# Out of the Cold

[PHOTOS COURTESY OF BOB JAIRELL]

***Create wind and snow shelters to keep your profits from freezing.***

*Story by*
**BROOKE BYRD**

Farmers and ranchers may choose to use a variety of weather shelters when faced with extremely cold and harsh conditions. However, says Robert Kilian, range management specialist with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), "there are some planning things you need to take into consideration when you're going to build a livestock shelter."

Kilian, who works out of Miles City, Mont., divides weather shelters into two categories. "There's fabricated livestock shelters, and then there's living livestock shelters," he says. Those in the fabricated category include man-made windbreaks. Living livestock shelters, also called shelterbelts, are rows of trees and shrubs that form a windbreak.

Producers must consider such factors as snow and wind, as well as location and herd size, before creating a shelter, Kilian emphasizes. "What may work for one person may not work for another." He recommends producers contact local NRCS specialists to tailor shelter specifications to their individual circumstances.

## Out of the equation

Kilian advocates the use of windbreaks to cut down on extreme winter temperatures. "All windbreaks — fabricated or living — are designed based on a height/porosity relationship," he says. This relationship will dictate the size of the area protected.

A porosity of 50% at a given height provides the greatest distance of reduced wind; however, he says, "If you're in an area that has potential for wind and snow, you need to take snow out of the equation." To do that, he suggests producers use a trip row, placed upwind of the windbreak. Without a trip row, he explains, windbreaks are likely to drift shut due to snow accumulation.

The trip row is designed on this same height/porosity relationship, Kilian says. Multiplying the height of the structure (with 50% porosity) by 10 gives the area of protection. "If your trip row is 4 feet (ft.) tall, made of 50% porosity, you will be able to capture snow in a distance of 40 feet," he explains.

Kilian recommends building the windbreak in similar proportions, but cautions producers about picking a location. "They need to pay attention to their landscape," he says. "If it's hilly country, sometimes the valleys act like wind funnels and just draw it in." Similarly, he warns those living in the Dakotas and Montana about high-speed winds. "You might not want to build on top of an open flat where wind gusts can be as high 80 to 90 miles per hour (mph)," he says.

"You would have to build a structure you could set the Empire State Building on just so it stands," he says. When building windbreaks in windy environments, "You need to ensure that the materials used are durable enough to withstand the winds of your area."

## A living barrier

For a more aesthetically pleasing approach, Kilian recommends living livestock shelters. "Essentially you're planting a windbreak out of trees and shrubs," he says. While this option provides the same level of shelter for cattle, it may offer some additional benefits.

Shelterbelts provide a great deal of wildlife habitat, he says. "All your birds will use it at some time. What kind of wildlife uses it will depend on what kind of trees you plant."

For producers seeking means of wildlife conservation, shelterbelts can be a great option. To attract or maintain habitat for a specific species, Kilian notes, a producer might plant shrubs with berries, or large deciduous trees with canopy cover for nesting or with lateral branches to evade predation.

"Junipers, which are really dense, make really good hiding cover or protection from the weather," he says. However, he says, areas with large deer numbers may be affected by deer browsing. Steps to protect the trees may need to be taken.

Shelterbelts can also be used to reduce energy needs. "If you take that wind off your house, it's easier to heat," he explains. Similarly, in the summer, the shade provided by the shelterbelt can reduce air conditioning costs. Living shelters also provide an indirect savings on energy expenditures by livestock, Kilian says.

"If unsheltered, a cow has to eat more to stay warm. So, if you can reduce the energy needs, you don't have to feed as much hay, which means potentially you don't have to spend as much for diesel harvesting hay," he explains.

While it may seem like trees and shrubs take too long to grow, Kilian says, "You'll start having an effect within the first couple of years." If trees or shrubs are 18 inches (in.) tall when planted, after only a little growth, "you have a disturbance height of 2 feet, and you start getting some of the snowfall out of the system."

**Fig. 1: Protection provided by typical V-shaped snowbreak**

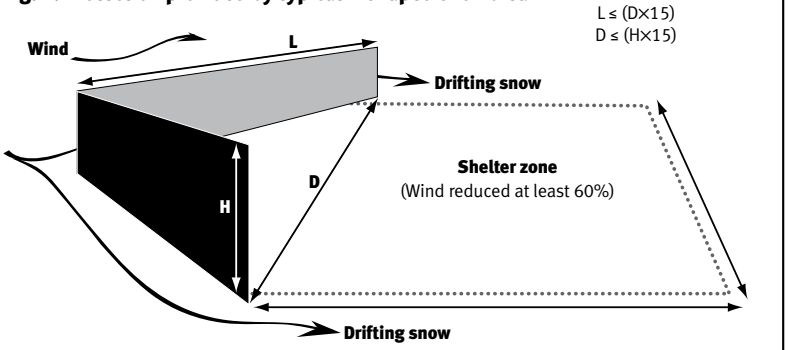


**Table 1: Number of cow-calf pairs protected by shelters based on measurements**

| H (ft.) | L (ft.) | D (ft.) | Area[1] (sq. ft.) | Pairs |
|---|---|---|---|---|
| 6 | 60 | 85 | 3,964 | 79 |
| 8 | 80 | 111 | 7,047 | 141 |
| 10 | 105 | 148 | 11,824 | 236 |
| 12 | 125 | 176 | 16,828 | 336 |
| 14 | 145 | 205 | 22,714 | 454 |

[1]Area of protection with at least 60% wind reduction.

Bob Jairell, retired FS researcher, prefers a solid snowbreak to protect cattle from snow and wind.

Most shelterbelts are created from a minimum of three to five rows of trees and shrubs. "Determine the type of tree by the height and canopy width," he says. In the back row, he recommends producers place tall deciduous trees that will have wide canopies. But, since the bottom 10 ft.-15 ft. will be mostly trunk, he suggests a second row of pine trees with branches all the way up. "Then, the third row will be a shrub," he says.

When deciding which plants to use, Kilian also cautions producers to first examine how much snow they receive. "If you get 3 feet of snow annually, and you know it drifts 6 feet, you might want a 10-foot-tall shelterbelt," he says.

In terms of price, Kilian notes that it depends mostly on maintenance and preparation costs. Most shelterbelts will need to be fenced off, he explains, especially deciduous trees. In areas with high-precipitation zones, shelterbelts can be planted and left alone. "Out West it takes a little more effort because we don't have enough moisture for trees to flourish," he says. "We have to do other things to give them the advantage; properly placed trip rows can be very beneficial in capturing winter moisture for the trees."

Various Farm Bill programs might financially support the building of shelterbelts, Kilian notes, although he says that specific practices can vary from state to state. "The Environmental Quality Incentives Program (EQIP) generally supports windbreaks and shelterbelts for livestock and homesteads," he says. Due to energy savings and wildlife habitat, other government funding might also be available. For more information contact local NRCS offices or visit *www.nrcs.usda.gov*.

## Optimum protection

They call Bob Jairell "the snowman." A retired U.S. Forest Service (FS) researcher, Jairell provides his expertise on snow shelters to farmers and ranchers around his Laramie, Wyo., home. His method of choice is a completely solid U- or V-shaped snowbreak.

The shape, he says, is crucial. "What this thing is doing is splitting the wind," he says. "The wind starts to go around both sides, but as it starts to go over the top of the shelter, it's got a back pressure that keeps the wind blowing downwind, so you've got a calm area.

"A flat wall does not work," he continues. "It traps snow on both sides of it."

A U-shape actually provides 25% more protection, Jairell says, but producers have had trouble shaping materials to those specifications. To find the right measurements to build their shelters, he says, "the relationship between the height of the shelter and the width of the wings gives you the maximum optimum protection behind it." To avoid building the wings too long, which could cause the snowbreak to start collecting snow, he uses a formula where H is the height of the shelter, L is the length of each wing, and D is the diagonal distance between the two wings' ends (see Fig. 1, page 22).

For the optimum deflection of the snow around it, he says D should be no more than 15 times H. The distance specifications are to keep the wings at a 90° angle, and, he says, L should be no more than 15 × D. As an example, on a 12-ft.-tall shelter, the diagonal distance between the wings' ends should be approximately 176 ft., and the length of each wing should be 125 ft. (see Table 1, page 22).

To get "the biggest bang for your dollar," Jairell recommends shelters be at least 12 ft. tall. "No matter what stands behind there, wind is going to be jettisoned over the top of that."

The area within the shelter should have winds of approximately 0 mph, while the rectangle that forms behind the triangle carries a wind reduction of 60%-80% of the ambient. "If you had a 100-mile-per-hour wind, if they stood in that rectangle, they'd be in a 20-mile-per-hour wind," Jairell says. "If they got out of that rectangle, but still stayed in the influence of the ends of the wings, then the wind would be reduced 60%, 50%, 40% — to 3,000 feet downwind where there's still an influence of that shelter."

Producers should also take into account how big their herd is when calculating shelter size. Based on research done at Colorado State University, Jairell suggests allowing 50 square ft. (sq. ft.) per cow-calf unit behind the shelter. For instance, in the example above, there would be 16,828 sq. ft. of protected area, which would allow 336 cow-calf pairs protection. This is a generous number, he says, since cattle will huddle next to each other during cold temperatures.

Jairell also emphasizes that shelters be completely solid. "You're trying to prevent snow from getting to the animals, not just

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cold wind," he says. "Up to 30% porosity will reduce the wind more than any other porosity or solid board," but without a trip row, "you'll build up snow behind it." For producers faced with a great deal of wind and not much precipitation, he says a porous windbreak might be the answer.

He warns against leaving a gap at the bottom, as some producers do to keep the wood from rotting. "That makes it even worse," he says. "If you've got a solid wall out there, the wind's about 100 times stronger going underneath that because it's being compressed and forced through."

For producers without much space or with smaller herds, Jairell says taking two metal panels, wiring them together into a V-shape and covering with a tarp or plywood can be a great solution (see picture on page 22). In times of medical treatment or calving difficulty, he says, it can be a useful, portable tool.

Producers must choose the appropriate materials for their circumstances, he notes. "A 12-foot-tall shelter costs $5.68 per animal initially," he says, based on building materials of wood planks, poles and particleboard. For a permanent shelter, cost per animal goes down after the initial building.

In terms of materials, anything that is solid and stands up to the wind works well, he says. Most importantly, Jairell emphasizes, producers need to adapt shelter plans and materials for their own needs.

## Building with bales

Another option for a snowbreak can often be found in a producer's own backyard. Mike Moon, manager of the Colorado State University (CSU) John Rouse Beef Improvement Center, has been using round hay bales since a mid-1990s CSU study.

"In areas where we didn't have any windbreaks, we actually made them out of the haystacks," he says. "We normally stack hay in the field, so we just changed the stack configuration."

Round bales were used as snowbreaks at the CSU John Rouse Beef Improvement Center. Already-present stacks of hay were simply moved to a different configuration.

The round bales were configured into a V-shape, with the point facing into the prevailing wind. Two bales high [approximately 12 feet (ft.)], each wing was 20 bales long — roughly 100 ft. The first layer of bales was stacked on the ends so strings would not freeze and break against the ground, while the second layer was stacked on the sides.

Moon alternated feeding bales from leg to leg each day so the V would stay even. Once the hay was fed to the point of making the shelter ineffective, "we moved to another one," he says.

"It worked very well. We still use them," Moon continues. "During storms, you'll get a drift on each side of the V that never touches the hay. ... The only snow inside the V is what's fallen."

The haystacks were fenced off from hungry cattle. While Moon was forced to use permanent fencing due to an elk problem, he recommends using portable panels so producers can adjust the location.

That portability, says Bob Jairell, retired Forest Service (FS) researcher, is the unique thing about using hay bales. "If he didn't like where they were, he could move them," he says. That eases worries about accumulating disease organisms in heavily used areas, since they can adjust shelter locations. Also, it can help with grazing management to protect important vegetative or riparian areas.

Hay quality of bales used in the snowbreak wasn't affected, Jairell notes. Hay samples taken from bales used in the shelter and bales from the same field not used in the shelter did not reveal any differences.