Living Snow Fences

Blowing and drifting snow have created problems for people ever since they started their trek to the West. Pioneers left Missouri in early spring to avoid deep snow in the mountains and blizzards on the plains. As early as 1903, railroad companies planted trees as barriers to control blowing snow along right-of-way. By 1915, the Great Northern Railway Company reported it had planted half a million tree seedlings.

Winter woods and snow still have the power to disrupt our lives. Almost every year we hear local radio stations announce school closures because of blowing and drifting snow. Sometimes it's only a small segment of a road subject to drifting that causes miles of the road to be closed. Snow drifts jeopardize public safety and emergency services, interrupt businesses, and increase livestock and wildlife mortality.

Snow fences are a proven technique for reducing the impact of blowing and drifting snow. These structural barriers, commonly made of slats or pickets, are placed to interrupt blowing snow. With an action similar to a rock placed in a flowing stream, they cause an eddy effect that alters wind speed and direction, allowing snow to settle on.

Snowplows provide a fast, efficient way to keep roads open, but annual costs are often high. When roads are subject to recurring snow blockage, a more permanent, cost-effective solution is desirable and often needed.

Growing Solutions

Another kind of snow fence, made of living plant materials such as grasses, shrubs, and trees, can be used to improve public safety and reduce road closure. Often called living snow fences, they are actually densely planted windbreaks that have been specifically designed and planted to reduce blowing and drifting snow. Like a structural barrier, they cause blowing snow to settle in a designated area.

Living snow fences are more cost-effective than structural barriers and provide a wide array of benefits beyond snow control.
Growing Benefits

Living snow fences offer a wide range of options and will meet many objectives. These benefits continue to improve and multiply as a living snow fence grows and matures:

- Longevity
- Cost-effectiveness
- Reduced annual maintenance
- Snow and dust containment
- Wildlife habitat
- Aesthetics enhancement

Some facts about living snow fences

Service life is estimated at 50 to 75 years. The estimated life of a slat snow fence is 5 to 7 years; over a 50-year span, the installation and maintenance costs would be 4 times more.

Average cost is $3 per mile per year for each unit of snow trapped compared to $185 per mile per year for a 4-foot slat fence.

More efficient in capturing snow. When mature, a living snow fence may capture up to 12 times more snow than a slat fence.

Provide habitat for birds to nest, eat, and escape. Small mammals— even deer—are attracted to the habitat created by a living snow fence.

Can be designed to conserve energy for farmsteads, feedlots, and community facilities.

Some disadvantages to consider

Living snow fences require more space than slat snow fences.

New plantings must be protected from grazing.

It takes from 5 to 7 years for living snow fences to provide effective snow control and 20 years to fully mature.

Site conditions such as shallow soils and pH (moisture or alkalinity) may prohibit plant establishment.
Living Examples

Interstate 84 Snow Fence

“Most Dangerous Freeway in America” is how USA Today described the 41-mile stretch of Interstate 84 that runs from near Moscow, Idaho, southeast to 80th Lake City, Utah. When the wind blows, snow and dust can cut drivers’ visibility to zero. A local task force studied the problem and decided to build a living snow fence on a 2.5-mile section of the highway.

Installed in 1996, the living snow fence includes two rows of high-density willow and two rows of dwarf irrigation willow, and fabric mulch to conserve moisture and control weeds. Rocky Mountain Juniper, Saltbrush Sumac, and Siberian Peasants were selected because of their tolerance to site conditions and effectiveness for controlling snow and dust. Total footage of the snow fence is 4,720 feet. In 1998, the Natural Resources Conservation Service field staff reported a 99 percent survival rate for the trees and shrubs planted.

Many partners worked together to plan, fund, and install the snow fence. These local landowners provided easements, labor, and equipment. Other partners included the Fort Collins Soil and Water Conservation District, Mid-States Resource Conservation and Development Council, Idaho Department of Transportation, and Fish and Game, USDA’s Natural Resource Conservation Service, and the Natural Resources Conservation Service.

Jolly Hill Snow Fence

Jolly Hill Road, located in rural Bonner’s Ferry County, is the only maintained winter access road for residents of the small community of Jolly. To get to the Great Northern Ferry Area, it has a 2.25-mile long section that is prone to drifting snow. Annual county expenditure costs were high. During the winter of 1991-92, it cost the County $18,704 to keep the road open.

In 1993, the County installed a 1.5-mile snow fence to reduce future costs and improve safety. The design called for 2 rows planted 75 feet apart, Siberian Peasants and Rocky Mountain Juniper were selected for the northern side. Fabric mulch was placed in the row to conserve moisture and control weeds. The County installed water to a buried irrigation line which supplied a drip irrigation system. Partners for this project included the private landowner, Great Northern Ferry, Bonner’s Ferry County, and the Natural Resource Conservation Service.
Living Designs

Height, density, length, and plant protection are key elements in the proper functioning of a mature living snow fence. To avoid problems, carefully consider these factors during the design phase.

Height
Determine barrier height by the tallest row in a planting. Barrier height affects snowdrift depth and length. Snow storage potential can be manipulated by barrier height. Doubling the barrier height will increase snow storage by four times—an important economic factor to consider in species selection.

Density
Determine the density of a living snow fence by the species, number of rows, spacing between rows, and spacing of plants in a row. A 50 percent dense winter shows the greatest amount of snow if other factors are equal. Between-row spacing can vary depending on design criteria and objectives. Two-row high-density plantings are recommended. Preferred species are evergreens, shrubs, and low-growing broadleaf trees.

Length
Length determines the maximum area that can be protected if winds are perpendicular to it. Snow storage at the ends of a barrier is significantly less than near the center. Barrier design must extend far enough beyond the protected area to intercept winds that are not perpendicular to the barrier. Extending the area to be protected will increase this "wind effect."

Planting Protection
If livestock can access the site, than fencing will be necessary to plantings. Significant damage can occur from trampling, rubbing, and browsing. Fencing will avoid soil compaction as well as physical damage to the irrigation system and weed barrier.

Key Design Elements

<table>
<thead>
<tr>
<th>Decision</th>
<th>Conifers</th>
<th>Shrubs</th>
</tr>
</thead>
<tbody>
<tr>
<td>snow</td>
<td>capture</td>
<td>Zone</td>
</tr>
<tr>
<td>centerline</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum distance from living snow fence to road or area to be protected: 150 to 200 feet in open country with snowy winters.

Orient living snow fence at right angles to prevailing winter winds. Doubling the height will more than quadruple the amount of snow captured. Vegetation with about 50% density will capture and store the greatest amount of snow. Conifers are ideal species to plant because of their height and year-round foliage. Many deciduous trees and shrubs also work well, especially in combination with conifers.

There are hundreds of site-specific design options.
Planning Living Solutions

Living snow fences must be well-planned and located to achieve the myriad of benefits they offer. For example, a snow fence located in the wrong place could cause more snow accumulation on the road instead of protecting it.

Follow these 10 steps to ensure success

Step 1: Determine planting objectives. Your objective may be as simple as the control of blowing and drifting snow or more complex with multiple objectives such as providing in-stocked protection of wildlife habitat, enhancing the beauty of the landscape, or water harvest and storage.

Step 2: Take an inventory of all on-site physical factors, including:
- Annual precipitation, average snow volume to be stored
- Topography and aspect, distance upwind available for planting
- Soil type, fertility, depth, and pH
- Current and potential land uses, land ownership, constraints

Step 3: Determine planting stock needed by species, number and who will order them.

Step 4: Decide what site preparation work is needed and who will do it.

Step 5: Determine fertilizer needed. Most wind breaks and living snow fences are not fertilized unless a deficiency shown in the growth and foliage if the trees and shrubs.

Step 6: Determine type of irrigation system needed to ensure plant establishment and survival. An irrigation system will need to be considered in areas with less than 30 inches of annual precipitation.

Step 7: Determine fencing needed to protect young plants from grazing livestock or wildlife. Decide who will install and maintain it.

Step 8: Decide what kind of weed barrier or mulch will be used and who will install it. Growth rates are significantly faster when weed barrier is used. Newly planted trees can’t compete with annual weeds and grasses to make plans for cultivation, chemical weed control or mulching.

Step 9: Plan for proper maintenance:
- Frequent inspections of irrigation systems and fences to allow speedy repairs when needed.
- Frequent inspections of plants to spot weed and pest problems to allow quick remedial action.
- Prompt replacement of any dead plants.

Step 10: Make a plan by listing decision make, the actions will need to take place, and who will carry out each action.

Who should be involved in planning?

Living snow fences often involve multiple landowners or jurisdictions that can make planning more complex. Involve key decision makers and partners early in the planning stages.

Potential partners include private landowners, county commissions, county road departments, conservation districts, Resource Conservation and Development councils, State Department of Highways, State Department of Lands, State Forester, and federal, state, or local land managing agencies.
Living Plant Selection

Use of well-adapted plant species is critical to the success of a living room fence. Consult your local office of the Natural Resources Conservation Service or Cooperative Extension System for site-specific recommendations.

Some commonly recommended species

Evergreen
- Eastern redcedar, Austrian pine, Blue Spruce
- Rocky Mountain juniper and Utah juniper are very drought tolerant
- Scotch pine and Ponderosa pine are suited under 7000 ft.

Low Broadcast
- Silviera empress, Maximilian empress
- Russian olive on upland sites only because species can spread in areas with high water tables

Shrubs
- Azeva honeylocust, Hibiscus honeylocust, clovebush, golden current, Fothergilla, mountain laurel, Russian olive

Where to get technical and financial help

The Natural Resources Conservation Service, Cooperative Extension System, or state forester can provide valuable on-site planning and design assistance. Resource Conservation and Development councils and conservation districts can help with project coordination.

USDA programs like the Conservation Reserve Program, Environmental Quality Incentives Program, and the Soil and Water Incentive Program may provide help. Contact the Natural Resources Conservation Service, your local conservation district, state department of lands, or state forester for more information and assistance.

Published by
Natural Resources Conservation Service
Main Resource Conservation and Development Association
USDA National Agricultural Center, Lincoln, Nebraska

December 1989
Bobbi Bibb

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, sex, religion, handicap, political beliefs, or citizenship status (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, and tape) should contact USDA's TARGET Center at 202-720-2600 (voice) or 202-720-2650 (TDD).

To file a complaint of discrimination, write USDA, Director, Civil Rights Division, Room 320-B, 1400 Independence Avenue, S.W., Washington, D.C. 20250 (or call 202-720-5964). USDA is an equal opportunity provider and employer.