Living Snow Fence

An agroforestry practice

Photo: Craig Stange, NRCS

With action similar to scattered rocks in a stream, living snow fences create eddy effects that alter wind speed and direction, causing snow to settle in designated areas, protecting roadways, structures, livestock and wildlife.

Winter winds and blowing and drifting snow have the power to disrupt lives. Almost every year local radio stations announce school and road closures because of blowing and drifting snow.

Sometimes miles of road will be closed when only a small segment has been drifted over. Blowing and drifting snow jeopardizes public safety and emergency services, interrupts businesses, increases road maintenance costs and causes livestock and wildlife mortality.

Structural barriers, such as horizontal or vertical slatted snow fences, are a proven technique for reducing the impact of blowing and drifting snow.

With an action similar to scattered rocks in a flowing stream, these barriers create eddy effects that alter wind speed and direction, causing snow to settle out. When roads are subject to recurring snow blockage, a more permanent, cost-effective solution is often desirable and needed.

An alternative to a structural snow fence are rows of living plants such as grasses, shrubs and trees. Often called living snow fences, these are strategically planted windbreaks that have been specifically designed 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, can meet many additional objectives, and provide a wide array of benefits beyond snow control.

Why use a living snow fence?

Living snow fences offer a wide range of benefits that continue to improve and multiply as a living snow fence grows and matures, such as longevity, cost-effectiveness, reduced annual maintenance, snow and dust containment, wildlife and pollinator habitat.

Photo: National Agroforestry Center

Efficacy

A living snow fence is more efficient in capturing snow than a slatted fence. When mature, a living snow fence, depending on its design, may capture up to 12 times more snow than a slatted fence and can be designed to conserve energy for farmsteads, rural buildings, livestock and community facilities.

Living snow fences also can provide habitat for wildlife to nest, feed and escape, as well as attract pollinators.

Service life

The life of a living snow fence is estimated at 40-50 years, while that of a slatted snow fence is 7-20 years, which means that over a 50-year span, the installation and maintenance costs of a slatted snow fence could be 4-7 times greater than a living snow fence.

Considerations

Although living snow fences have many benefits, these do not come without consideration that they require more space than slatted fences and that land is effectively out of production. Also, new plantings must be protected from livestock and wildlife.

While more effective at snow control than slatted fences, living snow fences may take 5 to 7 years to develop. Living snow fences also require regular maintenance and their density will change over time.

Finally, site conditions such as shallow soils and pH (acidity or alkalinity) may prohibit the establishment of a living snow fence.

Photo: Gary Kuhn, NRCS

Planning considerations

Photo: Loren St. John, NRCS

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It's important to put the right plant in the right place, therefore, living snow fences must be well-planned and properly located to achieve the wide array of benefits they offer. For example, any snow fence located in the wrong place could cause snow to accumulate on the road instead of keeping it clear.

Ten steps to ensure success

1. Determine planting objectives. The objective may be as simple as the control of blowing and drifting snow or more complex with multiple objectives such as providing livestock protection or wildlife habitat, enhancing the beauty of the landscape or water harvest and storage.
2. Take an inventory of all site factors, including:
   - Annual precipitation and anticipated snow volume to be stored
   - Topography, aspect and distance from area to be protected
   - Soil type — fertility, depth, wetness, texture, salinity and pH
   - Current and potential land uses, land ownership, easements, location of utilities and other restrictions
   - Troublesome wind direction
3. Determine the planting stock needed by species and number.
4. Decide what site preparation work is needed.
5. Determine the fertilizer needs. Most windbreaks and living snow fences do not need to be fertilized unless a nutrient deficiency shows in the growth and foliage of the trees and shrubs.
6. Determine the type of supplemental water needed to ensure plant establishment and survival. An irrigation system or other types of supplemental water should be considered in areas with less than 20 inches of annual precipitation or on sites that may benefit from additional water. In some cases use of fabric weed barriers may provide necessary moisture conservation, precluding the need for supplemental water.
7. Determine the fencing or plant guards needed to protect young plants from grazing livestock or wildlife.
8. Decide what kind of weed control will be used. Annual weeds and grasses compete with newly planted trees. Using cultivation, chemical weed control, fabric weed barriers or mulching significantly increases plant survival and growth rates.
9. Include proper maintenance:
   - Frequent inspections of irrigation systems and fences allow speedy repairs when needed.
   - Regular inspection of plants to spot weed and pest problems allows quick remedial action.
   - Prompt replacement of any dead plants eliminates gaps in the living snow fence.
   - Corrective pruning of storm damage reduces future plant problems.
10. Make a plan that includes a listing of the decisions made, the date actions will need to take place and who will carry out each action.

Living snow fence design

Photo: Craig Stange, NRCS

A significant economic factor in using living snow fences is the reduced road maintenance costs of snow removal.

Length

Length determines the maximum area that can be protected. 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 deviate 25 degrees from either direction of perpendicular. Extending a snow fence at least 100 feet beyond the area to be protected will help mitigate this 'end effect.'

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 barrier stores the greatest amount of snow if other factors are equal. Spacing between rows can vary depending on design criteria and objectives. Twin-row, high-density plantings are recommended due to their efficiency. Preferred species are evergreens, shrubs and low-growing broadleaf trees.

Height

Determine design barrier height (expected height at 20 years) by using the tallest row in a planting. Barrier height affects snowdrift depth and length. Snow storage potential can be manipulated by adjusting planned barrier height. Doubling the barrier height will increase snow storage by four times — an important economic factor to consider in species selection.

Location

Location of the living snow fence in relation to the distance from the road is critical. Orient the living snow fence as near perpendicular to prevailing winds as possible. Barriers placed too close to the road can result in drifts being deposited on the road. Barriers should also be compatible with farming practices, farming operations and local conditions. Typical road setbacks range from 100-600 feet depending on site conditions and geographic locations.

Plant Selection

Use of site-adapted plant species is critical to the success of a living snow fence. A combination of conifers, shrubs and low-growing broadleaf trees can provide multiple benefits. Incorporate other plant species that provide functions such as wildlife and pollinator habitat, aesthetics and added income from woody floral products or food producing plants. Consult your local USDA office of the Natural Resources Conservation Service, state forestry agency or Cooperative Extension Service for site-specific advice.

Planting Protection

If livestock can access the site, then fencing will be necessary to protect plantings. Significant damage can occur from trampling, rubbing and browsing. Fencing will avoid soil compaction as well as physical damage to the irrigation systems and weed barriers that may be present. If wildlife damage is likely, use tree shelters or other forms of protection.

Living snow fence design

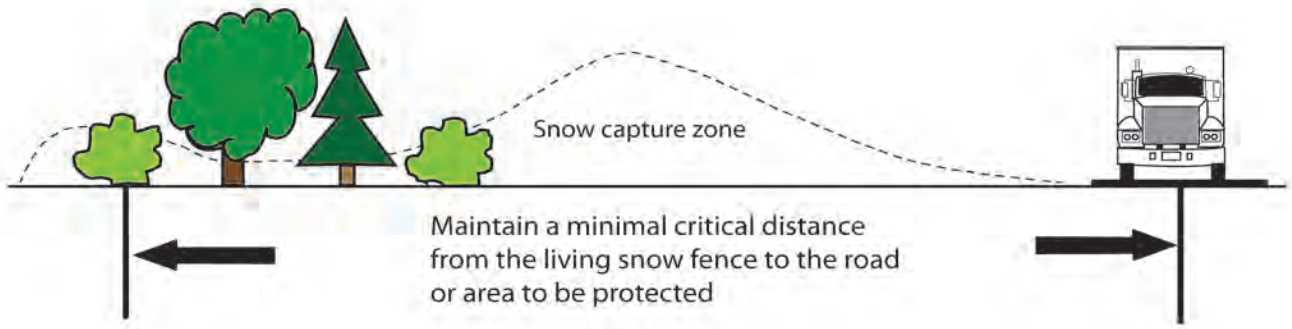

Illustration: Doug Wallace, NRCS

Orientation, length, height and density are all factors that determine the efficacy of a living snow fence to capture and store the greatest amount of snow.

Critical design elements

- Orient living snow fence as near as possible at right angles to prevailing winter winds.
- Doubling the height will more than quadruple the amount of snow captured.
- Vegetation with about 50-percent 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 work well, especially in combination with conifers.
- Incorporate other functions into the design such as wildlife and pollinator habitat, aesthetics and added income from woody floral products or food producing plants.

Photo: Craig Stange, NRCS

Maintaining a living snow fence

With the power to disrupt lives, increase highway maintenance costs, jeopardize public safety and emergency services, blowing and drifting snow continues to be a hazard to both rural and city communities. Putting trees to work as living snow fences can be an effective way to reduce the blowing and drifting snow and are a cost-effective means to reduce annual highway maintenance, add an aesthetic aspect to roadways, while creating habitat for wildlife and pollinators.

Management and maintenance

Proper care of the living snow fence is critical to its long-term functioning. A living snow fence will need regular maintenance and attention from the day it is planted. Practices such as weed control, protection from livestock and wildlife damage, corrective pruning, replanting, insect and disease control and supplemental watering may be needed on a continuing or periodic basis.

Photo: National Agroforestry Center

For more information:

For local planning and design assistance contact your nearest USDA Natural Resources Conservation Service office, County Extension office, Conservation District, state forestry agency or local natural resource consultant.

For more information on living snow fences contact the USDA National Agroforestry Center: phone 402.437.5178, ext. 4011, or at www.unl.edu/nac/

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