. Check with your county agent before using a weedicide in your windbreak.

Usually cultivation will be needed for at least 3 years under irrigation and 5 years or longer on dryland. If you irrigate or if

you have dryland with more than 15-inches annual precipitation, you can seed a light cover to help keep down the weeds in the middles of your windbreak after the trees are well established. Bulbous bluegrass, dwarf orchard grass, dwarf crested wheat and Idaho fescue are some of the better species for this purpose. If you have 15 inches precipitation or less, keep your planting clean cultivated as long as you can. The trees need all of the available moisture.

Irrigation

Irrigated windbreaks should be watered often enough to keep the plants in active growth all summer. Just how frequently watering needs to be done varies a great deal with soil type and with local temperature and wind conditions. Therefore, it is difficult to establish a rule regarding how often to water your trees. In general, water your trees during the first two growing seasons at the same intervals you would water grain crops in your area. When you irrigate, leave the water on long enough to get deep penetration. After the second growing season, watering every 3 or 4 weeks will suffice under most conditions. Stop watering 3 weeks before the usual date of first frost. This helps your trees to harden up to withstand cold weather. If you have water available in the fall, irrigate the evergreens once more after you have had two hard frosts. This late watering helps the trees better to withstand severe weather conditions that cause winter injury.

Use of Fertilizers

On agricultural soils, trees usually will make good growth without any fertilizer. If you plan to plant trees on a site with low soil fertility, then fertilizer will help. Plow under a green manure crop, or a 15-ton per acre application of barnyard manure. There are special tree fertilizer pellets that have improved survival and increased first season's growth in some areas.



Fig. 21. This young combination farmstead and field windbreak on the J. P. Melhoff dry farm in Power County, Idaho, has been given a promising start through clean cultivation and protection from livestock. Good cultivation pays off in better survival, faster growth, healthier trees and nicer appearance for your windbreak.
— Soil Conservation Service Photo

Use commercial fertilizers cautiously. Experience indicates it is risky to use commercial fertilizer on dryland plantings, particularly on evergreens. It is risky to fertilize irrigated plantings the first year. After two or more seasons' growth, most species will make a favorable response to nitrogen. Growth rate and foliage color usually will improve. Black locust and Siberian peashrub (*Caragana*) plantings usually benefit from phosphate application on irrigated plantings. If a soil test on your windbreak site shows fertilizer is needed, add the amount necessary in two or more applications. Make the first application early just before spring growth begins. Space applications 3 weeks to a month apart.

Surface mulching is not recommended for windbreaks. Experiments have shown that mulches absorb light rains, thus reducing the amount of moisture available to trees in dryland plantings. Mulches make watering difficult in irrigated windbreaks. Coarse mulch materials, such as old hay or strawy barnyard manure, will attract rodents and give them protection while they damage your trees. Sawdust, well-rotted barnyard manure or other fine organic materials are a benefit if worked into the surface soil in moderate amounts.

Pruning

The general rule is, "Keep the ax and saw out of your windbreak." You design a windbreak to make a dense wind barrier. Therefore, no pruning should be done except to:

- prevent deciduous trees from developing weak crotches which may later result in split trunks;
- prevent long branches on deciduous trees from breaking off under heavy snow or windstrain;
- prevent the development of double or multiple leaders in the crowns of evergreens;
- promote uniformity and density in single-row supplemental plantings.

A single-row supplemental planting is sometimes needed along the yard border. Uniformity and density of such a planting can be improved by trimming. On deciduous shrubs or small trees trim off one-half the last season's height growth in early spring. Do this for 3 or 4 years. Further trimming need be only for holding the planting to the height desired.

Protection

Livestock, poultry, mice, gophers, rabbits, porcupines, insects, diseases, and sometimes herbicides can all be real enemies of farm tree plantings. You can easily control the threat from livestock and poultry by fencing them out. You will be wise to fence before you plant.

If you plant trees next to meadow, hayland, sagebrush areas or road right-of-way, you may have to combat mice, gophers or rabbits. Clean cultivation helps to keep out mice and gophers, but it is no complete assurance against damage from them. Mice and



Fig. 22. Livestock can completely destroy a young windbreak and do much to nullify the effectiveness of an older one. In this planting the much needed low dense growth has been removed. Serious root damage was done by heavy trampling. Tree stems were injured by animals rubbing and gnawing on them.

— Soil Conservation Service Photo

gophers will move into clean plantings under snow cover. Screen wire or hardware cloth cylinders may be used to protect small trees. Repellants will often prevent damage from rabbits and other rodents. U.S.D.A. Leaflet No. 396 gives instructions on how to prepare and apply rabbit repellants.

It will pay you to examine your windbreak periodically in late fall, winter and early spring for signs of rodent activity. Check your planting frequently through the growing season for signs of insect or disease damage. If you discover a pest problem in your tree planting and you do not know how to control it, ask your county extension agent for recommendations.

Frequently apparent disease damage in farm tree plantings results from the use of herbicides. Usually such damage is caused by drift from application of weed sprays in fields or along roads. Both deciduous trees and evergreens are affected, but some species are much more susceptible than others. The most serious damage usually occurs in spring or early summer while the new growth on the trees is still tender. Crinkling or curling of the leaves and a fading of the green color between the leaf veins coupled with stunted leaf development are common symptoms on deciduous species. New growth on evergreens wilts for several days. Browning of the needle tips may develop later. Twisted, malformed leaders are often the obvious lasting results. In severe cases, all new growth on trees may be stunted or deformed and killed. Be careful in the application of herbicides in or near your windbreak.

Special Care of Evergreens

Because of their natural adaptation to different soils and climatic conditions, the evergreens as a group do not become established as easily as the deciduous trees on prairie or desert soils. For that reason starting evergreens is somewhat a special problem in many farming areas of the Pacific Northwest states. Effective practices for the successful establishment of evergreens are:

Plant the deciduous tree and shrub rows of the windbreak first. Allow them to grow for two or three years before planting the evergreens.

Line out the evergreens in a garden nursery row. Do this at the time the deciduous rows of the windbreak are planted. Let the evergreens grow in the nursery until they are about 15 inches tall before moving them to their permanent locations in the windbreak. To make the moving easier, some farmers plant the seedling evergreens in gallon cans with holes in the bottom to permit drainage. The cans are then buried to groundline level in the garden row. By the time the trees are ready for moving, the sides of the cans usually have rusted enough to allow root penetration. If not, they should be slit in several places at the time of transplanting.

Plant a few rows of corn down the windbreak middles. Do not plant the middles full. Allow enough room to cultivate the tree row. Leave the cornstalks stand over winter, but watch the tree plantings for signs of mice damage. The young evergreens usually will not need protection after the second growing season.

Provide mechanical shading. Broad shingles or boards driven into

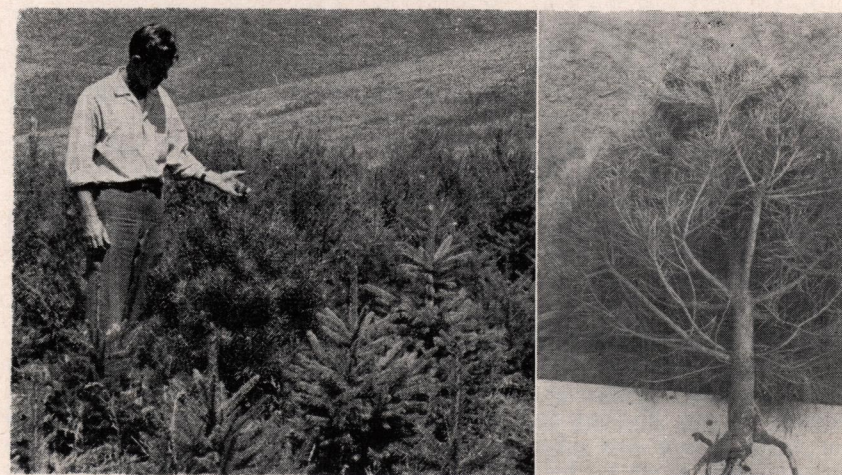


Fig. 23. During the winter following its fourth growing season, this evergreen planting in Idaho was seriously damaged by mice. Losses incurred were: Scotch pine and Austrian pine, 78%; Port Orford cedar, 42%; Norway spruce, 15%; Douglas-fir and white fir, 12%; blue spruce and Rocky Mountain juniper, negligible. An accumulation of weed and grass growth in the planting afforded protective cover for the mice. The Scotch pine in the inset is from the planting. Mice destroyed all its small roots, leaving the tree no anchorage or means of feeding itself.

the ground on the southwest sides of small evergreens give protection. Observations in Oregon showed that shading increased survival by 25 to 90 percent. A shading test with shingles on irrigated plantings in Idaho gave significant increase in survival for 2 evergreens out of the 10 species tested. Shading can also be provided by attaching burlap screens to stakes driven on the southwest sides of the plants.

TREATMENT FOR OLD PLANTINGS

Many old windbreaks and other farm tree plantings are showing signs of ill health. Some of the trees are dying. This condition usually results from having planted the trees on spacings that are too close to give them adequate room to grow. In the early years the trees do well, but long before they reach maturity they crowd each other severely. Tree growth rate slows down. Vigor weakens and the trees become more susceptible to disease, insects, and to damage from both cold and drought.

If an old planting has not deteriorated too much, cutting out the weaker trees will help strengthen the remaining ones. If all rows look about equally vigorous, remove as nearly as possible every other tree within the rows. If some rows are overtopped or almost entirely dead, remove them completely. Fertilizers will aid in rejuvenating old plantings, particularly black locust and other deciduous trees. If you have an old tree planting that needs improvement, consult your county extension agent before you begin the job of renovation.

MECHANICAL WIND BARRIERS

Fences made of slabs, board, brush or baled straw yield some windbreak benefits. They break up wind currents and provide good protection for short distances if constructed properly. Tests have shown that for all around windbreak values, such mechanical barriers should not have a solid face against the wind. Cracks or openings in the barrier should constitute 10 to 12.5 percent of the total surface. The barrier is more effective if the cracks or openings run on oblique angles to its surface.

It is difficult to get enough height on a mechanical wind barrier to have a protected area with much width. Results from different experiments indicate that an 8-foot board fence wind barrier gives about the same degree of protection over an area 80 feet wide that a dense 5-row, 35-foot tall windbreak gives over an area of 525 feet wide. Their low effective height means mechanical wind barriers usually must be located quite close to the area needing protection. This often creates serious snow drift problems. Mechanical wind barriers do little to keep down dust and have practically no wildlife value. The initial cost of construction and the necessary maintenance make them expensive unless materials can be obtained cheaply. The main advantages of mechanical wind barriers are that they take up little space and there is no waiting period for protection.

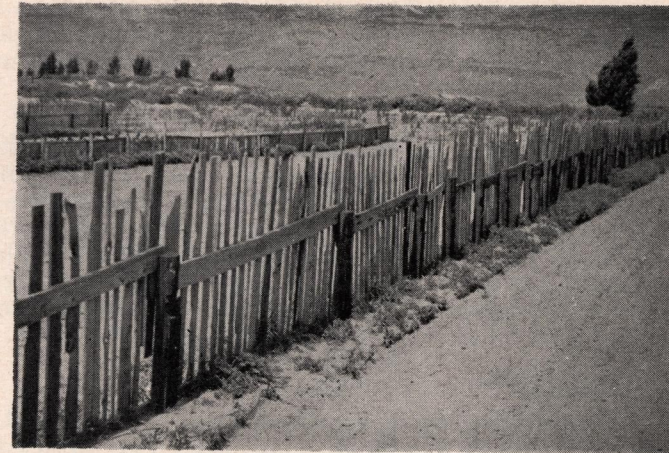


Fig. 24. Mechanical wind barriers can be used to good advantage if their limitations are known. The system shown is near Arlington, Oregon. A mechanical barrier can be quite helpful in getting a tree windbreak established.

APPENDIX

Geographic, climatic and soils characteristics vary greatly between areas in the Pacific Northwest. There is about as much variation within each of the three states (Idaho, Oregon and Washington) as there is in the region as a whole. For example, Oregon has 7 climatic zones and in Idaho 5 different tree planting zones are recognized because of climatic and soils variations. These variations create many problems in tree planting. They cause the optimum time for planting to vary widely from area to area. They influence the degree of care needed by tree plantings and the probability of their success. Climate and soils variations make the choice of species difficult for some areas. The following information will help you decide what trees to use.

Evergreen Trees

Evergreen trees are the foundation of a windbreak. They give year-around protection. They should be included in windbreaks wherever possible. The standard practice in establishing windbreaks is to plant evergreens in one or two leeward rows. In areas where they do well, evergreens may be used for the entire windbreak.

Deciduous Trees

Deciduous trees generally grow faster than evergreens, thus providing earlier protection. They are commonly used for the middle rows in windbreaks. Due to their faster growth, they will be taller than evergreens of the same age for many years. The height added by the deciduous trees extends the protection zone of the

windbreak. In some areas certain deciduous trees are the only ones that can be grown satisfactorily. In such areas, windbreaks are made up of deciduous trees in combination with a dense shrub.

Shrubs

A windbreak needs to be dense near the ground. For this purpose, a low, bushy shrub should always be used for the windward row of a multiple-row planting. Shrubs make ideal single-row or double-row low windbreaks around yards and gardens. Shrubs are often used for living snow fences and for supplemental plantings in field windbreak patterns. In many areas shrub rows are necessary to give the protection needed to establish evergreens in a windbreak.

Tree Descriptions

The following tables give information about the trees and shrubs recommended for use in windbreak plantings. This information is based on tests and observations made by research workers and field technicians in the Pacific Northwest. Use the tables as guides in selecting the best species for your windbreak.

EVERGREEN TREES FOR WINDBREAKS

NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Douglas-fir (<i>Pseudotsuga menziesii</i>)	60	25	20	Good	Excel- lent	Good form; medium growth rate, likes well drained soil; may be hard to establish on grassland soils; more difficult to establish on irrigated lands than Scotch pine or Norway spruce. Not recommended for eastern Oregon.
Rocky Mountain Juniper (<i>Juniperus scopulorum</i>)	20	15	12	Excel- lent	Excel- lent	Dense and symmetrical with excellent appearance; medium to rapid growth; not particular as to soil; tolerates high water table; difficult to start under dry land situations but grows well once established; appears to be most promising evergreen in 15-year old test under 12 inches annual precipitation at Sherman Branch Experiment Station in Sherman County, Oregon. Junipers are hosts of the cedar-apple rust disease. Do not plant juniper in communities where there are apple orchards.
Virginia juniper (<i>Juniperus virginiana</i>)	25	15	15	Good	Good	Dense, broadly conical crown; moderate to fast growth; similar in appearance to Rocky Mountain Juniper; a little less cold hardy and drought resistant than Rocky Mountain and western junipers. A very good windbreak tree if real dry locations and high elevations are avoided. See note on cedar-apple rust under Rocky Mountain juniper.
Austrian pine (<i>Pinus nigra</i>)	40	30	20	Fair	Good	Dense and symmetrical; smaller than ponderosa pine and not as drought resistant; medium to rapid growth; adapted to a rather wide range of conditions; excellent windbreak tree for many localities. Needs a deep, fertile soil or supplemental water if planted where annual rainfall is less than 20 inches. Austrian pine has made excellent early growth in dryland

EVERGREEN TREES FOR WINDBREAKS

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NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Lodgepole pine (<i>Pinus contorta</i>)	40	20	20	Poor	Excel- lent	plantings in Wasco, Gilliam, Sherman and Morrow Counties, Oregon, but has a tendency to die out in 12-15 years. Ponderosa pine is preferred in these counties.
Ponderosa pine (<i>Pinus ponderosa</i>)	60	30	15	Fair	Good	Rather dense crown; good form; medium growth rate; does well under wide range of conditions; develops yellowing of the leaves on saline soils. Usually not as satisfactory as Scotch pine or Austrian pine for irrigated plantings.
Scotch pine (<i>Pinus sylvestris</i>)	40	20	15	Fair	Good	Symmetrical and dense; becomes open near ground as tree matures; medium to rapid growth, stands hot, dry sites well; not particular as to soil, except that it must be well drained; may be killed if irrigated too much; a very good windbreak tree that is used extensively. A highly preferred evergreen in Oregon Columbia Basin Counties.
Blue spruce (<i>Picea pungens</i>)	40	25	20	Good	Excel- lent	Medium crown density; excellent growth rate; easy to establish with high survival; not particular as to soil; stands water-logging better than ponderosa; a widely used windbreak tree. There are many strains of this tree, some of which have poor form.
Norway spruce (<i>Picea abies</i>)	60	25	15	Fair	Good	Very attractive form and color; growth usually slow for first 5 years but medium growth rate after that; sometimes difficult to establish; crown very dense; makes an excellent windbreak; subject to spider mite damage.
						Crown very dense; needs more moisture and richer soil than pines; rapid growth under good conditions;

TREES AGAINST THE WIND

EVERGREEN TREES FOR WINDBREAKS

NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Northern whitecedar (<i>Thuja occidentalis</i>)	35	20	20	Good	Good	does fairly well on dry locations if soil is deep and fertile; subject to spider mite damage, one of the best all around windbreak evergreens.
Western redcedar (<i>Thuja plicata</i>)	50	25	25	Fair	Good	Attractive, very dense crowns; holds lower limbs well; survives well under irrigation where soil is not highly saline; makes extremely dense single-row windbreak or inside row in a multiple-row windbreak; apparently free of insect and disease problems; not widely used, but plantings known indicate it is a very good tree for many localities.
						Similar in appearance to northern whitecedar, but larger; not salt tolerant; makes extremely dense single row planting or is good for a middle row in a multiple-row windbreak where it is adapted; generally unacceptable for dryland plantings; not good on soils with pH higher than 7 nor at high elevations.

TREES AGAINST THE WIND

DECIDUOUS TREES FOR WINDBREAKS

Green ash (<i>Fraxinus pennsylvanica</i> var. <i>lanceolata</i>)	60	40	15	Good	Good	Dense, symmetrical and attractive; deep rooted and long lived; slow growth while young, but rapid after well established; tolerates high water table or long periods of drought; subject to scale insects; sprouting not serious; ideal for ditch banks and fence row plantings. Do not plant green ash close to rapidly growing trees such as black locust, Siberian elm or golden willow, or it will be over-topped.
Siberian elm (<i>Ulmus pumila</i>) and	50	30	12	Excel- lent	Good to Excel- lent	Moderately dense; attractive form; makes very rapid growth under a wide range of conditions; susceptible to scale insects; branches usually brittle when grown

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DECIDUOUS TREES FOR WINDBREAKS

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TREES AGAINST THE WIND

NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Chinese elm (<i>Ulmus parvifolia</i>) (Note: These two species are quite similar)						under irrigation, but pruning can reduce wind breakage; sprouting is not a problem but young seedlings often make thickets around irrigated plantings; sudden, severe fall freezes can cause extensive damage; very drought resistant, but has not stood up well in Oregon Columbia Basin. Very acceptable dry land tree in Idaho up to 5,000 feet.
Black locust (<i>Robinia pseudoacacia</i>)	50	40	15	Fair	Fair	Moderately dense crown; very rapid growth rate; adapted to wide range of soils; does not stand water-logging; seldom damaged by insects; injured roots will produce a thicket of locust sprouts; therefore use it with caution along ditch banks or fence rows; on irrigated land confine locust between rows of other trees to prevent spreading; suckering is not serious on dryland. A well liked and widely used tree.
Russian olive (<i>Elaeagnus angustifolia</i>)	30	20	12	Excel- lent	Excel- lent	A small tree with dense attractive crown; very rapid growth; adapted on a wide range of soils, both dryland and irrigated; sprouting is negligible, but along ditches it may spread by seed; widely used and well liked.
Hybrid poplar (<i>Populus</i> x spp.)	50	25	15	Good	Excel- lent	Medium tall tree with fairly dense crown; very rapid growth; likes moist situations; suckers from injured roots; do not plant near field drains or near irrigation ditches; competitive with adjacent crops; has given good early performance in dryland plantings; provides very quick protection under irrigation. Has not been widely planted but is well liked by those who have used it.

DECIDUOUS TREES FOR WINDBREAKS

TREES AGAINST THE WIND

NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Lombardy poplar (<i>Populus nigra</i> var. <i>italica</i>)	70	15	20	Good	Excel- lent	Tall, fairly dense, narrow crown; very rapid growth; suckers from injured roots; "saps" nearby ground; somewhat subject to heart rot and canker diseases. A good tree where fast growth and extra windbreak height are desired. Serves well in middle rows of farmstead or main field windbreaks and for single row plantings where height is needed, such as in orchards.
Golden willow (<i>Salix alba</i> var. <i>vitellina</i>)	35	30	15	Good	Excel- lent	Medium sized tree with good growth form for windbreak plantings; bright, orange colored young branches make it attractive in winter; very rapid growth; has wide range of adaptability to soil and moisture conditions; sprouts from crown only and does not spread from runners; used successfully in dryland plantings in southern Idaho; subject to damage from scale insects.
Black willow (<i>Salix nigra</i>)	40	30	20	Excel- lent	Excel- lent	Broad, global crown that is rather dense; usually has several stems from near ground level; very fast growing, particularly in moist situations or under irrigation; subject to damage from scale insects; serves well as one of the middle rows in the windbreak; not too suitable for single-row plantings because of low, wide spreading branches; has been a life saver in some locations where salty soils and high water tables made establishment of other trees difficult.

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SHRUBS FOR WINDBREAKS

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NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Siberian peashrub (<i>Caragana arborescens</i>)	10	10	12	Excel- lent	Excel- lent	A dense attractive many-stemmed shrub that makes rapid growth; wide range of soil adaptability; long life, disease free; sprouts from crown only; use for irrigated and non-irrigated; most popular shrub for the bushy windward row.
Nanking cherry (<i>Prunus tomentosa</i>)	6	4	15	Fair	Good	Upright, dense shrub with fast rate of growth; abundant producer of edible fruit that makes excellent jelly; fruit is retained through winter and provides good wildlife food; attractive shrub with good wind-break qualities; not subject to insect or disease damage.
Peking Cotoneaster (<i>Cotoneaster acutifolia</i>)	5	4	12	Fair	Good	Has many of the same features as Nanking cherry except slightly slower rate of growth and grows on more severe soils sites; withstands drought conditions; produces abundant fruit that is retained through winter; like Nanking cherry, is excellent for windbreaks and wildlife plantings; no known disease or insects.
Tatarian honeysuckle (<i>Lonicera tatarica</i>)	7	5	15	Fair	Excel- lent	Many-stemmed, attractive global-shaped shrub with numerous pink or white flowers; good wildlife food and cover; red fruit drops in fall; an excellent wind-break shrub; not subject to insect or disease damage; does well on most soils.
Common lilac (<i>Syringa vulgaris</i>)	12	10	15	Good	Excel- lent	Very dense, slow to medium growth rate; long lived; not particular to soil; sprouts heavily mainly at the crown; occasionally becomes infested with scale insects; this shrub is well liked in Idaho.

TREES AGAINST THE WIND

SHRUBS FOR WINDBREAKS

NAME	Average Size in Windbreaks		Minimum Annual Moisture Require- ment Inches	Salt Toler- ance	Cold Hardi- ness	GENERAL INFORMATION
	Height Feet	Width Feet				
Western mountain ash (<i>Sorbus sitchensis</i>)	15	10	20	Poor	Good	Attractive, dense, symmetrical, fast-growing tall shrub with no pruning; small-to-medium-sized tree if pruned to single stem; produces abundant colored fruit for songbirds and wildlife; not subject to disease or insect damage.
Common privet (<i>Ligustrum vulgare</i>)	12	10	15	Good	Good	Extremely dense; attractive; medium to rapid growth; needs well drained soil; sprouts only from crown; makes ideal low single-row windbreak and serves well as shrub row in multiple-row plantings.
Mugo pine (<i>Pinus mugo</i>)	8	8	20	Fair	Good	A dense, attractive evergreen shrub; moderate growth rate; does best on well-drained fertile soils; does better as a windbreak shrub at elevations below 4,500 feet.
Multiflora rose (<i>Rosa multiflora</i>)	8	10	20	Fair	Fair	Numerous slender, thorny canes grow from large root crowns; does not sucker from roots, but tips of arched canes will start root growth if covered; flowers profusely and provides good bird food and excellent cover; requires close care until established; a suitable windbreak and fencerow shrub for many areas under 4,200-foot elevation.
Southernwood (<i>Artemisia abrotanum</i>)	6	4	12	Fair	Good	A very dense low shrub with many stems from large root crown; stems are semi-woody in upper portions and commonly die back to harder tissue each winter; very rapid growth, sometimes reaching its maximum height during first growing season; short lived usually lasting about 12 years; a good plant giving quick low protection in high elevation dryland communities.

TREES AGAINST THE WIND

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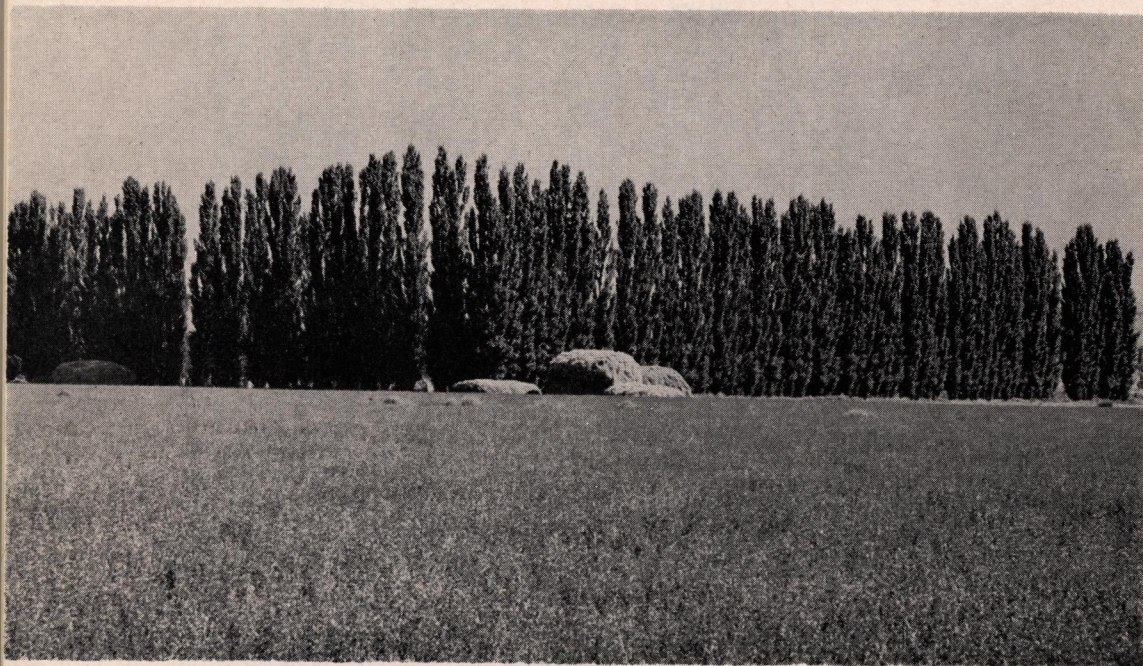


Fig. 25. This Lombardy poplar windbreak in Elmore County, Idaho, gives both farmstead and field protection.

This bulletin originally was prepared jointly by the Agricultural Extension Services of Oregon State University, Washington State University, and University of Idaho in consultation with staff members of the Soil Conservation Service, Oregon State Board of Forestry and the forestry colleges at the educational institutions above named. Revision was done by the Idaho Interagency Forestry and Biology Committee, composed of representatives of the U.S. Forest Service, Soil Conservation Service, Bureau of Land Management, Idaho State Forestry Department, Idaho Department of Fish and Game, forest industry and the University of Idaho Forest, Wildlife and Range Experiment Station and Agricultural Extension Service. Extension foresters and forestry technicians of the Soil Conservation Service and state conservation agencies in the other northwest states critically reviewed the revised draft.

**YOU CAN GET TECHNICAL ADVICE
AND ASSISTANCE ON YOUR TREE
PLANTING PROBLEMS FROM:**

County Extension Agent
Soil Conservation Service, local office
State Fish and Game Department
State Forestry Department
Agricultural Stabilization Committee, A.S.C., county office

Additional bulletins on tree planting subjects:

Plant Your Trees Right, PNW Bulletin No. 33

Raising Christmas Trees for Profit, PNW Bulletin No. 6

13 Considerations in Landscaping Your Home, PNW Bulletin No. 8

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