TAKE A BREAK, FROM THE WIND!

Windbreak/living snow fence benefits, planning, and planting

Trees in our landscapes provide important benefits to our homes including wind and snow protection, energy conservation, shade, fruit, wildlife habitat, beauty, and possibly increased property values. Using trees and shrubs to create windbreaks can be especially beneficial for rural acreages. Depending on the area of the state you live, they can provide all the benefits mentioned above and make a substantial difference in your quality of life on your acreage.

A windbreak, which also acts as a living snow fence, is a band of shrubs and trees perpendicular to the prevailing winds. A multi-row windbreak can create a protected zone or microclimate on the leeward side (Figure 1). Large windbreaks surrounding homesteads create islands of increased comfort for you or your livestock in the open spaces of our state.

Properly designed multi-row windbreaks can provide many benefits:

- **Wind protection** – Protection from our sometimes fierce Wyoming winds creates more comfortable working conditions throughout all four seasons. Physical damage to buildings, paint, windows, roofs, and other structures can be reduced.
- **Snow collection and control of drifting** – Controlling where snow collects around your property can be a major factor in your quality of life. Snow that collects in your driveway can keep you from leaving or entering your property. You can spend many, many hours and significant amounts of money each year in snow removal.
- **Energy savings** – By reducing the wind that reaches buildings, windbreaks can significantly reduce heating costs. Savings of up to 40

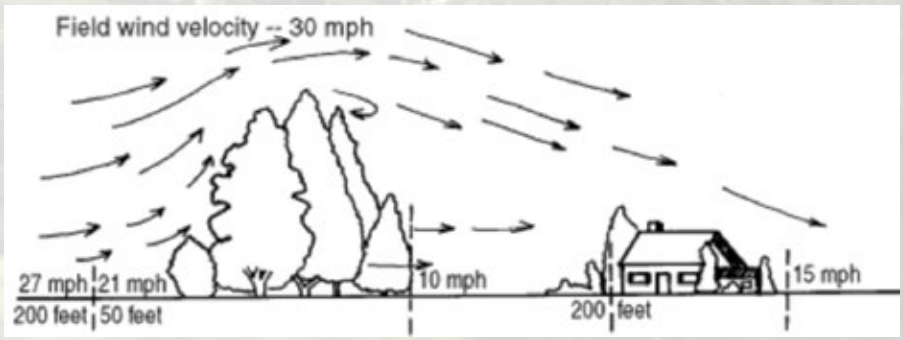

Figure 1. Windbreak protection zone. *(adapted from U.S. Department of Agriculture's Natural Resources Conservation Service)*

percent have been documented in buildings protected by windbreaks compared to unprotected buildings.

- **Aesthetic beauty** – Trees and shrubs with ornamental flowers, foliage, bark, and fruit can add a lot of beauty to your life. In addition, ornamental and otherwise useful trees and shrubs are an investment in your property's long-term value.
- **Wildlife habitat** – Wildlife utilize windbreaks for food, habitat, and cover. Many birds that nest in windbreaks eat insect pests. Fruit trees and shrubs such as chokecherry, sandcherry, gooseberry, and currant can be integrated into a windbreak planting to provide food for wildlife as well as for personal use.
- **Screening and filtration** – Windbreaks can help filter blowing soil or dust particles from fields and gravel roads, improving air quality around the home. They can also increase privacy and help reduce road noise.

General considerations in windbreak/living snow fence planning

So you've decided to add a windbreak to your property. You'll first want to consider a few key points when coming up with a design. The first is the effect of density on how a windbreak acts as a windbreak and a living snow fence.

Density has a considerable effect on how the windbreak will function and is also directly related to height. Density is the relative proportion of closed space as compared to open space. For example, wooden snowfence structures are commonly constructed of 4-inch boards each separated by a 4-inch space. Because open space is equal to closed space, these structures would have a density of 50 percent.

Research models show that density has a large impact on how a barrier will function. Note the drifting pattern created in the research model replicating the effects of a dense planting of trees in the upper barrier versus the effects a wooden snow fence would have (lower barrier).

Although this planting will provide good wind protection, the potential to cause severe drifting problems is high.

Windbreaks that are designed to distribute snow over a large area should be tall and of moderate density (40 to 50 percent). Those designed to capture snow within a limited area should be composed of multiple rows with species that exhibit high winter densities (greater than 65 percent), like evergreens. A barrier that is 50-percent dense will cast a downwind drift equal to approximately 30 times its height when the windbreak is full. Thus, a 4-foot slatted snow fence or a 4-foot single row of cotoneaster shrub (both approximately 50-percent dense) can cast a downwind drift of approximately 120 feet. On the other hand, a twin-row planting of an evergreen species like juniper will exceed densities of 60 to 70 percent. These types of plantings behave more like a solid barrier. Snow will be deposited on the upwind side first then on the downwind side. When dense barriers reach equilibrium, drift lengths of 10 to 12 times barrier height can be expected.

The trick to designing a functional windbreak is to keep it close enough to areas the landowner wants to protect so wind velocity reductions are realized yet far enough away that snow is not deposited on the area to be protected. Areas to be protected should be no further away than 10 times the estimated height of the tallest tree row – but how close can the planting be? The Natural Resources Conservation Service (NRCS) recommends the first row in the windbreak that the wind hits be no closer than 150 feet from the area to be protected. This minimum distance is based upon average windbreak densities, heights, and expected snowfall amounts and will keep protected areas free of snow during most storms while maximizing wind-control benefits. Local conditions should be considered when determining the final location of the planting. Poor tree location may create considerable problems.

A common mistake in windbreak design is failing to make the planting long enough. Wind sweeps around

the end of a barrier much like water as it moves around a rock in a stream. This phenomenon is known as "end effect" and reduces snow-storage capacity and increases wind velocities at each end of the barrier. The windbreak should be extended at least 100 feet beyond the areas requiring protection on each end.

In summary – allow room for snowdrifts to accumulate. Plant the first row that will be hit by the wind 150 to 200 feet away from the area to be protected. Setbacks of 150-200 feet from a roadway are often required by county governments to prevent snow collection on road surfaces. Placing it closer could cause drifting on the area you wanted to be protected. Second, allow space for trees and shrubs to mature. Generally, small shrubs should be planted 4 to 6 feet apart; medium shrubs and small evergreens 6 to 8 feet apart; and large trees 12 to 15 feet or farther apart. The spacing between rows is generally no less than 12 feet, to allow for the growth of large evergreens and to allow room for the use of mechanical equipment between rows for maintenance activities.

Draw a Rough Sketch

With those basic considerations in mind, the first step is to draw a rough sketch of your property. Indicate the direction of prevailing winds in your area, property lines, irrigation source, any overhead or underground utilities, and the area to be protected. Next, determine how many rows to plant. The most common arrangement is three rows: one shrub row for the row that will be hit first by the wind, a medium evergreen row in the middle, and then a large evergreen row closest to the area to be protected. The more rows that are planted, the denser the snow fence will become.

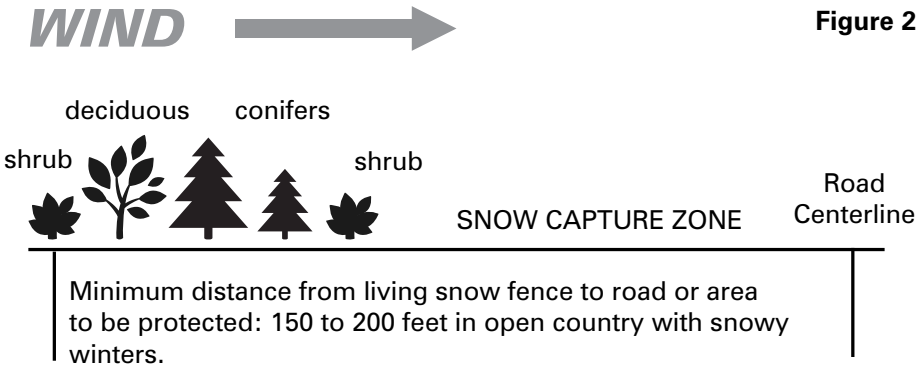

Figure 2

Select Your Trees

Pick the species of trees and shrubs that will be the most successful for your region. Several factors should be considered. Soil types (sandy, loamy, and clayey), soil quality (pH, alkalinity, salinity, and nutrient availability), average annual precipitation, and the U.S. Department of Agriculture Plant Hardiness Zone for your area are among the factors that have a large impact on the success of trees and shrubs. Being aware of your soil characteristics will assist in determining which tree and shrub species are best adapted to the site and will have the best chance for survival. The NRCS, conservation districts, and University of Wyoming Extension can help answer questions, and soil testing laboratories can assist in determining your soil type. It is also important to choose species that are either native to your area or a hardy non-native that will survive a Wyoming winter. Consider whether the species needs to be drought tolerant. A windbreak can consist of a

Potential tree and shrub species

Shrub
- Common lilac
- Sandcherry
- Nanking cherry
- Currant
- Cotoneaster
- Serviceberry
- Chokecherry
- American plum
- Buffaloberry
- Privet

Small Deciduous Trees
- Amur maple
- Gamble oak
- Hawthorn
- Tartarian maple

Tall Deciduous Trees
- Green ash
- Hackberry
- Bur oak
- Honeylocust

Small Conifer
- Rocky Mountain juniper
- Eastern red cedar
- Pinion pine

Medium Conifer
- Black Hills spruce
- White fir

Tall Conifer
- Ponderosa pine
- Colorado spruce
- Austrian pine
- Douglas fir

single plant species if that is the only type adapted to the site; however, use of multiple species can add diversity that will help the windbreak better survive disease or insect issues.

Preparing the Site

Stake the intended rows. Always "call before you dig" by dialing 811. The people at One Call of Wyoming will let you know if there are underground lines or wires that will need to be avoided. When planting seedling trees, it is best to "rip" the soil about 18 inches deep and 3 to 4 feet wide. For some, this is not possible due to lack of access to equipment. At the very minimum, rototilling to a depth of 6 to 8 inches will loosen the soil and make way for tree or shrub roots to establish and grow.

Next, place a fabric weed barrier over the rows; this will help trees survive by conserving moisture and controlling weeds. The weed barrier is pulled taut and then secured by using long staples on the edges and then burying the edges with soil. Start at one end, cut an X in the middle of the fabric (this is where you will dig your planting hole) (Photo 1). Then measure from there the distance to the next tree and continue.

When planting seedling trees (see Figure 3), dig a hole the depth and width of a shovel head (Photo 2). Dig until the shovel head fits snuggly. Make sure roots all point down and spread out. If improperly planted, a tree root can curve back up to the surface (called a J-root, Photo 3) and can kill your tree. Push the soil into the hole around the roots, firmly packing as you go (Photo 4). Large air pockets around the roots can cause roots to dry out.

Amend or Not to Amend

People often ask if the soil should be amended prior to planting seedlings. A soil amendment is any material added to a soil to improve its physical properties, such as water retention, permeability, water infiltration, drainage, aeration, and structure. The problem that arises with amending soil for trees is that eventually their roots will grow beyond the organic or inorganic improvements that have been made, and they will have to live in the soil in which they are planted. Once the tree's roots spread through the good "amended" soil into the original

soil, the tree may be stressed. Trees acclimated to their environment from the beginning do best. Also, high-nitrate fertilizers can burn the roots of the trees and should not be applied for the first three years.

Once planted, trees require careful attention the first few years. Water without overwatering. A drip irrigation system is often useful in getting the right amount of water where you need it. See *Barnyards & Backyards* magazine's Spring 2011 issue article "Drip irrigation system delivers right amount of water right where it should" for detailed information on installing a drip system. The article is available online at barnyardsandbackyards.com. Species such as pine and juniper can easily be overwatered. Irrigation and drip systems can efficiently deliver a measured amount of water to each tree. Drip systems use emitters that are 1 to 2 gallons per hour. Your local conservation district is a good resource for helping design a watering system and showing you how much to water the trees.

Protect Against Wildlife

Wildlife can harm seedling trees. Deer, antelope, elk, gophers, rabbits, and even livestock can make a meal of newly planted trees (Photo 5), and during the fall rut, buck deer can cause

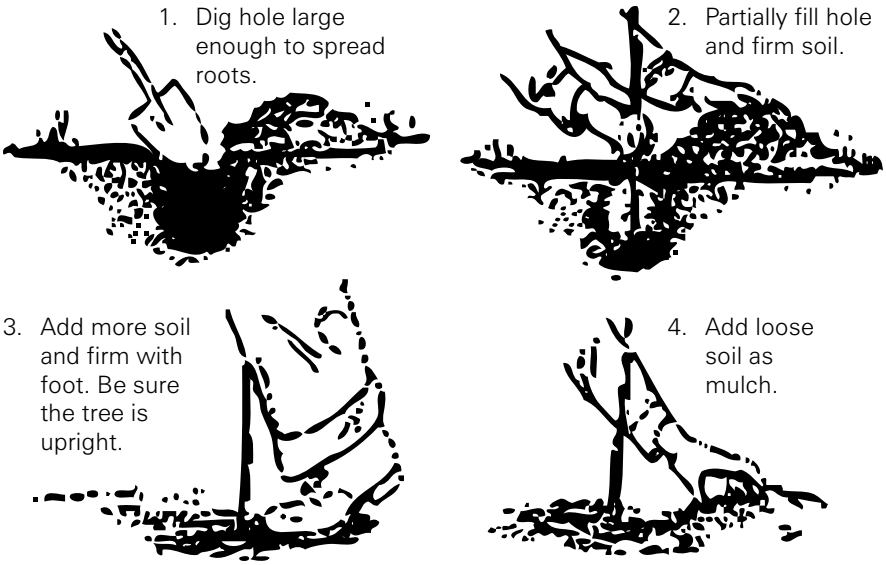

Figure 3: *www.extension.umn.edu/distribution/naturalresources/components/DD0505a.html*


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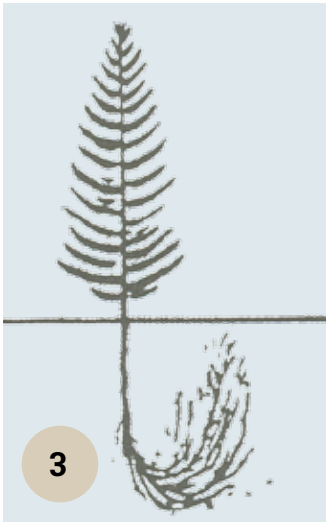
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severe damage to some species (depending on the height) when they rub their antlers on the bark. Some precautions include putting a fence around the tree rows, using tubes, or using a repellant for browsing. Tree protectors (Photo 6) and tubes can help protect seedling trees from wind. These can be purchased from forestry suppliers, some nurseries, or your local conservation district.

To protect conifers and broadleaf evergreens, you can use an antitranspirant, available at your local weed and pest control district and some conservation district offices. Antitranspirants, sprayed over the tree usually in March and November, seal in moisture and create a barrier that will help protect the trees from becoming wind burned.

Growing trees in Wyoming is always a challenge. With a little planning and a lot of care, your living snow fence can be successful. The benefits go far beyond beauty and summer shade.

Good luck, and happy planning and planting!


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The material in this section was adapted from:

"Windbreak and Living Snow Fence Design," North Dakota State University Extension Service.

"Trees, a natural solution to snow problems," Winter 2006 *Barnyards & Backyards*, by James Arnold, available at barnyardsandbackyards.com.

"How to plan and plant a living snow fence," Winter 2011 *Barnyards & Backyards*, by Liz Harvey and Martin Curry, available at barnyardsandbackyards.com.

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For more information

Wyoming conservation districts – http://www.conservewy.com/DISTRICTS.htm

Natural Resources Conservation Service Wyoming offices – www.wy.nrcs.usda.gov/wymaps/wycomap.html

Wyoming State Forestry Division – http://slf-web.state.wy.us/forestry.aspx

University of Wyoming Extension county information – http://www.uwyo.edu/ces/areas/index.html

Other written resources

Trees for conservation – A buyer's guide, is a publication from Colorado State Forest Service that provides information to select your tree and shrub species for a living snow fence and is available at csfs.colostate.edu/pdfs/08byrgd-www.pdf

Windbreaks for snow management, EC1770, is a publication from the University of Nebraska—Lincoln Extension at http://www.ianrpubs.unl.edu/epublic/live/ec1770/build/ec1770.pdf

"Reducing deer and rabbit damage to woody plants," Spring 2008 *Barnyards & Backyards*, available at barnyardsandbackyards.com.

"Getting the straight dirt: How to test the health of your soil," Spring 2006 *Barnyards & Backyards*, Available at barnyardsandbackyards.com.