TREES a natural solution

Most locations in Wyoming have two common weather events that, especially when combined, result in residents spending millions of dollars annually -- wind and snow. Drifting snow often makes travel hazardous causing thousands of motor-vehicle crashes and costly delays. Simple tasks such as driving out of the garage or opening the barn door can become challenging.

Trees can be an effective tool in managing snow; however, if not properly located, these same plantings can create considerable problems. Research shows snow storage capacity can be quadrupled as the height is doubled for certain barriers. Planting trees too close to areas you want to protect can increase snow problems.

The design of the tree planting should be done with your needs and winter conditions in mind. In some cases, landowners may choose to relocate fences, driveways, or feedlots to take full advantage of the windbreak provided by trees. Remember, a tree planting is a long-term investment, and it pays to consider all alternative designs. Generally, tree plantings should be located perpendicular to the prevailing wind direction.

Photo 1. 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).

Density has a considerable effect on how the windbreak will function and is also directly related to height (see Photo 1). Density is the relative proportion of closed space as compared to open space. For example, wooden snow fence 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.

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 equilibrium is reached, i.e., the windbreak is full. Thus, a 4-foot slatted snow fence or a 4-foot single row of cotoneaster (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 to12 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 the snow load

to snow problems

Photo 2. Although this planting will provide good wind protection, the potential to cause severe drifting problems is high.

Photo 3. The research model shows how end effect reduces snow storage and increases wind velocity at the ends of the barrier.

zone is avoided. 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 windbreaks 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 (see Photo 2).

The recommended minimum distance from roadways is increased to 200 feet to allow for protection during greater storm intensities. Because tree plantings often exceed 60- to70-percent density, as described earlier, the potential for a drift occurring on the upwind side of the planting exists. When roads are located on the upwind side of a tree planting, trees should be planted a minimum of 80 feet from the roadway.

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 (see Photo 3).

Use care when designing your windbreak and seek help from local experts such as those from local conservation districts, the Wyoming State Forestry Division, the NRCS, and your Cooperative Extension Service office.

Properly designed, tree plantings can serve to mitigate snow-related problems and improve the quality of rural life for many years.

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